ANNUAL REPORT

OF THE

MINISTER OF MINES

FOR THE

YEAR ENDING 31ST DECEMBER,

1889,

BEING AN ACCOUNT OF

MINING OPERATIONS FOR GOLD, COAL, &C.,

IN THE

Province of British Columbia.

VICTORIA, B. C.:
rinted by RICHARD WOLFENDEN, Printer to the Queen's Most Excellent Majesty.

PROVINCE OF BRITISH COLUMBIA.

MINING STATISTICS FOR 1889.

Name of Bar, Gulch, Creek, or River.	No. of Companies working.	No. of Interests.	No. of Companies taking out gold.	No. of Companies prospecting.	Average number of men employed during season.		Rate of Wages.		Nature of Claims.					How Worked.					Description of Machinery.		Value of Gold per ounce.	Estimated value of yield for the year.	Value of Silver per ounce.	Estimated value of yield for the year.	Total Divisions.		Total Districts.		Remarks.
					Whites.	Chinese.	Whites.	Chinese.	Bar.	Creek.	Bench.	Hill.	Quartz.	Rocker.	Sluices.	Hydraulic.	Shaft.	Tunnel.	Water Wheels.	Steam Engine					Gold.	Silver.	Gold.	Silver.	
CARIBOO.																												
Barkerville Division:																												
Williams Creek and tributaries	27		24	3	38	60	$3.50 to 4.00	$2.50 to 3.00		11		12	4		6	8	7	6	1	1	$15.75 to 16.50	$25,092						
Mosquito Creek and Red Gulch	8		6	2	13	6	,,	,,		4		2	2		2	2		2			17.25	11,000						
Hardscrabble and Sugar Creeks	3		3		3	11	,,	,,		1		2				2		1			17.00	2,500						
Lowhee Creek	9		6	3	6	19	,,	,,		4		3	2	1	4	1	2	1	1		17.25	8,000						
Grouse and Canadian Creeks	12		9	3	12	18	,,	,,		5		6	1		5	3	1	3			16.00	9,500						
Antler Creek	12		8	4	17	18	,,	,,		7		5			8		2	2	2		16.25	7,000						
Cunningham Creek (Upper)	5		5			12	,,	,,		4		1			4	1					16.00	3,000						
Stevens, Beggs, and California Creeks	5		5			17	,,	,,		5					3	2					15.75	6,450						
Desultory						20																6,000			$78,542			
Lightning Creek Division:							$3.50 to 4.00																					
Lightning Creek	10		5	5	8	17		,,		7		1	2		4	1	3	2			17.50	6,000						
Van Winkle, Chisholm Cree., and Perkins Gulch.	9		5	4	10	12	,,	,,		3		6			5		2	2			17.25	2,450						
Devil's Canyon and Slough Creek	6		6			30		,,				6			3	3					,,	11,200						
Nelson, Burns and Coulter Creeks	6		6			19		,,				6			4	2					,,	6,700						
Last Chance and Davis Creeks	4		4		2	14	,,	,,		2		2			2	1	1				,,	3,600						
Peters Creek and tributaries	3		2	1	5	7	,,	,,		3					2		1		1		17.00	1,000						
Swift River and tributaries	4		4			15		,,		4					4						16.25	3,200						
Rushon Creek and vicinity	3		3		3	5	,,	,,		3					2		1				17.50	4,000						
Desultory						15																3,000			41,150			
Quesnellemouth Division:																												
Fraser River (from 6 miles below to 20 miles above the town of Quesnelle)	10		10			57	,,	,,	5		4	1		2	2	6					15 to 16	17,300						
Quesnelle River	3		3			19	,,	,,			2	1			2	1					16.00	5,200						
Cottonwood River	4		4			21		,,	2		2				4						,,	5,000						
Hixon Creek and vicinity	6		3	3	5	15	,,	,,		3	1		2		3		1	2			,,	5,500						
Desultory						15																4,000			37,000			
Keithley Creek Division:																												
Keithley Creek	5	16	5		8	16	4.00	2.50		2		3			2	1	2		2		17.40	7,000						
Do. Desultory						10																1,500						
Snowshoe Creek	6	15	6		9	12	,,	,,		4		2			4	1	1		1		17.00	8,000						
Do. Desultory						5															,,	500						
French and Snowshoe Creeks—Desultory						7															,,	700						
Harvey Creek	2	6	2		6		,,			2							2		1		17.40	2,500						
North Fork Quesnelle River	4	18	3	1	2	15	,,	2.00		1	3				3			1			16.50	2,500						
Do. do. Desultory						4																500						
Kangaroo Creek—Desultory						6															,,	1,000						
South Fork Quesnelle River	4	30	3	1	2	20	,,	,,			1	3			3	1					,,	8,000						
Do. do. Desultory						8															,,	2,000						
Cedar Creek	2	8	2			8		,,		2					2						,,	2,000						
Quesnelle River (from Forks 40 miles down; no organized companies, all desultory mining)						20																5,000						
Horsefly River	3	20	1	2	5	4	3.50	,,				3				1		2			,,	3,000						
Fraser River (6 miles below Quesnelle down to Riskie Creek)	6	50	6			50					6				1	5					16.00	15,000						
Fraser River—Desultory						20															,,	2,000			61,200			
CASSIAR.																												
Dease Creek	10	45	9	1	7	13	5.00	4.00		4		6			4			6	1		15.50	11,200						
Thibert Creek	7	32	7		12	9	,,	,,		1		6			1			6			16.00	10,800						
Stickeen River	1		1		4		4.00	,,	1												,,	1,000						
McDame Creek	12	45	12		5	34	6.00	4.50		4		8									17.50	16,380						
Snow Creek	1	4	1		1		,,			1											18.00	600						
Quartz Creek	4	14	4		2	8	,,	5.00		1		3									,,	10,950						
Poor Man Creek	1	1	1		1							1									,,	100						
Gold Creek	1	1	1		1					1											,,	400						
Desultory mining																					,,	3,500			54,910			
KOOTENAY.																												
Western Division:																												
Big Bend Subdivision																												
McCulloch Creek	2	18	1	1	10		4.00			2						1		1			18.00	3,700						
French Creek	1	4	1		4		,,			1							1				,,	3,000						
Carnes Creek—Desultory					2																,,	400						
Columbia River	1	5	1		5	25	,,				1					1					,,	4,700*						* Of which $4,000 were obtained by Chinese.
Illecillewaet Subdivision	1			50	20								50†				7	7										† 36 locations—open cuts on vein.
Eagle Creek Subdivision				13	22		8.50						13†					2										† 11 ,, ,, ,,
Forty-nine Creek—Desultory					8																							
Toad Mountain Subdivision	2			80	175		,,						82		8		10	11		1	18.00	900	95c.	$17,917				
Upper Arrow Lake—North Arm				10	3		,,						10†															† 10 ,, ,, ,,
Hot Springs Subdivision	2			78	100		,,						80†				14	2					95c.	29,956				† 64 ,, ,, ,,
Hendryx Mines	1			1	12		,,						4					1		1					12,700	$47,873		
Eastern Division:																												
Wild Horse Creek	7	16	7		5	51	3.00	2.50			5	10			11	8					18.00	20,000						
Palmer's Bar	1	4	1			4		,,	1						1						,,	1,000						
Moyea River	1	3	1			3		,,	1						1						,,	1,000						
Weaver Creek	1	3	1		3		3 00				1				2	1					,,	2,000						
Bull River	2	2	1	1	2		,,			1					1						,,	800						
Porcupine Creek	5	6	2	3	8		,,			2											,,	2,000						
Perry Creek	1		1		13		,,					1 (lease)						1			18.50	6,500						
Desultory mining																						3,000			36,300			
LILLOOET.																												
Cayoosh Creek																												
Bridge River					30	150								1	1	1	1	1			15 to 16.50	60,364‡			49,000			
Bars and Benches of Fraser River																									60,364	$47,873		
YALE.																												
Osoyoos Division:																												
Cherry Creek	23	39	14	9	9	30	3.00	2.00		14		1	7	8	6		1	7			14.50	4,000						
Mission Creek	3	10	3		3	7	,,	,,		3					3						16.50 to 17	1,000						
Rock Creek	25	25		25	56	20	,,	,,		13		1	24		13	1	20	5			16.00	3,500						
Okanagan Camp	16	16		16	32		,,										12	4										
Siwash Creek	12	37	3	9	37		,,			12					6		5	1	5		,,	2,000			10,500			
Similkameen Division:																												
Similkameen River	11	35	10	1	11	54	3.00	1.25		5	5		1		10	1			4		17.75	4,000						
Tulameen River	14	30	12	2	15	40	,,	1.50		6	5		3		11				5		,,	15,000						
Granite Creek	12	32	10	2	32	3	,,	,,	1	3	8				12			5	3		,,	10,000						
Slate Creek	4	11	4		11		,,			4					4						,,	2,500						
Collins Gulch	3	6	3		3	3	,,	,,			3				3			1			,,	500						
Boulder Creek	3	10	3		3	7	,,	1.25			3				3						,,	3,800			35,800			
					821	1108																			$428,466	$47,873		

Yield of Platinum for the season is estimated at 1,000 ounces @ $3.50 per ounce = $3,500.

PROVINCE OF BRITISH COLUMBIA.

TABLE

Showing the actually known and estimated yield of gold and silver; the number of miners employed; and their average earnings per man, per year, from 1858 to 1889.

Year.	Amount of gold actually known to have been exported by Banks.	Add one-third more estimate of gold carried away in private hands.	Gold. Total.	Estimated yield Silver.	Gold and Silver. Total.	Number of Miners employed.	Average yearly earnings per man.
1858 (6 months)	$ 390,265	$ 130,088	$ 520,353	.....	$ 520,353	3,000	$ 173
1859	1,211,304	403,768	1,615,072	.....	1,615,072	4,000	403
1860	1,671,410	557,133	2,228,543	.....	2,228,543	4,400	506
1861	1,999,589	666,529	2,666,118	.....	2,666,118	4,200	634
1862	3,184,700	1,061,566	4,246,266	.....	4,246,266	4,100	517
1863						4,400	482
1864	2,801,888	933,962	3,735,850	.....	3,735,850	4,400	849
1865	2,618,404	872,801	3,491,205	.....	3,491,205	4,294	813
1866	1,996,580	665,526	2,662,106	.....	2,662,106	2,982	893
1867	1,860,651	620,217	2,480,868	.....	2,480,868	3,044	814
1868	1,779,729	593,243	2,372,972	.....	2,372,972	2,390	992
1869	1,331,234	443,744	1,774,978	.....	1,774,978	2,369	749
1870	1,002,717	334,239	1,336,956	.....	1,336,956	2,348	569
1871	1,349,580	449,860	1,799,440	.....	1,799,440	2,450	734
1872	1,208,229	402,743	1,610,972	.....	1,610,972	2,400	671
1873	979,312	326,437	1,305,749	.....	1,305,749	2,300	567
1874	1,383,464	461,154	1,844,618	.....	1,844,618	2,868	643
1875	1,856,178	618,726	2,474,904	.....	2,474,904	2,024	1,222
1876	1,339,986	446,662	1,786,648	.....	1,786,648	2,282	783
1877	1,206,136	402,045	1,608,182	.....	1,608,182	1,960	820
1878	1,062,670	1-5th 212,534	1,275,204	.....	1,275,204	1,883	677
1879	1,075,049	,, 215,009	1,290,058	.....	1,290,058	2,124	607
1880	844,856	,, 168,971	1,013,827	.....	1,013,827	1,955	518
1881	872,281	,, 174,456	1,046,737	.....	1,046,737	1,898	551
1882	795,071	,, 159,014	954,085	.....	954,085	1,738	548
1883	661,877	,, 132,375	794,252	.....	794,252	1,965	404
1884	613,304	,, 122,861	736,165	.....	736,165	1,858	396
1885	594,782	,, 118,956	713,738	.....	713,738	2,902	246
1886	753,043	,, 150,608	903,651	.....	903,651	3,147	287
1887	578,924	,, 115,785	693,709	.....	693,709	2,342*	296
1888	513,943	,, 102,788	616,731	.....	616,731	2,007	307
1889	490,769	,, 98,154	588,923	$ 47,873	636,796	1,929	330
					$52,236,753		

* This is exclusive of over 650 white men who, during the season of 1887, were working on or prospecting for mineral claims.

REPORT

OF THE

MINISTER OF MINES,

1889.

To His Honour HUGH NELSON,

Lieutenant-Governor of the Province of British Columbia:

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Mining Industries of the Province for the year 1889, is herewith respectfully submitted.

JNO. ROBSON,

Provincial Secretary and Minister of Mines.

Provincial Secretary's Office,

5th February, 1890.

REPORT.

GOLD.

The value of the Gold exported by the Banks at Victoria during the year 1889, is as follows:—

Bank of British Columbia	$254,816
Garesché, Green & Co.	188,580
Bank of British North America	47,373
	$490,769

CARIBOO.

MR. BOWRON'S REPORT.

"RICHFIELD, November 25th, 1889.

"SIR,—I have the honour to submit, for your information, my fifteenth annual report upon the mines and mining industry of the Cariboo District, accompanied by the customary statistics in tabular form, from which it will be seen that the gold yield of the district taken as a whole is a trifle under the output of last year; the number of white men engaged in mining being about the same, while it will be observed there is a decrease in the number of Chinese so employed.

"But little prospecting for new creeks at a distance has been done during the year. One party of four men started late last fall down Willow River with boats, and spent the greater part of the winter in prospecting the bars, benches, and in some instances the deep ground, on that river and its tributaries. They found gold in nearly every place tried, but not in sufficient quantities to pay at the present prices of supplies and consequent high cost of prospecting; but, with railway communication, a large extent of country was traversed that it is believed would prove remunerative.

"The Barkerville Polling Division still maintains its supremacy as the chief gold producer.

"Williams Creek, with tributaries, worked for nearly thirty years, still yields more gold than any other creek in the Province. The gold is now taken principally from the hills and sides of the creek by means of hydraulic pipes, as the creek channel has been pretty well worked out by drifting, although upper-streaks are frequently found to pay, and hence the lasting nature of the creek.

"Messrs. Taylor & Boyce, working about half-a-mile above Richfield, have been fortunate enough to come upon a portion of the old channel of Williams Creek hitherto unworked, and from the result of working a small piece of the ground this year have high expectations for next year's operations.

"The Forest Rose hydraulic claim has again yielded handsome returns, which it will undoubtedly do for many years to come. The deep ground below Cameronton, although known to be rich, still lies, as it has done for the last dozen years, unworked, presumably because it is beyond the ability of individual miners to operate successfully owing to lack of drainage. This ground offers an exceptional opportunity for the investment of capital, with a certainty of satisfactory returns if properly managed.

"On Conklin Gulch, the Gulch Hydraulic Company has made good progress with their 'cut' and laying down flume, and each season as it nears the bed-rock, the wash-up improves.

"On Stout's Gulch the Wintrip claim did fairly well, but the continual slides from the side-hills greatly retarded progress.

"The yield of gold from Grouse Creek has been better than for some years past, principally owing to a discovery made by Messrs. Jarvis, McAlinden and Company, which bids fair at the present writing to be of considerable importance, and will probably lead to the opening up of from half to three-fourths of a mile of a lead lost on this creek, as below the Heron Company, which paid so well in 1866–7, the lead could not be found. The discovery of Jarvis and Company is apparently a channel of about twenty feet wide (with well-defined rim-rock) running into the hill nearly opposite McAlinden's store, from which the company have already taken some four thousand dollars, and will continue the work during the winter.

"The Waverley Hydraulic Company have made satisfactory progress and will, it is thought, reach bed-rock with their 'cut' next season, after which, it is believed, the claim will be remunerative.

"Antler Creek has not met expectations this season.

"The Nason Company, driven out of their works last winter by an insufficiency of water to drive their machinery, owing to the frost, started again in July, and barely got the water out of their diggings when one of the gudgeons (a heavy casting) broke, which had to be replaced by a new one from the foundry at Victoria; the necessary repairs were made and the water is once more out of the diggings, and there is now a prospect of the value of the claim being proven.

"An attempt was made this fall by a company to reach bed-rock in the deep ground some ten miles below Grouse Creek, where the bottom has never been reached. Eight of our best miners endeavouring to get down without wheel and pumps, were driven out when down twenty-six feet. They speak of putting up machinery and making another attempt in the Spring.

"The claims on Mosquito Creek and gulches in that vicinity have done exceedingly well, considering that they are mostly hydraulic claims and that the water supply has been light.

"In the Lightning Creek Division the gold product upon the whole has been fair, considering that there are so few of what are thought to be really good claims.

"On Rushon Creek a company of white men have very good diggings; aside from which nearly the whole yield of this division is now produced by the Chinese.

"The Quesnellemouth Division does not make as good a showing as last year, although the number of men (Chinese) employed is about the same.

"On Hixon Creek, Senator Reid and Company have put on a force of men, and will carry on operations during the winter, running tunnels with the view of striking a back channel which it is supposed runs through the hill immediately below the Quesnelle Quartz Mining Company's mineral locations.

"I regret to say that no attempt has been made during the season to further prove the value of the discoveries made three years ago on Goat River and other tributaries of the Upper Fraser, which is somewhat surprising in view of the fact that it was reported, and generally believed, that there was plenty of ground that would pay four dollars a day to the hand in that neighbourhood. With better facilities for transport, this extensive field would support a large population.

"The accompanying statistics will, I believe, give a tolerably correct impression as to the works going on in the various sections of the district in alluvial mining; but to arrive at an estimate of the gold yield of the whole district for the twelve months of 1889, I beg to submit the following as closely approximate:—

Barkerville Division, 1st January to 15th November	$ 78,542
Lightning Creek " " " "	41,150
Quesnelle " " " "	37,000
Keithley and Harvey " " "	61,200
Desultory, of which no account is obtainable	7,000
Whole district, from 15th November to 31st December	10,000
Making a total for the year of	$234,892

"*Quartz.*

"Our Quartz interests, which must be regarded as the main source from which the future wealth of the district must flow, is a subject that should be dealt with by men experienced in the treatment of ores; and I may here volunteer the observation that if this view were more generally accepted, it would, I believe, be fruitful of good to the interests involved.

"Although this branch of our mining industry has not developed to the extent anticipated in my last annual report, I am not prepared to attach blame to any person therefor, but rather to my own inexperience in such matters and consequent lack of judgment in properly estimating the difficulties and drawbacks which I am now satisfied are inseparable from the establishment of pioneer reduction works here, as in any country so far removed from the source of supplies.

"Mr. Martin has given his best attention to the completion of the Government Test Works here, and although, so far, but one trial test has been made of ore, viz.: that from the Black-Jack mine, the result (although not satisfactory to Mr. Martin himself) was satisfactory to the company, as showing that their mine is valuable, and demonstrating the fact that we have valuable ore in the country.

"From one hundred tons of ore worked at the Black-Jack mill, $523.00 were obtained in free gold on the plates; and from twelve tons of the concentrates (of which there were thirty-six tons from the one hundred tons crushed) a return of twenty-four dollars ($24.00) to the ton of concentrates was obtained, but from the assays made of the concentrates by Mr. Martin he was not satisfied with the percentage saved, so would run no more through until certain appliances were added to the mill, which are now on the way from Ashcroft Station and which he expects to have in operation two weeks after their arrival. Several lots of ore are now at the works awaiting treatment.

"The district has been visited during the summer by Mr. Samuel Gifford, of London, representing English capitalists, who came here at the instance of C. D. Rand and Company, who have a number of quartz locations in the district. Mr. Gifford, being a man who has devoted his life to the development of quartz mines in various parts of the world, is thoroughly conversant with the treatment of ores by the most modern and improved methods, and although from the nature of his engagements was not at liberty to give his opinion respecting the value of our quartz mines, still, the interest he manifested in the mines, the Government Test Works, the mining laws of the Province, &c., &c., warrant the belief that his visit will be productive of great good to the district.

"The one great drawback to our advancement, with which Mr. Gifford seems to have been impressed, is the want of railway communication, and without which, development will necessarily be slow.

"This necessity is, however, so fully appreciated by the Government, who, having the best interests of the district in view, will not fail to forward in every possible way the consummation of so desirable an object.

"I have, &c.,
(Signed,) "JNO. BOWRON,
Gold Commissioner.

"*To the Hon. Jno. Robson,*
"Minister of Mines."

MR. MARTIN'S REPORT.

"GOVERNMENT REDUCTION WORKS,
"BARKERVILLE, B. C., 28th December, 1889.

"SIR,—I have the honour to submit the following report of the work done at the above works.

"The works were completed about the latter part of January last, with the exception of a few things that could not possibly be done in midwinter. It was my intention to put in buddling troughs to concentrate the sulphurets from test lots of ore sent in for trial, but some of the members suggested that I should apply to the Honourable Provincial Secretary for an automatic concentrator, which they considered would give better satisfaction to depositors of small lots of ore, and to the community. The request was granted, and, after several delays, the concentrator arrived here on June 26th. We immediately set to work to erect it in place, and for five days, after completing the machine, we crushed several tons of waste quartz rock and passed it over the machine so as to thoroughly test it and instruct the men in charge how to operate it. Everything being satisfactory, on July 22nd we commenced crushing two lots of ore from the "Dufferin" mine—one lot of 2,600 lbs. and one of 2,300 lbs.—then followed on with 20,300 lbs. from the "Proserpine," 20,250 lbs. from the "Forest" mine, and 19,869 lbs.

from the "Lowhee" mine. The concentrating machine did very good work, saving over ninety per cent. of the value left in the ore, after it had passed over copper plates. The concentrates from the above lots will be chlorinated when the "Black Jack" concentrates are finished with, which will be some time next month.

"The roasting furnace was started on July 8th on 44,500 lbs. of concentrates from the "Black Jack" quartz mine. Some difficulty was experienced in instructing the men how to roast the ore successfully, but proceeding slowly and patiently for a time, we succeeded in getting them to do their work well. It was important that this part of the operation should be properly done, because upon it depended the success of the remaining part of the process.

"Twelve tons of the roasted concentrates were treated by amalgamation in 3,000 lb. lots, modifying the treatment a little in each case, but in no case could we extract more than sixty per cent. of the value. The reason of this was that the mercury was broken up very fine, which then coated the magnetic oxide contained in the roasted concentrates, and we failed to settle and separate it from the tailings.

"It being impossible to estimate what the cost would be to experiment and find out the exact way of treating these concentrates by amalgamation, I applied to the Honourable Provincial Secretary for a small chlorinating plant, which, from tests made on a small scale, I was satisfied would work up to ninety per cent. This, with the necessary chemicals, took several months to get here and to erect in place, so that it was not until the 9th of December that we started the roaster on a second lot of concentrates from the "Black Jack Quartz Company," and the chlorinating plant on the first lot of Black Jack concentrates, which were put through at the rate of one ton per day. Up to date we have chlorinated about fifteen tons of concentrates, which show, from assays made of the tailings, that over ninety per cent. of the gold was extracted. We have two tons in the tub now chlorinating. Every part of the plant is working satisfactorily. The B. C. Mining Company's ore has been declared by competent assayers and metallurgists to be amalgamating ore. The Island Mountain Company's ore, from tests made in San Francisco, has also been declared a roasting and amalgamating ore. When these companies are ready to start working their mines these works will be able to test their ores satisfactorily by amalgamation or chlorination, and to find out the proper method before they commence erecting works for themselves, and they can have from these works well trained men to conduct the process for them without fear of failure.

"The "Black Jack Quartz Mining Company" commenced crushing ore on June 1st in their one-stamp Kendall Mill, and managed to put through 202 tons before the frost compelled them to close down The ore averaged 4.50 dollars in free gold and 13.00 dollars in sulphurets per ton of rock crushed. In blasting the rock in the shaft the sulphurets were shattered very fine, which then mixed with the waste rock, and it was found almost impossible to separate the ore from the waste, so that nearly all the rock taken out was sent to the mill, and accounts for the low grade of the ore. The endeavour in this case was to develop the mine, and to mill what ore was taken out to pay the running expenses. Sinking the shaft and milling the ore from it cost more than double what it will cost to mine and mill the ore when the mine is thoroughly opened. A shaft was sunk 42 feet deep and a drift of 22 feet run on the ledge, when it was found that the ledge changed its course, which made it necessary to stope up an incline shaft to the surface, from which the ledge can be worked to better advantage. The incline shaft had reached within 5 or 6 feet of the surface when the mine was closed down for the winter.

"This mine clearly shows what can be done in this district by energy and perseverance.

"I have, etc.,
(Signed) "E. A. MARTIN.

"*To the Honourable John Robson,*
"*Minister of Mines, Victoria.*"

MR. STEPHENSON'S REPORT.

"FORKS QUESNELLE, B. C.,
"8th November, 1889.

"SIR,—I have the honour to forward herewith the estimated yield of gold for the Keithley, Alexandria and Williams Lake Divisions of Cariboo District.

"There was a very light snowfall in this section last winter; that, and a very dry season during the summer months, caused a limited supply of water for hydraulic mining, which in some instances was unfavourable, while on the other hand it enabled other places to be worked to better advantage.

"On Keithley Creek two Chinese companies are digging ditches and preparing for hydraulic work in the spring. As the bed of the creek is getting worked out they are turning their attention to the gravel deposits in the hill sides, and I think with fair prospects of success.

"On Snowshoe Creek, Messrs. Veith & Borland have just finished a ditch, and are now getting a set of iron hydraulic pipes on the ground for the working of the Hayward claim, which is supposed to be a continuation of the Live Yank lead, now so successfully worked by Messrs. Anderson and Smith.

"On Harvey Creek, the Jubilee Company have been working steadily all summer, sawing lumber, fluming the creek, building a wheel and putting down an incline. They will now soon commence washing, the winter being the most favorable time for their work underground drifting out the bed of the creek.

"On the North Fork of Quesnelle River, James Moore & Co. are running a tunnel at the mouth of Spanish Creek. It will take them all the winter and well on in the spring before they get in to where they expect to find pay. They are the only white men on the North Fork, all the rest of the mining going on at present being done by Chinese.

"On the South Fork of Quesnelle River, a company of white men have been prospecting during the summer, and have located some ground for hydraulic mining. The great trouble will be to get water on the ground. To accomplish this they will either have to drive a tunnel one mile long to bring the water from a lake, or will have to make a ditch about twelve miles long. Either job will take considerable time and money. The company now say they are going on with the work in the spring, just as soon as they can get accurate survey lines run and determine which way they will bring in the water. A good supply of water would open up several good hydraulic claims along the South Fork of Quesnelle River. At present there is only one such claim working, and owing to the scarcity of water they do not work more than three months in the year, while the mining season will admit of from seven to eight months work during the year.

"On the main Quesnelle, from the Forks down, there is yet some mining going on in a desultory manner by the Chinese. They keep moving along, working a while in one place then in another for forty miles from here down. They draw their supplies from here, as they can use boats on the river, which enables them to easily move from one place to another.

"From Horsefly there is nothing of moment to report. The Harper claim, so far, has not proved successful; and there is only one claim, the "McCallum," or Discovery Company, that is paying, none of the others having yet got into the channel.

"Along the Fraser River, in the Alexandria and Williams Lake Divisions, a distance of about seventy miles, there are six Chinese companies working. These companies have ditches and water rights and are permanently located, while there are also other Chinese working along the river rocking. They generally have boats or canoes; they carry their whole outfit along, and keep moving up and down the river just as they find a prospect.

"I have, etc.,
(Signed) W. STEPHENSON,
"Government Agent."

"The Honourable the Minister of Mines."

CASSIAR.

MR. CRIMP'S REPORT.

"TELEGRAPH CREEK, CASSIAR,
"19th October, 1889.

"SIR,—I have the honour herewith to enclose the mining statistics for the current year, and also a few remarks on the mining industry of this district.

"It will be seen by the returns that there has been a material increase in the yield of gold this year over last.

"The following statement is, I think, very near the actual amount taken out:—

Dease Creek	$11,200
Thibert ,,	10,800
McDames Creek	16,360
Quartz ,,	10,950
Snow ,,	600
Gold ,,	400
Poor Man's ,,	100
Stickeen River	1,000
Desultory	3,500
Total	$54,910

"The amount would have been very much larger if the season had been more favourable for mining, Since the middle of July there have been continuous heavy rains, which caused the different creeks to rise so high that all the wing-dams were swept away, and the consequence was very little gold was taken out from the beds of the creeks. The principal portion of the yield was from tunnels in the different hills.

"Very little prospecting has been done the past summer, and consequently I have no new discoveries to report.

"Mr. Robert Highland, of Telegraph Creek, and two others fitted out a boat and went down the Delaird River and prospected some of its tributaries. They went up the Highland River about 140 miles and prospected in different places, but without any result. They did not find anything that would justify their returning there again.

"The prospects for next year look as favourable, I think, as the past season has been; and I also think there will be about the same number of miners in the district.

"There are wintering on Dease Creek four whites and thirteen Chinese, on Thibert Creek eight whites and six Chinese, and on McDames Creek four whites and thirty-five Chinese. Quite a few miners will winter at Telegraph Creek and Glenora Landing, on the Stickeen. Provisions are plentiful, and at usual prices.

"I have, &c.,
(Signed) "J. L. CRIMP.

"*The Honourable John Robson,*
"*Minister of Mines, Victoria, B.C.*"

KOOTENAY.

Western Division.

MR. TUNSTALL'S REPORT.

"REVELSTOKE, December 1st, 1889.

"SIR,—I have the honour to forward the mining statistics for the District of West Kootenay, for the current year.

"*Big Bend Subdivision.*

"The Big Bend Placer Mines have attracted little attention during the past season, principally owing to the high cost of living. Ten cents per pound is asked for packing a distance of seventy miles; yet the small demand for freight and scarcity of feed for animals seem to render this charge necessary to properly remunerate the owner of the only pack train freighting from here to the Big Bend country.

"On McCulloch Creek, the Ophir Bedrock Flume Company has met with encouraging results, as it has run through the old ground which had been previously worked and from which little gold could be expected. The bank of gravel has also decreased in height, and the boulders encountered are not so numerous. The Last Chance Company took up last summer the ground formerly leased by the Baldhead Company, which was abandoned after running a tunnel 1100 feet long without reaching bedrock, caused by a mistake in the survey. The present company expects to reach the bottom of the channel about the early part of spring. Should its exertions meet with success the remainder of the vacant ground will be recorded and worked to advantage by small companies.

"On French Creek, Messrs. Goodwin, Hunter and others, known as the Consolation Company, obtained for a term of five years the ground formerly leased by the French Creek Tunnel Company. Shortly after beginning work they struck gravel which returns six ounces to the set, with every appearance of the pay being permanent.

"Near the mouth of Smith Creek, Lund & Company are hydraulicing a bench with very good results. Frost set in before their ground sluice was cleaned up, and further work had to be suspended for the season. About twenty-five Chinamen have been rocking on the bars of the Columbia River during the low stage of water, and sluicing on the benches when the water is high, but with what success could not be ascertained.

"The trail between here and McCulloch Creek will require considerable repairs next year to render it passable. The culverts and small bridges are in a decayed and dangerous condition, and will have to be renewed; also localities of a marshy nature corduroyed.

"*Illecillewaet Subdivision.*

"Mining operations in this portion of the district have not been of an active character, most of the miners having done merely sufficient work to hold their claims, although the principal locations compare favourably with any others in the Province. The galena ores average from twenty to eighty ounces of silver per ton, and from fifty to seventy per cent. lead.

"The Illecillewaet Mining Company owns three locations which are considered valuable, and a tunnel has been run two hundred feet to strike the vein. The Corbin and Kennedy mines consist of the Happy Find, Crystal, and Corbin & Kennedy, No. 2, from which rich assays have been obtained. The Selkirk Mining and Smelting Company also possesses three good locations; the principal one, the Lanark, has a shaft sunk to a depth of 120 feet, and a tunnel run in over 100 feet. Considerable shipments of ore were made from this mine a couple of years ago, with a stated profit of $65.00 to the ton. The Maple Leaf, owned by A. F. McKinnon, is held at $80,000. A tunnel in this claim exposes a vein of galena and carbonates of a high grade character, twenty-nine feet wide.

"The Cariboo Creek Mining Company, under the superintendence of D. Woolsey, is running a tunnel to tap the vein running through the Maple, Quebec, and Corona, about 400 feet from the surface. The adjoining mine to the above is the Round Hill, owned by Captain McCallum. There are several other groups of mineral claims in this subdivision which will come to the front as work progresses on them, among which the Gold Hill locations, and others, situated within a radius of a few miles, will prove of value with development. With this extensive mineral wealth in its vicinity, and smelting facilities within a comparatively short distance, the town of Illecillewaet is destined to become an important mining centre.

"*Fish Creek Mines.*

"The Fish Creek Mines are situated at a point about eleven miles south of the line of railway, and are known as the Dunvegan, Alma, Mogul and Edinboro. They are owned principally by Messrs. Boyd, Bain, Scott, and Kirkwood. The first mentioned claim is considered, by persons competent to judge, the equal in point of value of any mine in the West Kootenay district. A tunnel has been run a distance of over 70 feet to intersect the vein which is from 8 to 10 feet wide and contains a solid body of galena 4 feet wide, with an assay value of 80 to 150 ounces of silver to the ton. This property was bonded last October to Mr. J. Wilson, with a three months' option, for the sum of $75,000, with the privilege of extracting 150 tons of ore, which will be forwarded to the sampling works at Revelstoke. A good trail has been constructed from five miles above Illecillewaet to the mine, and a pack train is engaged transporting ore to the railway. The facility with which ore is extracted can be ascertained from the fact that the labour of two men in ten hours produced eleven tons. The first carload of average ore has been sampled, with an assay return of 90 ounces of silver to the ton, and 69 per cent. lead. This is a result which augurs well for this rich and promising section of the district, and adds to the number of first-class mines known to exist.

"*North Arm of Upper Arrow Lake.*

"On the north arm of Upper Arrow Lake there are ten locations, the principal ones being the Monarch, Silver King, Gloucester, Gipsy, Belfast, Argyle, North Star, and Yellow Jacket. Good ore has been found in some of the claims, but the mineral veins exposed will require more work to determine their value.

"*Toad Mountain Subdivision.*

"In the Toad Mountain mines the Hall locations occupy a prominent position in point of value and the amount of work done on them. The principal operations have been confined to the Silver King, from which 40 tons of ore yielded 11,960 ounces of silver, or an average of 299 ounces to the ton. Another shipment had been packed to Nelson and was awaiting transportation when I was there, the returns from which, I have since been informed, amounted to 230 ounces to the ton. A tunnel 60 feet long has been run on the vein, and a winze sunk at its extremity 50 feet, exhibiting at this depth a mass of high grade peacock ore, of unknown width, as the opposite walls had not yet been reached. The work done on the Kootenai, Bonanza, and American Flag, exhibit a similar richness to the Silver King on the surface, and, so far as ascertained, are equally as rich. The lode running through these claims is from 12 to 16 feet wide, six feet of which is of solid ore. The foot and hanging walls are composed of dolomite of lime, the country rock being granite. The course of the ledge is east and west, and has been traced for a distance of four miles over mountains and through intervening depressions. The following are the names of the additional locations: Victoria, Forest, Newmarket, Dandy, Iroquois, Grizzly Bear, Jim Crow, Snow Flake, Morning, Evening, and Tough Nut. Most of these contain ore of a more or less rich character. The body of ore in the Dandy is three feet wide and will yield over 60 ounces to the ton, and the Iroquois, Grizzly Bear, Evening, and Tough Nut, can ship ore of the same value. The latter was bonded by Mr. G. B. Wright for the sum of $60,000, but owing to some misunderstanding with the company he represented, the bond was cancelled. A shaft has been sunk to a depth of 25 feet and a tunnel run a length of 75 feet. The width of ledge is from four to eight feet, returning high assays. When proper facilities for transportation are supplied, work will be actively prosecuted in these mines for the purpose of shipping ores to the smelter.

"On the right bank of Cottonwood Smith Creek, which empties into the west arm of Kootenay Lake, a short distance below Nelson, is a group of claims owned by Dr. Labeau; they are the Apex, Fairview, Uncle Sam, and Umatilla. The vein is composed of argentiferous galena, varying from four to five feet wide, assaying as high as 80 ounces to the ton. The development of these locations will materially increase the prosperity of the Kootenay Lake country. On the summit of the mountain, at the head of the stream mentioned, on the left hand side, are the mines owned by the Cottonwood Gold Mining Company, composed principally of English shareholders. They are the Ella, Golden King, and Golden Wreath. These claims contain an immense deposit of schistose slate, over three hundred feet wide, which

assays $6.70 in gold to the ton. The surface is oxidized to a depth of several feet and is free milling in character. The principal amount of gold in the rock is associated with sulphurets, which will require concentrating to a value of $30.00 per ton to render profitable. The machinery erected on the ground consists of two Huntingdon mills, with a capacity of 12½ tons, operated by an engine of 20-horse power. This plant has not been found adapted to work ore of the character obtained; and I was told Mr. Stanley, the superintendent, had proceeded to England with the object of urging the erection of a 100-stamp battery, with necessary concentrators, next season.

"*Eagle Creek Subdivision.*

"The Eagle Creek mines are situated about six miles west of Nelson, on or in the vicinity of the creek of that name, and are reached by the trail in use between Nelson and the Columbia. The Eagle Creek Gold Mining Company's property consists of five locations on the right bank, extending up stream, and are known as the Poorman, Hardscrabble, Eagle, Hard-up, and Kootenay. This company has exhibited a great deal of energy in prosecuting its operations, which have been carried on under the able management of Mr. Nails. The ledge is gold-bearing and is well defined, lying between walls of hornblende granite, with a dip of about 45 degrees to the west. The breadth of the vein is from 20 to 24 inches, and possesses an assay value of $50.00 to the ton. In addition to other work performed, a tunnel has been run a length of 130 feet, intersecting the lode at a depth of 85 feet from the surface. The machinery, comprising a 10-stamp mill and four free concentrators of five tons capacity each, was floated down the Kootenay River on rafts as far as the natural obstructions of the river would permit, to a suitable place for its landing, whence a waggon road, 2½ miles long, was constructed to a site prepared for its erection. The building is being put up and the machinery, which will be worked by water power, will be in position to commence work in the spring. Messrs. White & Buchanan are the proprietors of two valuable extensions on this lode, which are considered equally as rich as the locations referred to.

"About half mile west of Eagle Creek, John Miles owns three locations, two of which, considering the small amount of work done, look exceedingly well. One of the claims, situated near the summit of the mountain, has a vein about 10 feet wide lying between well defined walls, containing galena ore which returns excellent assays in gold and silver. The other contains gold only, to what extent could not be learned, as the proprietor was absent when I called. More work will be required to establish its permanence, as the formation is irregular and broken up. About fifteen tons of good rock have been extracted and will be submitted to a test in the Eagle Company's mill.

"The Copper Queen is owned by Messrs. Barr, Baker and Brown. It is situated on the right bank of the Kootenay, some distance back of the river, probably a mile, and a little over that distance above Forty-nine Creek. It is a wonderful deposit of argentiferous copper ore from 50 to 60 feet wide, rising to a height of 30 feet above the surface for a length of between 500 and 600 feet. The ore contains silver to the extent of $26.00 per ton; the percentage of copper runs high. The formation is similar to the famed Anaconda mine in Montana, which has returned large dividends to its shareholders, the foot wall being of quartzite and the hanging wall of granite. The work done consists of open cuts run on the vein an aggregate distance of sixty-one feet, and a cross cut forty-five feet.

"Some eight or nine men were engaged the past summer mining for gold on Forty-nine Creek, with a return of from $1.50 to $2.00 per day, as far as can be known.

"*Hot Springs Subdivision.*

"The Hot Springs camp is situated on the north shore of Kootenay Lake, about 30 miles from Nelson in a north-easterly direction. The mines seem to exist in successive tiers from near the foot of the mountain to the summit, increasing in richness with the elevation attained. The principal locations are noted for the extent and value of the mineral wealth they possess. About the latter end of September I called at the Hot Springs and was surprised to find the great improvement visible in some of the claims within a couple of months from the date of a previous visit. The surface in places has been subjected to upheavals and slides, which broke up and distributed the mineral lodes, rendering some of them difficult to trace, and causing the bodies of ore sometimes to perish out without any apparent cause. But as sinking progressed below the point of disturbance this irregularity ceased, and the veins which exhibited a tendency to disappear have widened and become so much better defined that no doubts are entertained

in regard to their permanence. The mining prospects of the camp never looked so promising as they do now. The lodes pursue a northerly and southerly course, and dip to the west. The claims first encountered on the mountain side contain a low grade galena lying in a schist formation, with veins of an average width of eight feet, assaying about 20 ounces in silver to the ton. Higher up a coarse cube galena exists under the same conditions as the preceding, with a return of from forty to fifty ounces to the ton. At a still greater elevation the mineral deposits lie in schist and lime, and contain ores of a high grade, ranging from twenty up to thousands of ounces to the ton. Wire silver is first found at this height, and the ore bodies exhibit the peculiarity of contracting to a few feet and widening to a breadth of thirty feet or more. At or near the summit carbonates of a very rich character are found in a lime formation in the vicinity of the granite belt. The mineral here is is free milling, and can be treated by the ordinary amalgamation process. The Skyline is the most valuable location found at this altitude. It is principally owned by Mr. A. D. Wheeler, who is also the proprietor of several other valuable claims. A shaft sunk to the depth of fifty-five feet exposes a vein eight feet wide, composed of almost entirely high grade ore, containing native silver and black sulphides, the latter running up to as high as $16,000 per ton. This, of course, is a choice assay. The Union is another location with an 8-foot ledge, carrying galena and carbonates, which looks very promising.

"The Neoshu is a recent discovery possessing very rich ore, containing native and ruby silver, but the amount of work accomplished so far has not been sufficient to prove its permanence. Among the valuable locations which exists may be mentioned the Krao, with a shaft 75 feet deep exhibiting a ledge 12 feet wide, yielding assays of from 40 to 60 ounces in silver. The United has an immense vein which will return from 25 to 40 ounces. The Little Donald, owned by Messrs. Davenport and Stevens, at a depth of 75 feet, shows, I am told, 4½ feet of solid ore of a valuable character. The Gallagher also gives good returns, one lot of ore containing thirteen tons smelted at Butte, Montana, yielding an average of 126 ounces of silver to the ton. The Number One exhibits a strong vein four feet wide, which it still retains at a depth of 48 feet. The ore returns large assays. This mine was bonded last fall by J. McKay, the great California capitalist, for the comparatively small sum of $16,000 for a term of six months. The Spokane, owned by the Pacific Bullion Co., of Spokane Falls, Wash., is a valuable mine upon which operations will be actively prosecuted. Extending in a southerly direction the Crow, Fledgeling, Now Then, Crescent, and Eden promise to become valuable mining properties.

"*Hendryx Mines.*

"The Hendryx mines are situated on the opposite side of the lake from the Hot Springs, a distance of about two and a half or three miles. They consist of two locations, for which Crown grants have been issued. The principal mine is known as the Blue Bell, after the small flower of that name which covers the ground in profusion at a certain season of the year. At the time of my visit a tunnel had been run a distance of 305 feet to intersect the vein at a height of 128 feet from the surface, and work was being vigorously prosecuted by means of an Ingersoll drill and air compressor, worked by a 25-horse power engine. The great advantage derived from using improved machinery of this kind is apparent when it is stated that the progress made in a single shift amounted to four feet in the hardest rock, whilst by manual labour, in the same time, but four inches would be accomplished. The lode is a mass of solid galena 86 feet wide, which gives an average assay of 20 ozs. of silver to the ton and 23 per cent. lead. Two adits cut the lode at higher levels, which everywhere shows ore of the same extent and quality. Another large vein, about seven feet wide, runs parallel to the main body. The quantity of mineral in sight seems almost inexhaustible, and though of a low grade, these mines are considered of great value, owing to the quantity and facility with which the ore can be extracted, reducing its cost to a minimum. The large amount disbursed in development has been expended by Dr. Hendryx and his brother in a judicious manner, and to-day it may be said the shareholders own one of the most desirable mining properties in the country. To properly utilize this wealth the erection of a smelter in the vicinity is considered necessary, and it is probable steps will be taken to construct one next summer.

"The number of records effected at the Revelstoke office since last report is 161; at Nelson 367; at the Hot Springs, for the three months ending October, 150. The following comprises the exports of ore from the mines mentioned, and the returns per ton, so far as ascertained:—Number One, 146 tons, 87 ozs. silver; Little Donald, 85 tons, 90 ozs. silver,

35 per cent. lead; Silver King—first shipment, 40 tons, 299 ozs. silver, 20 per cent. copper; second shipment—30 tons, 230 ozs. silver, 20 per cent. copper; Spokane, 65 tons, 40 ozs. silver 70 per cent. lead; Della, 20 tons, 120 ozs. silver; Skyline, 15 tons, 225 ozs. silver; Gallagher, 14 tons, 119 ozs. silver, $14 gold; Krao, 12 tons, 95 ozs. silver, 50 per cent. lead.

"The above shipments were made, in some instances, to pay current expenses, and in others for milling tests. The aggregate return for the 427 tons was 50,393 ozs. of silver. The rich mineral resources of the Kootenay Lake are undoubted. No further proof is required of its wealth than the developments exhibited in some of the mines, and the milling results obtained from the ores shipped, The business men of the State of Washington have not been slow in detecting the advantages offered, and every means will be taken to retain, at least, a large proportion of the trade that will necessarily ensue.

"Nearly all the supplies needed have been hitherto procured from Spokane Falls, notwithstanding the duties imposed, as being the most accessible point for the purpose.

"In addition to a contemplated branch line from Kootenai Station, on the Northern Pacific, to Bonner's Ferry, on the Kootenay River, a distance of about 30 miles, the Manitoba Railway intends to connect somewhere in the same direction. The Spokane & Northern has also given notice of application for a charter to operate a line starting from near the mouth of the Pen d'Oreille River, up the Salmon River Valley to Nelson.

"It is evident from the foregoing that exertions should be made to divert and retain this tide of prosperity for the benefit of the Province at large. This can be effected by providing railway communication between Revelstoke and Nelson. Two routes have been suggested as being available for the purpose. That from Revelstoke, down the Columbia and up the North Arm of Upper Arrow Lake, thence *via* Trout Lake and the valley of the Lardeau River, has hitherto been considered the most favourable; but Mr. Stewart, the engineer who explored that portion of the country, states that a considerable elevation within the comparatively short distance of four miles interposes too great an obstacle to be overcome. The other route, starting from the same point and following the river and Arrow Lakes to Sproat's Landing, to connect with the short line proposed to be built next spring, is deemed perfectly feasible.

"To accommodate the traffic during the summer months, in the absence of a railway between the Columbia and Kootenay Lake, a waggon road, enabling freight to be carried at an estimated cost of $10, between these two points would be considered indispensable; but this mode of conveyance, at the best, is a poor substitute for a railway, which can expeditiously perform the same service for about $4. The miner is thus benefited by the quicker and more convenient means of communication to the extent of $6 per ton. The charge for freight by steamer to Revelstoke will be $5 per ton, and the cost of smelting, Dr. Campbell states, will be the same as demanded by the Selby Smelting Works of San Francisco, from $13 to $15 per ton, according to the character of the ore supplied.

"The expenditure incurred by the owners of the 'Silver King,' Toad Mountain, from the mine to Nelson, by pack train, a distance of seven miles, was $10 per ton, and from thence to Butte, Montana, a distance of about 700 miles, including the cost of smelting, was in the vicinity of $47 more. The cost of transportation from the Hot Springs to the same destination, exclusive of carriage by pack train from the mines to the water's edge, which varied with the distance travelled, was $27.50 per ton, and the charge for smelting ores from that locality ranged from $8 to $18 per ton, according to their nature.

"The survey party at present operating between the Columbia and Nelson seems to give truth to the assurance that these two places will be connected by rail next summer; if so, with a large and swift steamer plying on the Columbia, which is at present under construction, and others to be placed on the route when necessary, the business will be easily controlled so long as the Columbia remains open; but the interests at stake are too important to be interrupted during the period the river is closed to navigation, and rail communication with the main line of the Canadian Pacific at Revelstoke will have to be effected to afford an outlet to this rich portion of the district.

"The remission of the duties on mining machinery cannot be too strongly urged on the attention of the Dominion Government. It is not manufactured in Canada, and being of an expensive nature, in addition to heavy charges for freight, an *ad valorem* duty of 33⅓ per cent. imposes a heavy burden which few companies are able to bear.

"When Mr. Mara, the member of Parliament for the district, was at Kootenay Lake, the subject was fully discussed with some of the principal mine owners, and he promised to use his influence for the removal of this drawback to an important industry, which, he stated, should

be encouraged to the fullest extent. The warm interest he takes in the matter will, it is hoped, be productive of good results. Increased prosperity means a large consumption of dutiable goods, the revenue from which would make up in a short time for the removal of this impost from the tariff.

"The completion of the works belonging to the Kootenay Smelting and Trading Company inaugurates a new era of prosperity in the history of the interior of this Province. They are situated a short distance below the town of Revelstoke, convenient to the river for the unloading of freight from steamers, and have a sampling and smelting capacity of 100 and 60 tons, respectively. Without going into details, I may state that they are supplied with the latest improvements, and contain all the necessary appliances for the efficient prosecution of the work for which they are intended, with the utmost economy of labour. The best of workmanship has been expended on the buildings, which are of a substantial character, under the supervision of Mr. R. Litster. The officers are Dr. Campbell, manager, and Mr. F. Roeser, assayer, two gentlemen of long experience in the departments over which they preside, to whom mine owners can entrust their business with the assurance of being honourably dealt with.

"The company is prepared to smelt ores at a stipulated price per ton; or will defray all charges on consignments, and after deducting therefor pay their cash value, based on the assays obtained. By the latter means the poor man can reap the benefit of his own labour without any unnecessary delay, and provide himself with means to develop his property for the purpose of making larger shipments.

"The public works requirements of the district are as follows:—A waggon road from Nelson to the summit of the Toad Mountain to enable the transportation of ore from the principal locations, is indispensable. The estimated distance is about seven miles, and a suitable grade can be obtained for the purpose. The construction of a wharf at Nelson is also a great necessity. At a low stage of water the steamers have to lie at a considerable distance from the shore, and the inconvenience and delay of landing freight on rafts have to be experienced. The distance from the bank to a depth of 4½ feet is 325 feet. Mr. Giffin, the Mining Recorder at Nelson, has submitted a plan for its construction, which will be forwarded to the Lands and Works Department.

"At the Hot Springs a road about five miles long is required to facilitate operations. To obtain this great convenience the miners are willing to give pecuniary assistance to the extent of $5,000. Trails suffice so long as prospecting is being carried on; but in the shipping of ores economy must prevail, and the least expensive mode of carriage has to be adopted to increase the profit on the high and medium grades of mineral, and secure satisfactory returns from those of a less valuable character.

"I have, etc.,
(Signed) "G. C. TUNSTALL,
"*Gold Commissioner.*

"*To the Honourable Jno. Robson,*
"*Minister of Mines.*"

Eastern Division.

MR. REDGRAVE'S REPORT.

"DONALD, B. C., December 16th, 1889.

"SIR,—I have the honour to submit to you my report upon the mining industry of East Kootenay District, and also statistics in reference to placer mines and mining, etc.

"*Porcupine Creek.*

"From this creek good prospects were found last year, and it was anticipated that quite a large amount of gold would be taken therefrom this season. To assist the miners, and to facilitate their getting supplies in cheaply, a good pack trail was made by the Government to that creek, but little gold was found, and that very much scattered amongst a mass of large boulders, which made it expensive to work. After working about three months, the miners virtually abandoned the creek; the pay to the hand not realizing more than $2.50 to $3.00 per day. The creek will be worked by a number of Chinese next season.

"*Quartz Creek.*

"On this creek large benches of good pay dirt have been found, and it is the intention of a number of miners to apply themselves in working the same by hydraulics in the spring.

"*Wild Horse Creek.*

"Owing to the low stage of water in this and other creeks, the falling off of the output of gold for the season's work is quite apparent, as nothing like full working time was accomplished. Six companies were hydraulicing; the interests held being thirteen in number, consisting of hill and bench claims; four white men and forty-five Chinese being engaged; at wages of $3.00 and $2.50 per day.

"*Perry Creek.*

"*Placer mining is here prosecuted by the Perry Creek Gold Mining Company, Limited* Liability, incorporated in 1887. Their tunnel, driven at a depth of several hundred feet under Mount Cenis, and following the ancient bed of the stream, is now about 900 feet in. Most of the ground encountered presents the features of a cañon, with the bed-rock, owing to the great rush of the waters, smooth and polished. Large boulders impeded the work, but wherever gravel and clay had lodged the ground was paying well. The company run cars on iron tracks in the tunnel, and they have machinery for driving pure air to the workings. The number of miners employed is from ten to fifteen, under a superintendent. The output for the year 1889 was valued at $6,500, the gold assaying in San Francisco as high as $18.50 per ounce. Five miles higher up on the same creek the said company have this year resumed work on their shaft, constructed in 1887. This shaft is sunk in the centre of the creek, 55 feet deep, and protected by a treble cofferdam. Having brought by pack animals, and partly on the backs of Indians, a powerful Cornish lift pump, of a total weight of 9,000 lbs., over a most inaccessible part of the country, it was placed in the shaft, which, by blasting through the solid bed-rock, had been deepened to 65 feet. Water was brought by a ditch and flume, and a large wheel in the latter, connected with the pump, kept the work clear. This consisted of drifts lengthwise and across the channel. Though the ground traversed in all directions by these drifts seemed most favourable for the lodgment of gold, only small quantities were found. The company sent orders in the month of October to temporarily cease working this portion of their ground. *Of individual miners working on Perry Creek there are only two or three Chinese who are* supposed to take out moderate wages.

"*Palmer's Bar.*

"Only one company of four Chinese were working on this bar—sluicing.

"*Moyea River.*

"*A company of three Chinamen working, both with sluice and hydraulic, on this river.*

"*Bull River.*

"Two white men working with sluices upon this river.

"*Findlay Creek.*

"Nothing has been done upon this creek during the past season. The property of the *Findlay Creek Gold Mining Company is still considered valuable, and work will be commenced* at their hydraulic mine at an early date next spring.

"The following is the approximate amount of gold taken out of the creeks, benches, and bars, as mentioned, viz.:—

"Porcupine Creek	$ 2,000
"Wild Horse Creek	20,000
"Palmer's Bar	1,000
"Moyea River	1,000
"Weaver Creek	2,000
"Bull River	800
"Desultory mining by whites and Chinese throughout the East Kootenay District	3,000
"Perry Creek Mining Company	6,500
"Total	$36,300

"The prospects for the miners are so alluring, and to those who have, especially the past season, turned their attention to the prospecting for minerals, that very little attention is now given to placer mining, and as the country is further explored, and minerals found, the little placer mining which will be carried on will be relegated to Chinese and those who have little ambition or are easily satisfied.

"MINERAL CLAIMS.

"One hundred and fifty new mineral locations have been recorded in this district during the past season, or from January to the present time, and forty re-records of those previously taken up. Representation work has been performed upon fifty locations, and forty-two bills of sale, and transfers of forty-seven claims have been made and bonded to different companies from Victoria, Vancouver, Toronto, and London, England, which are estimated of great value, and for which a considerable amount of cash was paid, the balance to be paid at the expiration of bonding.

"*Otter Tail.*

"Very little has been done in the development of the Otter Tail District, although it is known that fine deposits of galena ore exist in large quantities, and only await capital to prove that locality one soon to become prominent in the annals of quartz mining.

"*Windermere.*

"In the vicinity of Windermere two new locations were made, which are rich in copper, assaying $25 to $45 per ton with silver combined.

"*Findlay Creek.*

"From a claim on this creek, the 'Thunderer,' $45 to $80 in silver, with traces of gold, have been obtained from different assays.

"*Bull River.*

"A new mineral locality has been found in this part of the district by Mr. Cowan, of Fort Steele. Three locations have been recorded, and, from samples of ore assayed in Vancouver and other places, $9 in gold, $12 in silver, and 35 % in copper have been obtained.

"*Toby Creek.*

"This locality was fully reported upon last year. From discoveries made, locations recorded, and assessment work performed upon them, it was anticipated that good results would follow. Those expectations have been realized, and there is not a shadow of a doubt but that it will become one of the first centres in rich mineral ores in the East Kootenay District.

"A great quantity of work has been done; large ledges of silver and copper ores have been exposed; thirteen new locations have been recorded. The claims taken up last year have been worked and bonded for a considerable amount of money, and work is progressing upon them through the winter.

"The claims located are at a point about eighteen miles from the mouth of the creek. This creek empties into the Columbia River, where steamboats continually run in the summer months, enabling the miners to get in their supplies and forward the ore to Golden at a cheap rate, and where a smelter is about to be erected.

"*Spillemcheen.*

"On Spillemcheen Mountain a number of locations were made five years ago, and a vast amount of work has been done on the different claims located, but at the present time this locality is overlooked on account of richer mineral being found close by. Upon this vast lead—or mountain—of low grade ore is located the 'Rothchild' claim, and the 'Homestake,' 'Spillemcheen,' and 'Jumbo' claims, adjoining the 'Rothchild,' are continually being worked and developed. As soon as smelting works are within easy distance, the whole mountain will be again taken up and worked, on account of its inexhaustible mineral supply and easy access,

its location being about four miles from the Columbia River, and forty miles from the railway at Golden, and the great and never-failing water supply, will be utilized and governed for *milling and mining purposes.*

"*Jubilee Mountain.*

"This locality, or mountain, is situated about 2 miles from the Spillemcheen Mountain, and within a distance of 3 miles from the Columbia River. The locators, 6 in number, first recorded their claims two years ago, and from assays then made, of the ore then found, Jubilee Mountain came in to prominence, the assays going so high in silver that the finders consider it the "Eureka" and "Empyrean" of Eastern Kootenay.

"Vast ledges of silver and copper ores, 18 to 20 feet in width, have been developed and worked, and are now in an advanced stage; the assays obtained ranging from $50 to $400 per ton in silver, and very high in copper. From statements of experts from England, who represent great capitalists, the leads and deposits in this locality are pronounced as something wonderful, and vast in extent and richness that astounds them, and they prophesy the time is not distant when all the capital required for working these mines will be supplied in abundance, in fact is now waiting in England for just such undertakings.

"One company of English capitalists have secured six mineral claims out of the eleven new locations made this year, and from six which have been re-recorded.

"Development work has been performed on ten claims, and for the 'Constance' and 'Atlanta' Crown grants have been applied for.

"The 'Lancaster' claim is one of great prominence, shewing hundreds of tons of silver ore in sight. An offer of $50 per ton has been made to the party owning the mine for all ore supplied and for any amount of tons to be placed on the banks of the Columbia River. It must be very rich ore, as it would again have to be handled three different times before getting to the present smelter, the nearest one at the present time being Revelstoke, a distance of 120 miles from Jubilee by water and railway.

"The facilities are excellent for working claims on Jubilee Mountain, the cost of conveying the ore to the steamboat is trifling as compared with other localities, the distance being within two and three miles from steamboat communication.

"*McMurdo District.*

"Although but a small portion of this district and of its vast mineral wealth is known, sufficient reports have been made by men well versed in mineralogy to stamp it as one of the greatest silver bearing regions on the continent.

"A new route and building of a new trail by the Government has shortened the distance to a little over forty miles from Golden, a station on the C. P. R. admirably situated as a smelting point.

"The McMurdo discovery claims are located near the Glacier, which caps the head of the cañon threaded by the middle fork of the Spillemcheen River. The vein is a giant in the size of its outcrop and very rich in sulphide ores, some samples of tetrahedrite, or gray copper, running as high as $60 in gold and from $100 to $150 in silver.

"All the locations surrounding the discovery shew from 18 inches to 3 feet of mineralized quartz.

"The developments, which have only amounted to the annual assessments for the past two years, prove that in depth the minerals in the vein-stone are greatly augmented both in quantity and richness; the vein is in talcose state.

"Five miles in a south-easterly direction is a small basin-shaped depression christened 'Cariboo Basin.' About ten claims are located within its boundaries, but work has only been performed on two; these proved to be veins of copper sulphide ores associated with ribbon stringers of argentiferous galena.

"Across to the south-west of the cañon is another depression which is evidently the remains of a large tract of primitive table land. The melting during the glacial period has cut the surface down by hydraulicing a passage for its pent up waters into the cañon of the middle fork, which is called 'Carbonate Creek Mountain and Basin.'

"This mountain heads about N. W. by S. E. Its southern face and side is more or less *gored for a distance of a mile by the outcrop of an immense lode on which a considerable* amount of money for development during the past season has been expended.

"Last year a tunnel was made for a distance of 85 feet under one of the croppings upon the 'Monitor' claim. The vein was very much broken and out of place; the work shewed, however, that the mountain held greater inducements for the miner than at the surface. This lode and its mineral, which is a sulphide containing antimony, has been traced over two miles and across the cañon. It is in micaceous slates, having a dyke of granite gneiss as its hanging wall. Running parallel to the above is another lode—the two being separated only by about 500 feet of country rock. It is highly argentiferous galena impregnated with minute specks of tetrahedrite, which often causes an apparent specimen of galena to run up in the hundreds of ounces of silver. Quite a number of claims are located along its croppings, but very little work so far has been done. Three claims on this lode have been sold this season to a Vancouver company, who as soon as practicable will work and develop them.

"About six miles from this place is Copper Creek, where a number of claims are located. The claim 'Southern Cross' is located here, and is pronounced a valuable mine.

"A face of mineral from three to six feet wide shews itself up and down the mountain. Upon the eastern side of this some very fine prospects are shewn, the 'Lost Chief' shewing a face 6 by 4 feet of mineral. A drift, 17 feet, has been made on the outcrop, and 10 tons of fine average ore are piled and laid on the dump. During the past season a tunnel was driven 75 feet at an angle across the country rock to tap the lead 50 feet in depth from the upper drift. The Smelting Syndicate at Revelstoke offer from $50 to $114 per ton for the ore (which is argentiferous galena) delivered on the banks of the Columbia, some twenty miles by pack trail. This location is in clay slate and mica shist, having an iron-stone casing on either side.

"Some distance from the 'Lost Chief' there is a small water-way discovered, and named 'Deception Creek,' during the last season. Its waters form one of the south forks of the Spillemcheen River. Two lodes, supposed to be the continuance of the last-named vein, have been discovered and 15 locations made. One lode is argentiferous galena; the other is sulphide ore, having bismuth as a base.

"In taking a retrospective view of the past 5 years, when but a few hardy pioneers were exploring the rugged mountain sides in their quest for mineral wealth, travelling hundreds of miles with their food upon their backs, weary and footsore from the long and weary marches, no trails, no roads, no railways nor steamboats, unknown and unassisted, with very little knowledge of the minerals they were seeking, and, as it has been proved since, actually passing, re-passing, and overlooking some of the rich ledges now located by others who knew more and fared better, benefited by their trails and pathways, it is really astonishing that even so much is known of the country or so much actual work performed. Since that time a railway has been constructed, steamboats placed upon two large rivers, and the Government have met the wants of the miner, the merchant, and the inhabitants by making waggon roads and trails, and at the crossing of the rivers constructed bridges of the most substantial material and good workmanship, so that food and powder, &c., two of the first articles required in mining, can be obtained at fair and reasonable rates, enabling those to develop the riches that for so many ages have lain hidden from view, and to reap a rich reward from their laborious undertaking.

"Every month which passes adds knowledge to our surroundings, and it does seem that Kootenay is blessed with all kinds of minerals. Not far from Golden iron ore has been found assaying 75 per cent., and of the best quality, with a mixture of silver and tin. Three miles from the same place good prospects for coal are in view, work on which is now being performed upon the supposed seams. Four claims were recorded the other day carrying 40 and 50 per cent. of zinc. Slate of good quality is close by; and a mountain of the very best lime rock is now being worked, supplying the local market, one mile from Golden.

"In conclusion I must state that from the progress made this last summer in the development of its mineral wealth, combined with new channels of trade and commerce opened, it has made success an assured fact—in the near future—for this highly favoured district of the Province of British Columbia.

"I have, &c.,
(Signed) "STEPHEN REDGRAVE,
"*Recorder, &c.*"

LILLOOET.

MR. SOUES' REPORT.

"GOVERNMENT OFFICE, CLINTON, B. C.,
"December 21st, 1889.

"SIR,—I have the honour to enclose herewith mining statistics, and my annual mining report, *for the District of Lillooet for the year 1889.*

"The total yield of gold (ascertained from reliable sources only) is $60,364. This shows a falling off of nearly $30,000 as compared with the ascertained yield of last year.

"The decrease in yield, apparently, must be in the neighbourhood of Lillooet. Mr. A. W. Smith, the principal buyer of gold there, writes to me that 'mining in the vicinity during the 'past season has been less prosperous than usual; that is, there has been less done. I believe 'those engaged in it have done as well as formerly, but water in some places has failed, and 'that has caused a shortage in the yield. Another cause is, many of the Chinese have left to 'work on the railroad, and others to work on farms, and many have returned to China from 'this vicinity during the past year, so that at present there cannot be half the number of 'Chinese here that there were a year ago. There are, I think, seven Chinese companies on 'Cayoosh Creek, about fifty men. They have all done well—better, I think, than an average 'of former years. I have bought only $39,000 since last December, all from Chinese labour 'except about $400.' (Mr. Smith's purchases of gold last year were nearly $60,000.) Mr. Phair, Revenue Collector, also calls my attention to an exodus of the itinerant Chinese miners on the banks and bars of Fraser River, and estimates the decrease in their numbers at four-fifths as compared with the past two or three years.

"A company obtained a lease of certain abandoned mining ground on Cayoosh Creek in the early part of the year. They have been steadily at work on it during the season, with what success I cannot say, as the foreman declined to give me any information.

"A company has also bought the farm at the old ferry near Lillooet for the purpose of mining it. They worked on it for a month or two this fall, and are, I understand, quite satisfied with their purchase. Another company has also bought a farm a short distance below Lillooet, also on the west side of the river, for a similar purpose, but as they came into possession late this fall, I believe they have not done any actual mining. On the leased ground of the Fraser River Cable Company there has not been any work done this past season. The available water supply owned by the company was very low during the whole of the mining season. I am still without any information from the lessee on St. Mary's Creek.

"The Chinese miners on Cayoosh have found gold on the banks of the Creek, which they have been working this fall. The alluvial mining in this creek and on its banks will pay well, I have no doubt, for many years to come. Comparatively but little mining has been done on Bridge River and its tributaries during the past season.

"*Quartz.*

"There were 53 mineral locations recorded in the district during the past year, but only a small number obtained a certificate under the provisions of the Mineral Act.

"Everything connected with the Foster Gold Mining and Milling Company's claims on the Big Slide has been at a standstill during the past year. This remark also applies to the locations in the eastern portion of the district, with the exception of the claim on Mad River, North Thompson, which has been worked during the summer months, but I am unable to say to what extent. Of the various locations in the valley of Cayoosh Creek but little work has been done with the exception of the Bonanza Company, which has been at continnous work, up to a short time ago. This company has run a tunnel of nearly two hundred feet, but without any valuable results so far.

"Work has been continuous during the season on the ledge at the west end of Anderson Lake, referred to in my report of last year. New locations have also been made in that neighbourhood, which will be thoroughly prospected next year.

"I regret exceedingly my inability to report more favourably on mining matters in my district for the past year. The Chinese miners are reduced to a very small number. Of white miners there have been but very few for a number of years past, and during the past two seasons those few have turned their attention almost exclusively to quartz mining, and so far, I regret to say, their labour has not added to the returns.

"For the precious metals, the district is to-day practically unprospected, with the exception of a few isolated spots, and even in those very imperfectly. In conversation with Dr. Dawson, of the Canadian Geological Survey, a short time age, he pointed out that all that portion of the district bounded by the Fraser River, the Lillooet-Clinton and Marble Cañon Waggon roads and Hat Creeks as, in his opinion, very likely to contain the precious metals. I have my doubts if even one really practical and observant prospector has been over any portion of it. A still larger and equally unknown area lies on the west side of the river, bounded on the north by the Chilcotin, west by the Cascades proper, east by the river—say fifty miles square. I sincerely trust that both the localities indicated will at least have a commencement made on them next year.

"I have, etc.,

"*To the Honourable Jno. Robson,* (Signed) "F. SOUES,
"*Minister of Mines, Victoria.* "*Gold Commissioner.*"

YALE.

Kamloops Division.

MR. HUSSEY'S REPORT

"KAMLOOPS, 8th January, 1890.

"SIR,—I have the honour to enclose my annual mining report for the Kamloops Division of Yale District for the year 1889.

"*Stump Lake Mines.*

"Of the large number of claims located in this camp assessment only has been done on a majority during the past season. Several causes have led to this result, but the principal one was the closing down of the Star Mining Company, followed by the burning of the quartz mill and the destruction of other machinery connected therewith.

"The 'Mary Reynolds' claim, owned by Mr. John Hepburn & Company, has now three shafts—one 100 feet, one 75 feet, and one 35 feet—all on the same vein. Several drifts are also run from the 100-foot shaft a distance of 90 feet. From this claim 3,500 lbs. of ore have been shipped to San Francisco, and the encouraging result of $168 per ton has been obtained. There are said to be $10,000 worth of ore on the dump, averaging from $50 to $60 to the ton.

"On the 'Jenny Long,' 'Silver King,' 'Silver Queen,' and the 'Star' Company's claims nothing more than assessment work has been done during the past season. The principal development work done has been on the 'Joshua,' 'Tubal Cain' and 'King William' ledges, owned by the Nicola Milling and Mining Company, L'd. (foreign), which run through Mineral Hill, Stump Lake.

WORK DONE ON THE 'JOSHUA.'

Main double compartment shaft	400 feet.
Air shaft connecting with 100-foot level	85 "
Drifts on 100-foot level	175 "
Drifts on 200-foot level	220 "
Drifts on 300-foot level	350 "
Total	1,230 feet.

WORK DONE ON THE 'TUBAL CAIN.'

Main double compartment shaft	220 feet.
Air shaft connecting with 50-foot level	40 "
Drifts on 50-foot level	160 "
Drifts on 116-foot level	300 "
Drifts on 220-foot level	200 "
Tunnel connecting with 116-foot drift	290 "
Tunnel to connect with 220-foot drift	400 "
Total	1,610 feet.

WORK DONE ON THE 'KING WILLIAM.'

Main double compartment shaft	175 feet.
Air and other shafts	75 ,,
Drifts 100-foot level	180 ,,
Drifts 175-foot level	102 ,,
Total	532 feet.

"On the other mineral claims owned by the above company considerable prospecting work has been performed, aggregating about 200 feet of shafts and a large number of open cuts; and on the 'Joshua,' 'Tubal Cain' and 'King William' horse whims have been used for hoisting purposes. As the reduction machinery contemplated by the Nicola Mining Company, L'd., is of large capacity and will require a large outlay of capital to ensure a permanent supply of ore, they are putting in a steam hoist so as to sink the 'Joshua' 200 feet deeper and run drifts on the 500-foot and 600-foot levels.

"The lodes have strengthened with depth, and the quantity and value of the ore have steadily improved. The prospects are most encouraging for paying results as soon as reduction works are erected at the mines.

"The amount of work done on Mineral Hill by the Nicola Mining Company, L'd, far exceeds that by any other company in British Columbia, and it is to be hoped success will soon crown the efforts of this company, as it will not only have a beneficial effect on quartz mining in this district, but will also attract capital to other legitimate mining enterprises in other portions of the Province.

"At Stump Lake several good locations have been made, from which samples of ore have been taken assaying very high. Owing to lack of capital the claims are not thoroughly developed.

"Messrs. J. M. Forney and E. H. Covey have located mineral claims in the vicinity of Eagle Pass, and expect to be able to induce capitalists to develop the mines.

"*Placer Mining.*

"The placer mines on the Tranquille Creek are still being operated by Chinese exclusively. No definite information can be obtained as to the quantity of gold secured. These mines support about thirty Chinese, who are supposed to make about one dollar per diem during the mining season.

"*Coal.*

"Some development work has been done this season on the coal seams near Kamloops; not sufficient has been accomplished, however, to say whether the find will pay to work.

"In conclusion, I must express my unbounded confidence in the future of this district as a mineral country. Its development may be slow for a time, yet, with the production of bullion, confidence will be inspired and development encouraged.

"I have, etc.,
(Signed) "FREDERICK HUSSEY,
Gold Commissioner.

"*To the Honourable Jno. Robson,*
"Minister of Mines, Victoria."

Okanagan Division.

MR. DEWDNEY'S REPORT.

"GOVERNMENT OFFICE,
"VERNON, 18th December, 1889.

"SIR,—I have the honour to enclose herewith the mining statistics and my annual report for the Osoyoos Division of Yale District.

"*Cherry Creek.*

"Very little has been done in the way of mining on this creek during the summer, several of the Chinese having left for other parts of the Province, where they think steady wages are more profitable than prospecting under difficulties, with little promise of success.

"The Cherry Creek Mining Company are still running their tunnel into the hill, with good indications ahead that they will soon strike the channel, but whether productive or not time only will show.

"Mr. Donald McIntyre, in company with Mr. L. W. Riske, has been busily employed this summer erecting a quartz mill on their claims, situated on the Monashee Mountain, and I am informed that they have a quantity of rich free milling ore on the dump ready to commence crushing as soon as the mill is completed, which they expect will be in running order early in the spring. Great credit is due to the indefatigable manner in which Mr. McIntyre has for the last twelve years worked in developing these mines.

"The Hidden Treasure Mining Company on Cherry Creek, I hear, have done little prospecting this summer.

"*Mission Creek.*

"Three white men and seven Chinese have been working on this creek in a desultory manner during the summer, with poor results.

"*Rock Creek.*

"I have heard very favourable reports from the McKinney Camp. Mr. John Douglas, manager of the Douglas Mine, has struck a very rich body of ore—free milling—at a depth of 150 feet from the surface, and is now running cross drifts. He contemplates placing machinery on the claim next summer, as he is now confident that he has a good paying mine.

"The Cariboo Mine is also turning out very rich ore, and the owners intend to put up machinery as soon as a waggon road is built from the boundary line to the camp. On the other claims just sufficient assessment work has been done to hold them. There are in all about twenty-five represented claims at this camp.

"At the mouth of Rock Creek there are about six whites and twenty Chinese working, taking out small wages. The Hydraulic Mining Company have done a great deal of work in getting their claim opened up, and have expended in the neighbourhood of $15,000 for that purpose. In consequence of a severe frost setting in, the company were unable to wash up, which was a great disappointment to the shareholders, who were anxious for some returns after the heavy expenditure on their claim.

"*Okanagan Camp.*

"This camp is situated about twenty miles from Penticton. There are about sixteen claims taken up and represented by the holders putting on assessment work.

"One claim, the 'Wide West,' was bonded for $45,000, but, from what I can learn, the parties are unable to come to a settlement for want of funds.

"The Government, at an expense of $2,000, built a waggon road this year from Penticton Landing to connect with the In-ka-nip-Rock Creek sleigh road, which is a great boon to the miners and settlers, enabling them to get supplies into the settlement by teams in place of pack animals.

"*Siwash Creek.*

"This creek is situated on the west side of Okanagan Lake, running through a portion of the N. Kam-ap-lix Indian Reserve.

"There was quite an excitement over these diggings during the summer, with the usual results, owing to exaggerated reports. A number of claims were staked off and recorded, and as quickly abandoned.

"There are in all about twelve companies prospecting, sinking shafts, and running tunnels into the hills through the gravel with small prospects. The only paying claim at present is the Discovery Company. They have washed up about $1,500 for their summer's work, which, after deducting expenses, will leave them with a small dividend.

"I have, &c.,

(Signed) "W. DEWDNEY,

"*Gold Commissioner.*

"*The Honourable John Robson,*

"*Minister of Mines, Victoria, B.C.*"

"*Similkameen Division.*

MR. HUNTER'S REPORT.

"GRANITE CREEK, October 31st, 1889.

"SIR,—I have the honour to forward the annual mining statistics for the Similkameen Division, in which you will observe that the yield of gold exhibits a decrease from that of the previous year, principally owing to the unusually dry season and consequent scarcity of water.

"On Granite Creek the majority of claims are paying fair wages. Two companies, the Gladstone and Pogue, have been prospecting their claim nearly the whole season, but are now on fair pay.

"Collins Gulch is fairly worked out, although a few miners are still employed there.

'On Slate Creek mining was at a standstill on account of the scarcity of water, but late rains have enabled miners to resume work.

"On Boulder Creek very little has been done, for the same reason.

"The dry season made it most favourable for mining on the Tulameen, and considerable work has been done. A large number of Indians from the Fraser River have been engaged in mining by means of rockers and have made good wages; they are scattered along the Tulameen River, above Bear Creek.

"On the Similkameen good pay was obtained from the creek claims, but dry diggings were a failure from the want of water.

"Very little has been done during the past year in quartz mining, the owners of mineral claims having satisfied themselves with merely performing the necessary work to hold them. Want of means in this instance, as in many others, is the sole excuse for the little labour expended on them.

"I have, &c.,
(Signed,) "HUGH HUNTER,
"*Recorder.*"

"*The Honourable Minister of Mines,*
"*Victoria.*

COAL.

The following table shows the output of each year from 1874 to 1889, inclusive:—

Year.	No. of Tons.
1874	81,000
1875	110,000
1876	139,000
1877	154,000
1878	171,000
1879	241,000
1880	268,000
1881	228,000
1882	282,000
1883	213,000
1884	394,070
1885	365,000
1886	326,636
1887	413,360
1888	489,300
1889	579,830

REPORT OF THE INSPECTOR OF MINES.

"NANAIMO, B. C.,
31st January, 1890.

"SIR,—I have the honour, in pursuance of the 'Coal Mines Regulation Act,' as Inspector of Mines, to respectfully submit for your consideration my Annual Report for the year ending 31st December, 1889.

"During the year the following collieries have been in operation, namely:—

"Nanaimo Colliery, of the New Vancouver Coal Mining and Land Co., Limited.
"Wellington Colliery, of Messrs. R. Dunsmuir & Sons.
"East Wellington Colliery, of the East Wellington Coal Co.
"Union Colliery, of the Union Colliery Co.

"Very extensive and encouraging prospecting operations, involving a large outlay of capital, have been carried on by the above-named companies, and also by the Oyster Harbour Coal Company, during the present year, by means of diamond drills of great power (capable of boring to 4,000 feet), to prove and establish an extension of the Nanaimo coal fields, and also those of Comox; and the Tumbo Island Coal Company are prospecting their coal land on the island of that name in the Gulf of Georgia by sinking a shaft.

"The output of coal for the year 1889 amounted to 579,830 12/20ths tons, produced by the several collieries as follows:—

Nanaimo Colliery output	223,870	18-20ths	tons.
Wellington Colliery "	273,383	14-20	"
East Wellington Colliery "	51,372		"
Union Colliery "	31,204		"
Total output in the year 1889	579,830	12-20	"
Add coal on hand 1st January, 1889	10,922	15-20	"
Total coal for disposal in 1889	590,753	7-20	"

"The exports of coal by the same collieries in 1889 amounted to 443,675 tons, viz.:—

Nanaimo Colliery	export	179,286 tons.
Wellington Colliery	„	197,510 „
East Wellington Colliery	„	43,089 „
Union Colliery	„	23,790 „
Total coal exported in 1889		443,675 tons.*
Add home consumption in 1889		124,574 5-20 tons.
„ On hand 1st January, 1890		22,504 2-20 „
		590,753 7-20 tons.

*Several cargoes of anthracite coal, hauled over the Canadian Pacific Railroad, and shipped from Vancouver, B.C., to San Francisco, Cal., are obviously not included in this total of exports.

"The coal exported from Nanaimo, Departure Bay, and Comox, was shipped principally to San Francisco and ports in California: other shipments were made to Oregon, Alaska, Petropavloski, Hawaiian Islands, China and Japan (per C. P. R. steamers). H. M. navy and U. S. war and revenue vessels have been supplied with coal, and ocean mail steamers and other vessels calling for fuel.

"The returns of the collieries show about 124,574 tons under the head of 'home consumption' in 1889, as against 115,953 tons in 1888; but it should be understood that the coal used in the collieries is in the most instances included in such returns.

"The following statement of output and export of coal from 1887 exhibits a very gratifying rate of progress by the coal industry of British Columbia in the year 1889; viz.:—

	Output.	Export.
1887	413,360 tons	334,839 tons.
1888	489,300 „	365,714 „
1889	579,830 „	443,675 „

"In previous reports I have presented statements of the various sources with quantities of their supply of coal to the State of California, our chief foreign market, and the following shows the same from 1887:—

	1887. Tons.	1888. Tons.	1889. Tons.
British Columbia	324,949	345,681	417,904
Australia	155,649	271,612	408,032
England and Wales	91,248	126,167	32,890
Scotland	12,615	10,680	12,727
Eastern States (anthracite, &c.)	24,102	30,118	18,950
Puget Sound	569,710	568,948	372,514
Coos Bay and Mt. Diablo	39,155	81,194	87,600*
Japan	——	13,808	1,340
Total	1,217,428	1,448,208	1,351,957

*Coal from Mt. Diablo added since former reports.

"The above table affords a view of the standing of British Columbia in our best market, and the prospects are that the Province will maintain the position which the superior quality of its coal commands, for the future.

"I can truly say that the outlook and productive power and resources of the Province at the beginning of the year on which we have entered appear brighter and more promising of substantial success and prosperity, so far as the coal industry is concerned, than ever before.

"NANAIMO COLLIERY.

"The coal in this colliery was in good demand up till the last two months, when the mines had to stop work, owing to there being no ships to take away the coal.

"No. 1 Pit, Esplanade, in Nanaimo.

"This mine, forming part of the Nanaimo Colliery, belongs to the New Vancouver Coal Mining and Land Company, Limited. The working in this pit is by what is known as the No. 1 and No. 3 North Levels. The No. 1 Level is in a north-westerly direction about one mile, and in this district of the mine there has not been much coal mined during the past year; but there has been some extensive prospcting done, and the company, to all appearance, is going to be rewarded for their perseverance, as they have now got into thick coal, that, from the prospect and regularity of the seam, I think, will prove to be a large and profitable coal field; they have now got into this coal 200 yards, and it averages about seven feet thick, clean and hard. The great part of the coal got out of the mine in the past twelve months came from No. 3 North Level, and in this Level they have the prospect of getting into the same coal soon that they have got in No. 1 Level.

"Ventilation in this mine is very good. When I was down in December I found 49,000 cubic feet passing per minute for the use of 60 men and 14 mules. The motive power of the above air is a Murphy Fan. There is very little gas now found here, the mine being free from dust; and there are pipes to conduct water where required.

"No. 3 Pit (Chase River).

"This shaft takes its name from being near to the mouth of Chase River; it is about two and a half miles from Nanaimo and forms part of the Nanaimo Colliery. The coal in this mine has been, and is at present, hard and of a very good quality, although varying in thickness from four to ten feet. All the workings are by way of a slope starting from near the bottom of the shaft, the levels branching from the slope. The coal is worked here on what is termed the pillar and stall system, for which it seems well adapted.

"Ventilation is very good; motive power, a large fan on the top of the up-cast shaft. When I last inspected this mine there were 46,800 cubic feet of air passing per minute for the supply of forty-six men and twelve mules, and it is well conducted into the face by brattice or otherwise. This mine has been free from gas since it started; the mine is also free from dust, being wet throughout. In this mine, as in all the other mines of the Nanaimo Colliery, a deputation of men is sent to examine the mine, under section 79, General Rule 31. The finding of the condition of the mine is recorded in a book kept for that purpose, and a notice is put up where all may see it.

"South Field Mines, Nos. 1 and 2.

"These mines are now known as the South Field Mine, both places being worked into each other and have jointly one ventilating shaft.

"During the past year a few men have been taking out coal along the outcrop of the No. 1 tunnel, but the bulk of the coal came out of the No. 2 slope. This slope is down over 700 yards with an easy grade until approaching near the face when it goes off with much greater pitch. About one-half of the output of Nanaimo Colliery came from this mine. The coal is of very good quality, and from a series of bore holes put down from the surface to the coal, some distance ahead of the working, they have proved that they have a great extent of coal yet before them. This is also mined on the pillar and stall system. There is now a long range of stalls in good coal.

"Ventilation is very good; motive power a large fan on the up-cast shaft. This mine is ventilated on the separate split system, with two divisions to the east side and one to the west side of the slope, the intakes being the Nos. 1 and 2 slopes with a shaft between the two slopes for the return. The last time I was down this mine I found that there were 67,500 cubic feet of air going past per minute for the use of 74 men and 7 mules. There is very little gas found in this mine, and it is free from dust, being damp throughout. Here the workmen also take the privilege of section 79, General Rule 31.

"No. 4, SOUTH FIELD MINE.

"This is the New Slope mentioned in a former report, situated about half a mile in a southerly direction from No. 3 Pit. They have gone to a great expense here. The slope is now down about 700 yards, the coal being thin in some places, and at other times no coal; but it was reasonably expected that good coal would be found as in No. 3 Pit, coming towards this slope the coal was hard and from five to nine feet thick; it is, however, to be hoped that they will come on the coal soon.

"NORTH FIELD MINE, NANAIMO COLLIERY.

"This is the northern part of the estate, owned by the New Vancouver Coal Mining and Land Company, Limited, and is situated in Mountain District. In the year 1888 the company put down a series of bore-holes to the coal, and among them was one near to their boundary line, which adjoins the Wellington property; the prospect they got seemed to justify them in putting down a shaft. The contract was taken by Mr. R. Scott to find the coal. Great preparation was made, clearing away timber and levelling off the surface, and a steam engine was erected. Everything being in order, work was commenced in the shaft on the 8th January, and continued without any great stoppage or drawbacks, when, on the 31st July, coal was struck, the same as is known both here and in California as the Wellington Coal. This was at the depth of 424 feet from the surface. In passing through the coal they found that it was of very good quality and hard; there were three plys of coal with rock between them, making about seven feet of coal. The shaft was continued until they got down 445 feet from the surface. Everything having been got in order both on top and at bottom they then started in the coal, when they found they had a small fault; but now that they are getting fairly started with levels and a slope opening out to both sides they find that the coal varies in thickness from three feet eight inches to four feet four inches, and is very hard and of a good quality. They have got out a few thousand tons of the coal and it looks well. When Mr. Scott had the shaft finished he received charge of opening out the mine, which is to be carried on, on what is called the long wall system; and it appears as if it should work well, as the roof is stronger than the roof of this vein generally is.

"Ventilation is good; motive power, a fan on the Murphy principle. The last time I was down there were only four men in the mine, so that they had the fan running slow; but at that time there were 10,000 cubic feet of air passing per minute. There has not yet been any explosive gas found in this mine and everything is being done to make the workings as safe as possible.

"The shipping place from this mine will be Departure Bay Point, where a large wharf has been erected by the company, so that the largest ships may load at any stage of the tide. From this wharf to the mine, with sidings, there are five miles of railway of standard guage. There is also a railway in connection with the Esquimalt and Nanaimo Railway.

"In starting a new work like the North Field Mine, a large outlay of capital is required, and it is desirable that the enterprise shown by the company will meet with the success that it deserves financially; it will also give new life to this district. I may here be permitted to remark that the prospect of the company for coal in their several mines for the coming year exceeds any that I have ever seen them have, and I trust that it will continue so.

"WELLINGTON COLLIERY.

"No. 3 PIT, WELLINGTON COLLIERY.

"This is the pit mentioned in a previous report as being in the valley of the Millstone River, and, as I have stated in former reports of this mine, is all by the way of a slope on the south side of the shaft.

"The coal was worked on the pillar and stall plan, which is the general method in this colliery. There are now very few stalls being worked, but there is considerable mining being carried on at the pillars, which will last for quite a long time, as the pillars are fully one-half of the coal.

"Ventilation is very good. When I was last down, in December, upon taking it I found that there were 40,000 cubic feet of air passing per minute for the use of 37 men and 6 horses. This mine is ventilated on the separate split system, going direct down the slope and returning by way of the pillars and stalls; motive power, a large fan. In ordinary times there is little gas found, but sometimes, when the roof breaks when they have taken out the pillars, then considerable gas comes away. When, however, there is the least danger the men are sent out of the mine. Here, as in the other extensive mines of the Wellington Colliery, a deputation from the men goes through the mine once a month, to examine all the mine to know its condition as to its safety, and the result of their examination is recorded in a book which is left open so that any person may see it.

"No. 4 PIT, WELLINGTON COLLIERY.

"This pit is put down on the top of the bluff which overlooks the Millstone River Valley. They have been working steadily here the greater part of the year. The coal is worked from what are known as the north and south side workings. All the working in this mine has been on the pillar and stall principle, excepting a small place in the south side, which is now back again to the old style. The coal generally in this extensive mine has been very good, yet the mine has not been without its faults. This mine and No. 3 pit are connected at different places with open roads from one to the other, that is, on the south side. Beside the connection they have their fan shaft, by which men could be taken out if emergency required it.

"Ventilation is very good; motive power, a large fan on the top of the up-cast shaft, worked by a steam engine. This mine is ventilated on the separate split system—the two main divisions at the shaft and again further in the workings. The workings here are very extensive, spreading over a great area, but the air is well kept under control by the overman, so that one district is not overdone at the expense of another. After the air has travelled round its several districts, it is again merged into one volume, and then ascends the up-cast shaft. Sometimes I find the air passing a given place at the velocity of 1,500 (one thousand five hundred) feet a minute, and the last time I was down, in December, I found that there was 110,000 cubic feet of air passing per minute for the use of 150 men and 10 mules and horses.

"This mine gives off some gas, which comes from the roof where they are taking out pillars, but it is not allowed much chance to collect. The fireman, in going his rounds in the mine, seldom finds any gas in the stalls. The mine is free from dust, as there is throughout the mine, where they may be required, a regular system of pipes, so that water can be turned on at any time, either to lay dust or in case of fire.

"In addition to the overman and fireman, there is a staff of men called shot lighters. They use and have only safety lamps to ascertain if a place is safe and if a shot is properly prepared before they will light it. In this mine there is a monthly examination by a deputation of workmen made in the manner before described.

"No. 5 PIT, WELLINGTON COLLIERY.

"This is the only pit of the Wellington Colliery which has a railway connection with the Esquimalt & Nanaimo Railway, and it plays a good part in supplying the Victoria market with this famous coal. This is now about the most extensive mine in the district. The coal is brought to the shaft from the east and west levels incline from the south, and a slope on the north side. In all those places the coal has been and is now very good, and they send out fully 500 tons in one shift. The workings here have all been on the pillar and stall principle, except a small piece in the slope, which seems to work very well.

"Ventilation is very good, and well conducted into the face and where they are taking out pillars (coal) by brattice or otherwise. When I was down in December I found that the instrument registered 118,420 cubic feet passing per minute, that is to say: 45,230 on the east side, 51,460 on the west side, and 21,730 cubic feet per minute passing in the slope, but the above mentioned currents of air are again divided further in in the workings, so that each district will have fresh air. The total number of men employed here on one shift is 195, and 14 mules. This mine is free from dust, and no expense is spared to keep it so. They have a regular system of water works or pipes to take water to any part in the mine where they think it may be required, and, as I have said in a previous report, the mains are along the levels and main roads, with small pipes and hose to the stalls, with sprays of water blown off at different

places in the mine, the air carrying the moisture along, so that everywhere it is not only damp but wet in top, bottom, and sides. The pipes are supplied with water from a large reservoir on the surface, the pressure being the depth of the shaft—260 feet.

"This mine is examined monthly by a deputation from the miners here, and chosen by them, to look into and examine every part of the mine under the section and rule already referred to.

"NO. 6 PIT, WELLINGTON COLLIERY.

"This pit was mentioned in a former report as No. 6 Sinking Shaft, and about 900 yards east of No. 4 Pit. They continued at work without anything serious happening, when, about the 1st of May, coal was struck at the depth of 340 feet from the surface. The coal was found to be 8 feet thick, very hard, and of the usual good quality of the Wellington seam. Since that time they have been opening out to all sides, and have now got quite a distance away from the shaft all around. They are mining on the pillar system, as this seems to be adapted to the purpose, all things being considered. The coal has proved to be very regular and good, some places not quite so thick, but other places much thicker. This is now a valuable mine, and is proving an acquisition to this district, there being a large number of men working here.

"Ventilation is good; motive power, a steam jet, but they are now preparing to erect a fan. They are at present restricted to a certain number of men, so that the output of coal is small to what it will be in a short time, as they are mining with all haste to get a connection with their No. 5 Pit. Then we may expect to see the output of No. 6 Pit come to the front, for, from what can be seen, they have here got the coal to work on.

"NO. 2 SLOPE, WELLINGTON COLLIERY.

"This is a new mine started by Messrs. Dunsmuir & Sons in the Sabiston and Horne property in Mountain District, and to the east of the East Wellington Colliery. This slope is now down 150 yards. At the top they soon got into the coal, which was about five feet thick, good quality and hard; but after going some distance they got down through it, which put the coal away below the line of the slope which continued in the rock. They now again expect to get into the coal soon. If it is as good and as thick as it was above the fault, and there is no reason why it should not be, it will make a valuable work in this locality, as it is not far from Nanaimo.

"EAST WELLINGTON COLLIERY.

"This is the property of the East Wellington Coal Company. In this colliery there are two shafts, known as No. 1 and No. 2 Pits, although both are connected by their workings underground. By the windings of those works they are 1400 yards apart, but by a direct course they are only about half a mile distant. The No. 2 is west of No. 1.

"In the west side of the No. 1 shaft they are not now doing much mining, as they are only employing a few men, coal being thin. What coal they do take out is of a first-class quality, with a strong roof, well adapted for long wall work, which has been their method of working since they started. In the east side they have during the past year done much prospecting, which is looking favourable for having good coal on this side, although they have drifted through considerable bad and barren ground.

"On August 24th there was a serious fire in this shaft. Everything went on as usual until away in the afternoon, when volumes of smoke came out of the shaft, shortly after followed by flames. Then it was apparent that the ventilating furnace had set fire to the timbers of the shaft, and in a short time the head gear was on fire, and a large bin of coal near the same, while the machinery and boilers were only a few yards off. The men were got out by No. 2 shaft, that being afterwards covered and thus shutting off the air from below. By this time the fire engine was brought out from Nanaimo, and after placing it in the bed of the Millstone river they commenced work. It then became evident that the fire on top was not going to last long. As soon as possible they got No. 1 shaft covered, and in this way the fire was put out. Considerable damage was, however, occasioned by the fire burning out some of the shaft timbers, and also to the head gear, which took a few weeks to put in working order.

"No. 2 PIT, EAST WELLINGTON COLLIERY.

"In this Pit work has been going on steadily all the year, except for a few days when the fire was at the No. 1 Pit. The coal here has kept good and continues so. The roof, however, is not quite so strong, yet it is well adapted for long wall work, and this is the system that has been generally worked here.

"Ventilation is good. Motive power up to the time of the fire was a furnace with a steam jet; since that time it has been a fan, worked by a steam engine, that does its work very well. When I was down in December, I found 20,000 cubic feet of air passing per minute for the use of sixty men and six mules,—this being the air and men of both Pits, No. 2 being the intake and No. 1 Pit the outlet. This mine gives off some gas, but chiefly when the roof breaks. As the air goes along the coal face the gas has not much chance to collect and the works are well filled up. Every precaution is used to prevent accidents of any kind.

"UNION COLLIERY, COMOX.

"You will have seen in a former report that this colliery is the property of the Union Colliery Company. Their present mines are only a few miles from the flourishing Comox settlement.

"In this property the coal is exposed in various places, and at present they are mining at three different places and in two veins of coal.

"No. 1 and No. 2 tunnels go into the hill, being adit levels on the south side of the railway. They are in about 500 feet each, coal being about the same quality, which is very good and hard and on an average three feet thick. This is worked on the long wall system. The roof is very strong.

"Ventilation is good; motive power a furnace, the air going in by the level road and coming out by the way along the face of the workings. There is no gas found in here. The mine is free from dust, being wet throughout.

"No. 1 SLOPE, UNION COLLIERY.

"When previously reporting on this slope I stated it as being down 1000 feet. It is now extended to about 2,000 feet. They have been considerably troubled with faults of one kind and another. The coal, when free from faults or troubles, is about four feet high, of good quality and very hard. The workings from this slope are at the present time by four levels, one to the south side, and three to the north side. In some of these levels the regularity of the coal has been and is still improving as they go in.

"Ventilation is good; motive power a fan on the upcast shaft, built on the Murphy principle and driven by a steam engine. The last time I was down there were only three or four men in the mine, and they had the fan running slow, as it was not required at the time to go fast, yet I found that there were 20,000 cubic feet of air passing per minute. This mine gives off some gas, but it has got very little chance to accumulate. There is no dust in this mine, which is wet throughout. Everything is in good order.

"No. 1 SHAFT, UNION COLLIERY.

"This shaft is about half a mile south of No. 1 Slope and is about forty feet deep. There has been much prospecting done at this place, but they do not seem to have got right on the coal yet, although it has much improved of late, and to all appearance they will get on to a good seam soon.

"In this district the coal has not yet proved to be quite as thick as was expected, but the quality is all that could be desired. It is to be hoped that the company's expectations will be fully realized and that the coal may get thicker. They have put down to the coal a series of bore-holes. These bore-holes are away ahead and to the dip of the Slope. In some of those holes they found a good and encouraging prospect. After the large expenditure of money here, and in view of the outlay still required to prove the property, it would be a serious matter for the Province as well as for the Company if these mines were not a success; but it is only a question of a short time in my belief, judging from the indications, when these mines will be successful and when there will be flourishing collieries in this district of Comox.

"TUMBO ISLAND COAL MINING COMPANY.

"This island, lying at the south east entrance of the Straits of Georgia, is being prospected for coal by the above named Company. They commenced by putting a bore-hole down close to the water's edge; in this they passed through about five feet of hard coal. This prospect so encouraged them that they went down to the dip and started to sink a shaft, in which they are now down fully 100 feet. They have a steam engine, pit head gear, and other necessary appliances. Owing to the location of this shaft being so far to the dip of the bore-hole they do not expect to get to the coal at less than about 600 feet from the surface. This is a large undertaking, and will take a large amount of capital to reach the coal and put everything in order. It is to be hoped that when they get the shaft down they will find the coal as good as expected.

"PROSPECTING.

"There has been some very extensive boring in this district during the past year. Amongst them was the continuation of the bore-hole referred to in my previous report in No. 2 Esplanade Shaft. This was put down to the depth of 1,263 feet, the depth of shaft being 617 feet, makes the total from the surface 1,880 feet. From not having struck any coal, there was another bore-hole put down by the same company in the South Field. In this bore they passed through a seam of hard coal 12 feet thick, at 469 feet from the surface. This bore has been continued till the present time, and is 1,460 feet down. This bore shows a good prospect, and is very encouraging.

"OYSTER HARBOUR COAL COMPANY.

"Exploration with two diamond drills has been in progress at Oyster Harbour and Chemainus Bay during nearly the whole of this year. The first bore, commenced in January, was put down at the head of Oyster Harbour, on the north-west side, and pierced a depth of 1,300 feet through sandstone and shale, and was stopped in a fine-looking sandstone. The rocks at this place are tilted at a high angle, the cores from the bore showing a dip of some 25 degrees. While in process of boring, inflammable gas extended from this hole in sufficient quantity to burn with a bright flame when a match was applied.

"A second bore was started on the eastern side of the harbour, which, after going down 690 feet, was stopped for want of water. The stream which fed the drill dried up and the machinery was removed.

"A third hole was bored on the north-west side of Chemainus Bay, close to the water's edge. This hole was sunk to a depth of 1,600 feet, using up all the rods available, and operations were suspended. The rocks, as shown by the cores, which are sandstone, mostly, with shale bands, are all said to be of the right kind, and we may expect to hear more of operations in this neighbourhood.

"At Chemainus Bay, after getting down 300 feet, about the measures were found to be lying horizontally, and very nicely bedded the whole depth of the bore.

"ACCIDENTS

"IN AND ABOUT THE COAL MINES FOR THE YEAR ENDING 31ST DECEMBER, 1889.

"January—7th—George Brough, mule-driver, had his leg broken by getting jammed by empty cars in No. 1 Shaft, Nanaimo Colliery.

"January 18th—Albert Williams, runner in South Field, had his leg broken by being jammed with loaded cars.

"January 24th—Samuel Wariting was slightly injured through being jammed between two cars in No. 5 Pit, Wellington Colliery.

"February 1st—Henry McPhee, miner, was injured about the head by a fall of rock from the roof while at work in his stall in No. 3 Pit, Nanaimo Colliery.

"March 8th—Harry Croston, miner, was slightly injured by a fall of coal from the roof, while at work in No. 5 Pit, Wellington.

"March 16th—Alexander Marshall, sinker, when being hoisted up the North Field sinking shaft, fell from the bucket and was killed.

"March 27th—Joseph Thompson, runner in No. 1 Shaft, Nanaimo Colliery, had his hand jammed while lowering a car on an incline.

"March 27th—Gustav Karsola, miner, was slightly injured by a fall of top coal, when at work in his stall in No. 5 Pit, Wellington.

"March 30th—James Shearer, miner, working in East Wellington Colliery, had his jaw broken by a fall of rock from the roof.

"May 10th—Thomas Beard, miner, was injured by a fall of rock from the roof, when at work in his stall in No. 4 Pit, Wellington.

"May 10th—Thomas J. Jones, miner in the East Wellington Colliery, was injured by coal falling on him while at work.

"May 11th—Patrick Nearn, runner in No. 1 Shaft, Nanaimo Colliery, was injured by a run of cars.

"May 14th—Yung (Chinaman), tracklayer in No. 1 Slope, Union Colliery, had his back injured by a piece of rock falling on him while removing a prop.

"June 12th—John Campbell was injured in No. 4 Pit, Wellington Colliery, by being jammed between timber and cars.

"June 24th—Thomas Lonk, miner, was slightly injured by a fall of rock while at work in his stall in No. 4 Pit, Wellington.

"June 25th—T. Knight, miner, had his wrist broken by getting it jammed between a car and a prop in No. 3 Pit, Nanaimo Colliery.

"June 28th—Leopold Dispeniteance, miner in No. 4 Pit, Wellington Colliery, was severely injured by a fall of coal from the roof, while at work in his stall.

"July 6th—Wilkinson Richards, contractor in No. 3 Pit, Nanaimo Colliery, had his back broken by being jammed in the shaft between the cage and mid-wall.

"July 9th—Nesto Newman, miner in No. 5 Pit, Wellington Colliery, was injured by coal thrown from a shot.

"July 16th—George Phillips, mule-driver in No. 5 Pit, Wellington Colliery, had his collar-bone broken by the cars, while taking in timber.

"August 9th—M. Bart, miner in Union Colliery, was slightly burned about the face and hands, by firing powder while charging a shot.

"August 20th—Westley Harvey, miner, was burned on the face and hands by an explosion of gas in the No. 1 Slope, Union Colliery.

"August 26th—William Gordon, sen., a miner working in No. 3 Pit, Nanaimo Colliery, had one leg and wrist broken and otherwise injured by a fall of coal while at work.

"August 27th—W. Dooley, miner, had his leg broken by a run of cars in No. 1 Slope, Union Colliery.

"August 30th—Thomas Lathom, miner, was slightly injured by a fall of coal and dirt, while at work in No. 4 Pit, Wellington.

"September 27th—William Foxworthy, tracklayer at South Field Mine, had several of his ribs broken by getting jammed with a run of empty cars.

"October 5th—M. Campbell, miner, had the small bone of his leg broken by a fall from the roof, while at work in No. 4 Pit, Wellington Colliery.

"October 12th—John Dunsmuir, miner in No. 3 Pit, Nanaimo Colliery, was hurt about the back by a fall of coal.

"October 25th—Ah Loon (Chinaman), runner in the Union Colliery, had his thigh dislocated while pushing cars.

"October 30th—Ah Yeut (Chinaman), fell from a trestle near No. 1 Tunnel, Union Colliery.

"October 31st—The above-named Ah Yeut died this day from injuries received.

"November 7th—Sandretto, a miner in No. 4 Pit, Wellington Colliery, was injured by being jammed by a car, which he accidentally started away while loading.

"November 13th—William Brown, miner, was seriously injured by a fall of top coal on him while at work in his stall in No. 4 Pit, Wellington Colliery.

"November 16th—John Wesley, miner in No. 5 Pit, Wellington Colliery, was injured by a fall of coal from the top, while at work in his stall.

"November 22nd—George Codling, miner in North Field Mine, Nanaimo Colliery, was killed by a fall of rock from the roof. He went in to the face after having fired a shot which blew out some timber, and while in the act of putting the timber up the roof fell on him.

"November 23rd—William Anthony Farman, miner, was slightly burned on the face and hands by an explosion of gas in No. 1 Slope, Union Colliery.

"December 16th—John Aitken, shot lighter, in South Field Mine, Nanaimo Colliery, was severely injured about the back by a fall of rock from the roof when about to fire a shot.

"December 20th—The above named John Aitken died to-day from the injuries received.

"December 19th—Casueir Colate, runner in No. 3 Pit, Wellington Colliery, had his thigh bone dislocated by a car running on to him when at work.

"I am sorry to have to make out such a numerous list of accidents, both serious and fatal. There were thirty-three reported as serious, yet there were some of those so slight that the injured parties were at work in a few days; on the other hand, there are one or two persons that are injured to such an extent that it is doubtful whether they will ever be able to resume their mining occupation again.

"The fatal accidents were four in number—two of them by falls of rock; one by falling from a bucket when being hoisted up a shaft; and one by falling from a trestle.

"Of the serious accidents in the list, thirteen were caused by cars in the mine; six by falls of rock; nine by falls of coal; two by shots; one in a shaft; and two by explosions of gas.

"I have inquired into all the circumstances which attended all these accidents, and in nearly all instances went and saw the place when I knew the place had not been disturbed, and even then in some cases I went.

"Public inquest was held whenever requisite, at which all the evidence it was possible to obtain was taken, and as the depositions and proceedings of the inquiries so held are filed in the Attorney-General's Office I beg leave to refer you to the same.

"With respect to all the accidents, I could not discover that any blame or negligence could be attached to any one. You will perceive, when looking at the list, that nearly all the accidents took place when the men were working and where they were presumed to be skilful enough to know, at their several classes of work, when they were in immediate danger, subject to the direction of the overman, fireman, shot firer, and any other person in authority from the Manager; and as the shot firer and fireman are continually travelling from one place to another, they would in the course of their rounds be sure to have anything that they saw to be dangerous made safe.

"You will also notice from the list of accidents that, with the exception of two persons being slightly burned in the Union Colliery, there has not been a casualty from gas in this district, which says a great deal for the management and ventilation of the Collieries.

"Now that the workmen in all the extensive mines send a deputation by and chosen from themselves to examine every part of the mine (See section 79, General Rule 31), the Managers furnishing them with all the necessary appliances required to make a complete examination, so that no place need be missed, the workmen obtain a knowledge of the mines as to their condition with regard to safety, as the result of those inspections is posted in a conspicuous place where all may see it.

"As Inspector, I am always ready to attend to any matter that may be brought to my notice by any one who may have a cause of complaint.

"I will now conclude my report, hoping that the year we have entered on may be free from any serious accident, so that all may, by using the greatest care and not running any unnecessary risk, be saved from injury, and also hoping and trusting that this may prove a prosperous year to our mining industry and the workmen alike.

"Appended are the Annual Colliery Returns, also Examination Questions which were put to candidates for certificates as Colliery Managers by the Examiners under the provisions of the Act. It has been thought that the publication of the questions at the last examination would prove useful as showing intending candidates the nature and scope of the examination for certificates of Colliery Manager.

"I have, &c.,

(Signed,) "ARCHIBALD DICK,

"*Government Inspector of Mines.*

"*The Honourable the Minister of Mines.*"

COLLIERY RETURNS.

NANAIMO COLLIERY RETURNS.

Output of Coal for 12 months ending December 31st, 1889.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1889.		No. of tons unsold, including coal in stock, Jan. 1st, 1890.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
223,870	18	40,113	11	179.286	—	5,121	14	9,593	1

Number of hands employed.				Wages per day.			
Whites.	Boys.	Indians.	Chinese.	Whites.	Boys.	Indians.	Chinese.
697	16	.....	162	$2 to $4	$1	.....	$1 to $1.25.

Total hands employed..... 875 Miners' earnings per day .....$3 to $4.

Name of Seams or Pits—South Field No. 2, South Field No. 3, No. 1 Esplanade Shaft, and No. 1 North Field Shaft.

Value of Plant—$350,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—South Field No. 2. worked by slope; seam 6 to 10 feet; South Field No. 3, worked by shaft; seam 5 to 10 feet; No. 1 Esplanade Shaft, worked by shaft; seam 5 to 12 feet; No. 1 North Field Shaft, worked by shaft; seam 4 feet 6 inches.

Description and length of tramway, plant, &c.—Railway to South Field, 5 miles with sidings; railway to No. 1 Shaft, 1 mile with sidings; railway from North Field Mine to wharf at Departure Bay, 4½ miles; rails are of steel, 56 pounds per yard of standard gauge, viz., 4 feet, 8½ inches; 8 hauling and pumping engines; 12 steam-pumps; 4 locomotives; 150 coal cars (6 tons), besides lumber and ballast cars; fitting shops for machinery repairs, with turning lathes, boring, drilling, planing, screw-cutting machines, hydraulic press, steam hammer, etc., etc., diamond boring machinery for exploratory work (bores to 4,000 feet); wharves, 1,070 feet frontage, at which ships of the largest size can load at all stages of the tide

SAMUEL M. ROBINS,
Superintendent, The New Vancouver Coal Mining Co., Limited.

WELLINGTON COLLIERY RETURNS.

Output of coal for 12 months ending December 31st, 1889.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1889.		No. of tons unsold, including coal in stock, Jan. 1st, 1890.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
273,383	14	76,524	14	197,510	—	3,701	1	3,050	1

Number of hands employed.				Wages per day.			
Whites.	Boys.	Indians.	Chinese.	Whites.	Boys.	Indians.	Chinese.
750	12	.....	100	$2 to $3.75	$1 to $1.75	.....	$1 to $1.25

Total hands employed ..... 862 | Miners' earnings, per day ..... $3.50 to $4.50

Name of Seams or Pits—Wellington.

Value of Plant—$150,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—4 shafts with slopes, airways and levels; 3 air shafts; seam 6 to 10 feet thick.

Description and length of tramway, plant, &c.—12 miles of railway; 6 locomotives; 250 coal waggons; 13 stationary engines; 9 steam-pumps; 4 wharves for loading vessels, with bunkers.

R. DUNSMUIR & SONS.

EAST WELLINGTON COLLIERY RETURNS.

Output of coal for 12 months ending December 31st, 1889.		No. of tons sold for home consumption.		No. of tons sold for exportation.		No. of tons on hand 1st January, 1889.		No. of tons unsold, including coal in stock, Jan. 1st, 1890.	
Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
51,372	—	7,636	—	43,089	—	100	—	547	—

Number of hands employed.				Wages per day.			
Whites.	Boys.	Indians.	Chinese.	Whites.	Boys.	Indians.	Chinese.
175	3	.....	12	$2.25 to $5	$1 to $1.50	.....	$1 to $1.37

Total hands employed ..... 190 | Miners' earnings, per day ..... $3 to $5

Name of Seams or Pits—East Wellington No.'s 1 and 2 Shaft.

Value of Plant—$140,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—1 seam from 2½ feet to 7½ feet; 7 levels; 2 shafts.

Description and length of tramway, plant, &c.—4½ miles standard narrow gauge; 2 locomotives; 31 4½-ton cars; 2 hoisting engines; 2 donkey engines; 1 steam pile driver; 1 steam saw-mill complete, capacity, 12,000 feet per day; 4 steam pumps.

EAST WELLINGTON COAL CO.

UNION COLLIERY RETURNS.

Output of coal for 12 months ending December 31st, 1889.	No. of tons sold for home consumption.	No. of tons sold for exportation.	No. of tons on hand 1st January, 1889.	No. of tons unsold, including coal in stock, Jan. 1st, 1890.
31,204 tons.	100	23,790	2,000	9,314

Number of hands employed.				Wages per day.			
Whites.	Boys.	Indians.	Chinese.	Whites.	Boys.	Indians.	Chinese.
132	.....	.....	182	$2.50 to $4	.....	.....	$1 to $1.25

Total hands employed ..... 314 | Miners' earnings, per day ..... $3.50 to $4.50

Name of Seams or Pits—Union.

Value of Plant, $25,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—1 slope with airways and levels.

Description and length of tramway, plant, &c.—11 miles of railway, 4 feet 8½ inches gauge; 2 locomotives; 50 coal waggons; 1 diamond drill; 4 engines; 2 steam pumps; two wharves; one steam saw mill.

JAMES DUNSMUIR.

EXAMINATION QUESTIONS,

At Examination of Candidates for Certificates as Colliery Managers, held by the Examiners in Nanaimo, under the provisions of the "Coal Mines Regulation Act."

MINING ACT.

1. What does the Act provide in reference to the employment of boys and young persons in coal mines?

2. What are the requirements of the Act with regard to the working place?

3. State the provisions of the Act as to the payment of persons employed in the mines by weight.

4. What is the prohibition in the Act as to single shafts; and what is provided by the Act as to the division of the mine into parts?

5. What does the Act say respecting abandoned mines and workings?

6. State fully what the Act provides in regard to ventilation.

7. What distance does the Act require the brattice to be kept from the face of the working place?

8. What does the Act say as to safety lamps and lights?

9. What kind of safety lamp do you consider the best? Give fully your reasons why.

10. State the restrictions and precautions to be observed under the Act in the use of gunpowder and blasting in mines.

11. What are the requirements of the Act with respect to man-holes on self-acting inclines and other roads?

12. What are the duties of the Overman and Fireman as provided by the Special Rules?

13. What does the Act say as to the examination of machinery, shafts, &c.?

14. What precaution should be taken in approaching a place that is likely to contain a dangerous accumulation of water or gas?

15. How are dusty or fiery mines to be ventilated? What are the precautions to be observed in blasting, according to the Mining Act?

GASES.

1. What is the composition and weight of the following gases: Atmosphere, Nitrogen, Oxygen, Carbonic Oxide, Carbonic Acid, Fire Damp, and Sulphureted Hydrogen? State their properties, how made or produced, and how they can be detected?

2. What are the gases chiefly met with in coal mines?

3. What proportion of air is required to render Fire Damp explosive; what proportion is required to give it its greatest explosive power; and what proportion of air is required to render the mixture non-explosive?

4. Describe a Barometer, and Thermometer, and their use in denoting changes in the atmosphere.

5. To what extent are gases and vapours expanded by heat?

6. What is meant by White Damp; how is it given off, and what peculiarities has it?

7. What is meant by the diffusion of gases?

8. What effect has the combustion of lights on the air of a mine?

9. How would you ascertain if a working place or sinking shaft contained Fire Damp or any other obnoxious gases?

VENTILATION.

1. What are the different powers used in ventilating mines, and which do you prefer?

2. What precaution would you take when putting in a furnace against its taking fire and igniting the surrounding strata?

3. What is a dumb drift, and what are its uses in ventilation?

4. If there are 10,000 feet per minute (of air) passing along an air-course, the size of which is 6 feet by 7 feet, at what velocity is it travelling?

5. Assuming 5 feet per second to be the proper velocity for air to travel, what must be the size of the road when the quantity of air amounts to 24,000 feet per minute?

6. If 20,000 feet per minute of air be passing in a mine and it is proposed to split this into three equal currents along airways of about equal length and area, would the current in each be sufficient to remove ordinary discharges of Fire Damp, the size of the airways being say 5 feet by 6 feet?

7. How is the power of the furnace estimated?

8. Can you give a rule to find the weight of air?

9. How is the useful effect of a ventilating fan obtained by calculation?

10. Describe the water gauge; its use in ventilation.

11. If with 35,000 cubic feet of air per minute the water gauge is 1.8, at what height will it stand when the quantity is increased to 45,000 feet?

12. What is the motive column?

13. What is the motive column under the following circumstances?—

Depth of down-cast and up-cast shaft, 600 feet.
Temperature of down-cast, 45 degrees.
" " up-cast, 140 "

14. What pressure per square foot does a 1.5 water gauge indicate?

15. What is the horse power expended when the ventilating current is 30,000 cubic feet per minute, and the water gauge is 0.65?

16. What quantity of air will there be travelling along an airway, height 5 feet 9 inches and width 9 feet 7 inches; and anemometer registering 230 revolutions?

17. There are 6 splits of air in a fiery mine, as follows:—

No.	Size.	Area.	Vel. per sec.	Quantity.
1	10 x 6		8	
2	8 x 6		8	
3	8 x 6		6	
4	6 x 6		10	
5	6 x 6		8	
6	4 x 6		6	

Fill in the area and of air; find the total quantities passing per minute, and state the size of up-cast required?

18. If 28,000 cubic feet of air pass along an airway 900 yards in length, how much air will travel if the airway be lengthened to 1,500 yards, the pressure remaining the same?

19. If the horse power of a Fan be 36, and 68,000 cubic feet of air per minute is put into circulation, what would be the horse power required, the quantity of air being increased 130,000 cubic feet per minute?

20. What is meant by inertia?

21. What is meant by "rubbing surface?" What is the rubbing surface of an airway 1,272 feet long, 7 feet high, and 9 feet wide?

22. Supposing a Fan to be 40 feet in diameter, width of blade 13 feet, making 40 revolutions per minute, what is the theoretical quantity of air thrown by such a fan, leaving friction out of the question?

GENERAL QUESTIONS ON MINING.

1. If you were in search of coal, how would you endeavour to find it?

2. Describe the various methods of boring for coal.

3. What form of shaft, in your opinion, is the strongest, and what kind are usually adopted?

4. When there is quicksand containing a large quantity of water, what means would you adopt to pass through it?

5. In sinking and opening out a Colliery, what is the principle which should guide in determining the position of the works?

6. Explain the ordinary conditions for adopting the long wall and pillar and stall workings.

7. In a four foot seam of coal, 80 fathoms deep, what size would you make your pillars, having regard to the ultimate extraction of the greatest quantity of coal combined with the safety of the workmen?

8. Under the usual conditions of tram rails and tubs, what is the flattest gradient at which a self-acting incline will pass 100 tons in eight hours? Sketch the best arrangements of it at top.

9. In a seam having a rise of one in six, and the direction of the plane of coal being to full rise, sketch what you consider a good form of Longwall workings, having a regard to the ventilation, direction of the drawing, roads, &c., &c.

10. What is meant by specific gravity?

11. The specific gravity of a piece of coal 1.49, what is the weight of a cubic foot of it?

12. The coal in a pillar measuring 100 yards square has a specific gravity of 1.28; the seam is 5 feet 6 inches thick; the pillar lies 9 fathoms below the bottom of the shaft; what horse power must be exercised to remove the whole of the coal clean and deliver it at the bottom of the pit?

13. Explain the best method of drawing coal along a level road or one not dipping sufficiently to take away the rope.

14. Sketch a pair of levels and the mode to be adopted when approaching water in old workings; and state the number and length of holes you think advisable under 10, 50 and 100 fathoms pressure?

15. Give a good reliable formula for finding the thickness of metal tubing for different depths and sizes of shafts.

16. How would you proceed to obtain the specific gravity of a piece of coal?

17. How would you proceed in case of a fiery and dusty mine to keep the mine in a safe condition from explosions of gas and coal dust? State your idea of coal dust explosions.

18. In the case of a fire making such headway in a mine that you found it necessary to wall it off, how would you proceed?

MACHINERY.

1. What is a unit of work, and how many are there in a horse power?

2. What power is required to raise 8,000 cubic feet of water to a height of 300 fathoms?

3. Explain the use of the syphon; its use and application in mines.

4. How many gallons a minute will an engine of 170 horse power pump from a depth of 210 fathoms?

5. To what height will a pump, whose cylinder is 12 diameter and plunger bucket 3½ in diameter, force water with a pressure of 20 lbs. of steam?

6. Find the nominal h. p. of an engine cylinder, 30 diameter, stroke 4 feet, making 40 revolutions per minute, and 30 lbs. of steam pressure; also give effective h. p. of same, supposing 7-10 to be lost by friction.

10. What is the working load and breaking strain of 1¼ steel wire rope?

11. If the safety valve on your steam boilers was 4 inches in diameter, and the steam blew off at 50 lbs.; length of lever, 36 inches; fulcrum, 4 inches long; what weight would have to be attached to the end of the lever, reckoning lever and valve to weigh 5½ lbs.?

12. Find the situation of the fulcrum along a lever 15 feet in length, on which 2½ cwt. placed at one end may equipoise 30 cwt. at the other, the weight of the lever not taken into account.

13. In what time will an engine of 16 h. p. raise a ton of material from a depth of 170 fathoms.

14. What weight would an engine of the following diminsions lift:—Size of cylinder, 12 inches; length of stroke, 18 inches; steam pressure, 50 lbs.; geared 4 to 1 with drum 6 feet in diameter?

SURVEYING.

1. Plot the following survey and calculate are:—

N.	16	degrees,	40	minutes	W.	Distance, 160	links.
S.	75	„	32	„	E.	„ 120	„
S.	69	„	25	„	E.	„ 111	„
S.	41	„	3	„	W.	„ 85	„
N.	79	„	40	„	W.	„ 80	„
S.	53	„	30	„	W.	„ 70	„

2. Plot the following survey and calculate area; draw a line from terminal point to place of commencement, and give bearing and distance of same:—

N.	13	degrees,	33	minutes	W.	Distance, 630	links.
N.	30	„	42	„	E.	„ 496	„
S.	74	„	0	„	W.	„ 440	„
S.	40	„			E.	„ 433	„
S.	65	„	0	„	W.	„ 512	„

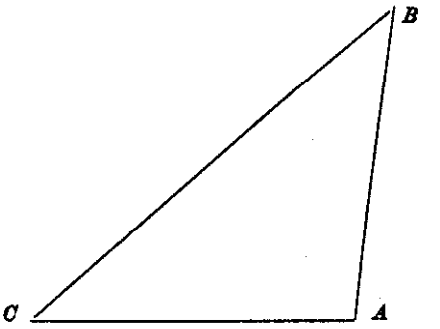
Scale—2 chains equal to 1 inch.

3. Shew how you would head your field-book for levelling.

4. Fill in and work out the following levels:—

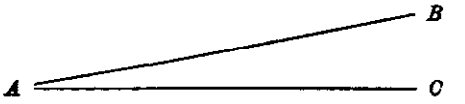
3.50	back sight,	5.65	fore sight,	Distance,	4.60	chains.
4.10	„	10.85	„	„	7.80	„
5.04	„	9.25	„	„	11.60	„
3.84	„	12.91	„	„	15.20	„
4.12	„	7.65	intermediate sight,			
		3.92	fore sight,	„	21.00	„
12.96	„	3.03	„	„	27.00	„

5.



In the above triangle the angles A and B are given. A equals 122 deg. 30 min. 15 sec. B equals 30 deg. 20 min. 15 sec. What is the angle C?

6. The included angle between the lines AB and AC is 1 degree; at what distance upon the line AB are the two lines 1 link apart, and what distance are they 12 inches?



7. Plot the following notes of a Level Book:—

Back sight.	Intermediate sight.	Fore sight.	Rise.	Fall.	Reduced levels, 100.00 datum.	Distance, chains.
3.50		5.65				4.60
4.10		10.85				7.80
5.04	9.25					11.60
		12.91				15.20
4.12		7.65				17.00
10.49		3.92				21.00
12.96	6.50					25.00
		3.03				27.00

8. What is meant by contour levelling?

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