ANNUAL REPORT

OF THE

MINISTER OF LANDS

OF THE PROVINCE OF

BRITISH COLUMBIA

FOR THE

YEAR ENDING DECEMBER 31ST

1922

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1923.

VICTORIA, B.C., March 22nd, 1923.

To His Honour WALTER CAMERON NICHOL,

Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

Herewith I beg respectfully to submit the Annual Report of the Department of Lands for the year ending December 31st, 1922.

T. D. PATTULLO,

Minister of Lands.

VICTORIA, B.C., March 22nd, 1923.

The Honourable T. D. Pattullo,
Minister of Lands, Victoria, B.C.

SIR,—I have the honour to submit the Annual Report of the Department of Lands for the twelve months ending December 31st, 1922.

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

G. R. NADEN,
Deputy Minister of Lands.

PART I.

DEPARTMENT OF LANDS.

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DEPARTMENT OF LANDS.

REPORT OF OFFICE STATISTICS.

VICTORIA, B.C., March 2nd, 1923.

G. R. Naden, Esq.,
Deputy Minister of Lands, Victoria, B.C.

SIR,—I have the honour to submit herewith report of the administration of Crown lands during the year ending December 31st, 1922.

The accompanying statements cover the various transactions connected with the disposition of Crown lands under the "Land Act" and other Acts coming under the jurisdiction of the Lands Branch. The statistics relating to pre-emptions, land sales and leases, the issuance of Crown grants and coal licences and leases are embodied therein.

During the year auction sales were held at Prince George and Creston, following the cancellation during the previous year of the delinquent agreements for sale which had been outstanding for some time in respect to the properties in both places named.

In Prince George a careful revision was made of the valuations of the lots upon which the sale was based, and although the number of lots sold in proportion to those offered was rather small, still provision has been made for the disposal of the balance on application and subject to the upset prices established at the sale.

The sale at Creston was in the shape of acreage at revised prices, and was considered very successful.

I have, etc.,
H. CATHCART,
Superintendent of Lands.

PRE-EMPTION RECORDS, ETC., 1922.

Agency.	Pre-emption Records allowed.	Certificates of Purchase.	Certificates of Improvements.
Alberni	12	30	2
Atlin	..	..	..
Cariboo	153	163	17
Cranbrook	24	22	3
Fernie	1	7	1
Fort Fraser	158	38	15
Fort George	146	210	19
Golden	2	8	1
Kamloops	46	1	11
Lillooet	84	218	29
Nanaimo	2	10	2
Nelson	12	102	5
New Westminster	9	8	..
Nicola	..	..	4
Omineca	63	53	5
Osoyoos	19	32	1
Peace River	39	5	3
Revelstoke	..	2	..
Similkameen	51	64	11
Skeena	25	54	2
Slocan	12	13	1
Stikine	..	..	..
Vancouver	105	216	29
Victoria	6	471	3
Totals	969	1,735	154

LAND-SALES, 1922.

Surveyed (first class)	832.00
„ (second class)	10,097.86
	10,929.86
Unsurveyed	5,593.90
Total	16,523.76

CROWN GRANTS ISSUED, 1922.

Pre-emptions	308
"Pre-emptors' Free Grants Act, 1916"	85
Purchase	196
Mineral	181
"Soldiers' Homestead Act"	8
Town lots	137
Reverted lands (other than town lots)	88
Reverted town lots	177
Reverted mineral	33
"Townsite Proportionate Allotment Act"	3
"Dyking Assessments Act"	1
"Schools Act"	9
Soldier Settlement Board	22
Land Settlement Board	42
Miscellaneous	5
Total	1,295
Applications for Crown grants	1,148
Certified copies	15

TOTAL ACREAGE DEEDED.

Pre-emptions	60,381.83
Mineral claims (other than reverted)	6,936.16
Reverted mineral claims	1,009.56
Purchase of surveyed Crown land (other than town lots)	19,087.76
Purchase of reverted land	19,174.99
Purchase of unsurveyed Crown land	3,003.50
Lands conveyed to Soldier Settlement Board	2,210.30
Lands Crown-granted to Land Settltement Board	5,186.75
Total	116,990.85

REPORT ON COAL LICENCES, LEASES, ETC., 1922.

COAL-PROSPECTING LICENCES.

Number of licences issued, 236; area, 151,040 acres.

COAL LEASES.

Number of leases issued, 17; area, 9,703 acres.

SUNDRY LEASES.

Number of leases issued, 122; area, 8,476 acres.

PRE-EMPTIONS INSPECTED IN 1922.

Alberni	205
Atlin	...
Cariboo	146
Cranbrook	69
Fernie	15
Fort Fraser	215
Fort George	170
Golden	14
Kamloops	116
Lillooet	55
Nanaimo	33
Nelson	29
New Westminster	6
Omineca	27
Osoyoos	86
Peace River	45
Revelstoke	49
Similkameen	85
Skeena	128
Slocan	5
Stikine	...
Vancouver	389
Victoria	8
Yale	...
Total	1,799

STATEMENT OF REVENUE, YEAR ENDING DECEMBER 31st, 1922.

Land-sales.

	Victoria.	Agencies.	Total.
Under "Coal and Petroleum Act"	$23,801 37	.....	$23,801 37
Under "Taxation Act"	46,501 21	.....	46,501 21
Townsite lots	58,364 89	$77,499 14	135,864 03
Country lands	6,330 11	78,737 95	85,068 06
Pre-empted lands	.....	35,815 16	35,815 16
Mineral claims	345 25	1,354 45	1,699 70
Improvements	.....	2,680 05	2,680 05
Totals	$135,342 83	$196,086 75	$331,429 58

Revenue under "Land Act."

	Victoria.	Agencies.	Total.
Sundry lease rentals	$29,679 13	.....	.....
Grazing and hay rentals	6,169 00	.....	$35,848 13
Survey fees	2,707 27	$8,991 74	11,699 01
Sundry fees	11,859 00	3,408 10	15,267 10
Royalty	210 61	.....	210 61
Totals	$50,625 01	$12,399 84	$63,024 85

REVENUE UNDER "COAL AND PETROLEUM ACT."

	Victoria.	Agencies.	Total.
Coal licences	$23,400 00	.....	$23,400 00
Coal rentals	20,564 78	.....	20,564 78
Sundry fees	1,360 00	.....	1,360 00
Lieu of work	700 00	.....	700 00
Totals	$46,024 78	.....	$46,024 78

SUNDRY RECEIPTS.

	Victoria.	Agencies.	Total.
Maps, blue-prints, etc.	$6,480 81	.....	$6,480 81
Miscellaneous	881 81	.....	881 81
Totals	$7,362 62	.....	$7,362 62

SUMMARY.

Victoria	$239,355 24
Agencies	208,486 59
Total	$447,841 83

SUMMARY.

	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.	1922.
Pre-emption records	2,049	2,383	3,655	3,855	4,304	2,277	1,167	824	823	1,752	1,624	1,495	969
Certificates of improve't.	439	624	715	962	1,002	665	465	541	379	326	328	217	154
Certificates of purchase	9,031	7,141	5,065	3,640	1,805	990	729	778	592	747	1,067	1,152	1,735
Crown grants	1,572	2,566	2,737	2,110	1,376	718	847	1,167	1,512	1,806	1,827	1,699	1,295
Total acreage deeded	300,587.79	524,325.99	253,143.60	390,036.32	245,244.78	75,225.00	98,452.00	187,111.64	260,321.40	512,844.87	215,364.50	163,161.76	116,990.85
Coal-prospecting licences	145	2,223	2,003	1,090	545	198	120	71	72	112	275	160	236
Sundry leases	92	121	47	46	51	38	86	73	83	51	113	104	8
Coal leases	.....	.....	75	207	71	29	31	7	3	1	12	6	9
Cash received	$3,190,416.21	$3,526,544.61	$2,525,497.29	$946,944.23	$589,687.36	$126,308.28	$159,213.65	$194,435.17	$369,392.51	$251,471.25	*$428,431.64	$381,860.60	$394,454.43
Letters received	37,188	41,946	43,302	31,738	30,287	19,151	13,779	15,780	22,500	†53,835	32,180	28,951	22,857
Letters sent	.....	23,568	21,612	17,305	14,790	10,104	8,432	12,632	12,500	18,063	19,912	22,372	16,517

*Cash received at Victoria only.

† This includes total letters received by entire Department.

REPORT OF THE SUPERINTENDENT OF BRITISH COLUMBIA SOLDIER SETTLEMENT.

March 31st, 1923.

G. R. Naden, Esq.,
Deputy Minister of Lands, Victoria, B.C.

SIR,—I have the honour to submit herewith annual report for the year 1922 of operations under the "Soldiers' Land Act," chapter 80 of the Statutes of British Columbia, 1918, amended by chapter 76, 1919, and chapter 85, 1920.

SOUTHERN OKANAGAN IRRIGATION PROJECT.

Construction-work on the project has been continued during the year. The main canal excavation was completed to the point where a considerable length of fluming is required to reach the Osoyoos Benches, and the concrete lining was extended to a point beyond the nursery. A concrete spillway to the river was constructed at a point near Hester Creek.

The cement-pipe works was operated from April 1st to July, inclusive—28,500 lineal feet being manufactured, varying in size from 6 to 24 inches in diameter.

The laying of the pipes was continued and completed in the areas offered for sale. Concrete measuring-boxes have been installed so that the water may be measured to each individual lot.

The repairs to the main canal near the inlet to the 76-inch inverted siphon begun in 1921 as a result of the wash-out due to the cloudburst in May of that year were completed and a new inlet structure built with the necessary connections to the siphon. A spillway to the river was constructed as an adjunct of the inlet structure.

For the irrigable areas above the main canal south of Oliver and within 2 miles of the town three motor-driven centrifugal pumps were installed and have worked satisfactorily. An area of 299 acres was ploughed, cultivated, fenced, planted out to fruit trees, and seeded down to alfalfa.

Due to a more complete measure of control of the outlet of Okanagan Lake at Penticton, the height of the Okanagan River through the project was kept within reasonable bounds and the progress of the construction was not retarded nor the lowlands flooded to the extent experienced the previous season.

The sawmill was not operated during the year. The Oliver Waterworks system has operated most satisfactorily.

During the year the step-down sub-station erected by the West Kootenay Power and Light Company within about half a mile of Oliver has, under an arrangement with the Department, supplied electric current for the various pumping units and for the street-lighting of Oliver during the winter. The residents of the community now enjoy the facilities afforded by electric light and power.

The waterworks system in townsite of Oliver has been operating smoothly, the automatic controlled pumps and motors working very satisfactorily.

A telephone exchange has been installed in the town of Oliver and surrounding settled district by the Dominion Government and operated as a part of their Okanagan system.

One hundred and fifty-two parcels of an area of 1,227.67 acres have been sold for $299,802.58. Amount received as first payments on same is $56,710.70.

In the townsite of Oliver eighty-two lots have been sold for $21,960. Amount received as first payments on same is $8,297.39.

The total expenditure on the project as at December 31st, 1922, is $2,606,162.39; total sales, $297.802.58; total deposits, $56,710.70.

NURSERY.

A very fine lot of stock has again been propagated at the nursery. Throughout the year many settlers and visitors called to obtain first-hand information relative to fruit-growing.

Balance-sheet, Nursery and Demonstration Lot, as at December 31st, 1922.

Assets.

Buildings, less depreciation	$10,157 19
Plant, tools, and equipment, less depreciation	1,387 88
Fencing and fluming, less depreciation	1,101 23
Orchard and stock-on-hand	21,945 79
	$34,592 09

Liabilities.

Provincial Government	$32,996 06
Provincial Government, interest on value of land under cultivation	726 00
Surplus	870 03
	$34,592 09

South Vancouver Housing under the "Soldiers' Land Act."

Three of the soldier purchasers are in good standing; one of the other five, due to bereavement, sickness, and unemployment, one is two months, one six months, one seven months, one nine months, and one fourteen months in arrears. Negotiations are proceeding for a sale relative to the last mentioned. All the others in arrears are paying amounts additional to the regular monthly payments to make good the sums overdue.

Indian Tour.

Under the official recognition and assistance of the Secretary of State for India and the Government of India, an Indian tour by a representative of the Province was arranged to interest surplus officers of the Army in India in the Province of British Columbia, particularly the South Okanagan Irrigation Project.

The military authorities afforded every possible facility in the way of transportation, etc. Following an interview with General Cummings, the Commandant of Bombay District, I proceeded to headquarters at Simla. The Commander-in-Chief, Lord Rawlinson, was greatly interested in our scheme of settlement for the South Okanagan Valley, and after a long discussion authorized his staff officers to make arrangements for a tour, which included Lucknow, Lahore, Rawal Pindi, Karachi, Khow, Poona, Bangalore, Madras, and Colombo in Ceylon. Mr. Burdon, the Secretary of State for India, and the Assistant Secretary, Mr. Pate, were both very kind and helpful in the furtherance of the scheme for British Columbia. At every centre visited the commandants were keenly interested and afforded every possible facility to reach the largest number of officers.

A lecture was usually given on the first evening of arrival at a military centre, and following that the whole of the time available was given to interviews. I found hundreds of officers anxious to obtain information concerning the Province and obtained thirty written promises to investigate the British Columbia scheme before I left India. During the tour and since that time considerably in excess of 200 letters from officers interested have been received. At the time of writing thirty-two officers from India have visited the Province and fifteen are known to be domiciled here. These officers are practically the advance guard of a large number which are expected to arrive via England during this spring and summer.

STATEMENT OF B.C. BETTER HOUSING FUND AS AT DECEMBER 31ST, 1922.

Municipality.	Amounts covered by Agreements within Time Limits.	Payments authorized by Order in Council under "B.H.A."	Amounts expired by Time Limits.	Amounts returned unused.	Balance payable.	Houses erected.	Houses under Construction or to be erected.	Total Houses.
Burnaby	$ 45,500	$ 35,000	$10,500	.....	.....	12	..	12
Cumberland	6,000	6,000	.....	.....	.....	6	..	6
Courtenay	35,000	35,000	.....	.....	.....	11	..	11
Cranbrook	15,000	15,000	.....	.....	.....	5	..	5
Duncan	3,500	3,500	.....	.....	.....	1	..	1
Esquimalt	25,000	25,000	.....	.....	.....	9	..	9
Kamloops	75,850	75,850	.....	.....	.....	27	..	27
Kelowna	32,300	32,300	.....	.....	.....	10	..	10
Langley	10,500	10,500	.....	.....	.....	6	..	6
Matsqui	2,000	2,000	.....	.....	.....	1	..	1
Nanaimo	54,000	54,000	.....	.....	.....	18	..	18
Nelson	24,000	24,000	.....	.....	.....	4	4	8
New Westminster	85,000	85,000	.....	.....	.....	25	..	25
North Vancouver City	84,200	84,200	.....	.....	.....	30	..	30
North Vancouver District	86,500	86,500	.....	.....	.....	28	..	28
Oak Bay	37,000	30,950	6,050	$2,500	.....	8	..	8
Penticton	23,000	23,000	.....	.....	.....	8	..	8
Point Grey	98,200	98,200	.....	.....	$4,200	23	1	24
Port Alberni	16,000	16,000	.....	.....	.....	4	..	4
Port Coquitlam	16,800	16,800	.....	.....	.....	6	..	6
Prince George	74,000	74,000	.....	.....	.....	25	10	35
Prince Rupert	125,000	125,000	.....	.....	.....	41	13	54
Saanich	59,000	59,000	.....	.....	.....	19	..	19
Salmon Arm City	3,500	3,500	.....	.....	.....	1	..	1
South Vancouver	109,500	109,500	.....	.....	.....	34	7	41
Trail	27,000	27,000	.....	.....	.....	6	3	9
Vancouver	300,000	300,000	.....	.....	.....	92	..	92
Vernon	27,200	27,200	.....	.....	.....	8	3	11
Victoria	220,000	180,000	40,000	.....	.....	52	..	52
West Vancouver	37,500	37,500	.....	.....	.....	8	4	12
Totals	$1,758,050	$1,701,500	$56,550	$2,500	$4,200	528	45	573

AREAS OF LAND CONVEYED TO THE SOLDIER SETTLEMENT BOARD OF CANADA.

The following lands have been reserved and conveyed to the Soldier Settlement Board of Canada for soldiers who have applied for loans to the Board:—

Cariboo District.—Lot 4923, S.E. ¼, 160 acres; N.W. ¼ Lot 8820, 160 acres; Lot 6712, 160 acres; S.E. ¼ Lot 2684, 160 acres; Lot 1120, 145 acres; Lot 5725, 160 acres; Lot 5016, 115 acres; Block A of Lot 8010, 187 acres; S. ½ Lot 1119, 160 acres.

Coast District.—N.W. ¼ Sec. 2, Tp. 1, R. 4, 165 acres; W. ½ of S.E. ¼ and E. ½ of S.W. ¼ Lot 2567, R. 5, 160 acres; S.E. ¼ Sec. 18, Tp. 16, R. 5, 160 acres; N.E. ¼ Lot 2559, R. 5, 160 acres.

Kamloops District.—Lot 2327, 180 acres.

OTTER DISTRICT.—Block A of Lot 28 (reconveyed), 69 acres. (NOTE.—Block A was conveyed on February 17th, 1920, relinquished by the Board, and again conveyed.)

YALE DIVISION OF YALE DISTRICT.—Lot 971, 157 acres.

Total, 2,458 acres.

I have, etc.,

J. W. CLARK,

Superintendent, B.C. Soldier Settlement.

PART II.

SURVEY BRANCH.

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REPORT OF THE SURVEYOR-GENERAL.

VICTORIA, B.C., February 20th, 1923.

To the Hon. T. D. Pattullo,
Minister of Lands, Victoria, B.C.

SIR,—I have the honour to submit the following report on the operations of the Survey Branch for the year ending December 31st, 1922:—

The field season was highly satisfactory from the ordinary land-survey standpoint. There was very little wet weather to delay survey operations, but the smoke from the innumerable forest fires throughout the Province seriously interfered with reconnaissance, triangulation, and topographical work. This latter condition did not, however, exist on the Coast north of Vancouver Island, where very little trouble was experienced from smoke.

Forty-four qualified surveyors were employed during the season for various periods, ten of these being engaged as assistants. Twenty-five parties were engaged for a more or less extensive season, while the remainder were employed for short periods only.

FIELD-WORK.

The field-work of the Branch is divided into three main classes of work—namely, surveys of Crown land for settlement purposes, control surveys, and topographical surveys.

Crown Land Surveys.—The area of Crown land surveyed totals 66,306 acres, 18,000 acres of which constitute lands which reverted to the Crown under the "Soldiers' Land Act" and which were divided into parcels suitable for pre-emption. These lands are scattered throughout the Province, generally in small areas on the outskirts of existing settlements. Owing to the limited appropriation for surveys in recent years it has been impossible for the Branch to undertake any extensive surveys of the somewhat more remote areas of agricultural lands known to exist in the northern districts, particularly the Peace River District. Under existing conditions it is possible, only from year to year, to take care of the immediate requirements, and owing to the consequent scattered nature of the work, necessitating much travelling by the various parties, the cost per acre of survey-work is considerably in excess of the cost when large areas in continuous blocks were being surveyed.

Furthermore, the survey of small areas adjoining previous surveys, in some instances made many years ago, necessitates the retracement of original survey-lines which frequently are difficult to determine, thus adding further to the cost of the work.

It is estimated that the actual cost per acre of surveys of lands for pre-emption during the past season was approximately 80 cents per acre, as compared with a cost of about 30 cents per acre ten years ago. It must be borne in mind, however, that in addition to the reasons for the increased cost mentioned above, there are other reasons for the increase, such as increased cost of labour and supplies and the more detailed requirements of the office in connection with field-work.

Of the area surveyed about 40,000 acres are located within the areas served by the Grand Trunk Pacific and Pacific Great Eastern Railways. The remaining areas are still more widely scattered in other portions of the Province, and consist, to a great extent, of lands specially required for settlement by individuals who have signified their desire to acquire same, or special areas of logged-off lands suitable for settlement. Areas of the latter class were surveyed on the Cheakamus River near Squamish; on Cortes Island; Kilbella River, Rivers Inlet; Elk River, near Fernie; and Arrow Park, West Kootenay. Summer home-site areas were laid out at Lakelse Lake, situated south of the town of Terrace, on the Grand Trunk Pacific Railway, about 95 miles east of Prince Rupert.

This work necessitated the running of 390 miles of new boundary-lines and the retracement of 228 miles of previously surveyed lines.

As pointed out in the Annual Report for the year 1921, the surveys of pre-emptions granted prior to the amendment of the "Land Act" in 1918 were practically all completed last year; consequently nearly all the lands surveyed in 1922 are vacant Crown lands.

It is estimated that 659 parcels have been surveyed, of which only thirty-four were alienated at the time of survey. The remainder will therefore be available for settlement when the surveys are finally dealt with and gazetted.

Control Surveys.—In order to properly correlate the individual lot surveys on the maps of the Department, so that conflicts of rights may be avoided and that future applications may be properly cleared on these maps, it is the practice of this Branch to do each year a certain amount of control-work. This consists of traverse, base-line, or triangulation surveys.

Traverses are usually run along trails, streams, or shore-lines, tying in existing lots and thus determining their relative position, and 551 miles of such surveys were carried out during the year.

No base-line surveys were done during 1922.

Triangulation affords the most accurate means of establishing control and a considerable amount of this work was done during the season. Two parties were engaged in the extension of the triangulation system of the Coast inlets, and similar work was done at Nuchatlitz Inlet, on the west coast of Vancouver Island, and Clearwater Lake, in Kamloops District. Approximately 900 miles of shore-line were thus established.

Two parties were engaged on triangulation, control, and reconnaissance, one in the area south of Ootsa Lake and another in the vicinity of Chilko Lake. All of this work will be of special value in connection with the Standard Base Map of the Province, now in course of compilation, in addition to the main object of obtaining detailed information of economic value concerning these comparatively little known areas.

Topographical Surveys.—The photo-topographical work was extended during the year in accordance with the general programme of covering eventually all the grazing and irrigation areas of the Southern Interior. This work was considerably hampered during the season owing to smoke from forest fires.

For the purpose of reporting in more detail by the various parties, the Province has been divided into the following main sections: Central and Northern Interior, Southern Interior, and Mainland Coast and Vancouver Island.

The following paragraphs give the names of the surveyors in charge of the various parties and the locations and nature of the work done by them:—

Central and Northern Interior.

The term "Central and Northern Interior" is applied to that portion of the Province lying north of the Dominion Government Railway Belt and east of the Coast range of mountains.

Surveyor.	Locality.
1. P. M. Monckton	Lakelse Lake.
2. V. Schjelderup	Upper Bulkley and Nechako Valleys.
3. J. F. Campbell	Vicinity of Prince George.
4. R. W. Haggen	Vicinity of Quesnel.
5. R. C. Farrow	Northern Lillooet District.
6. W. C. Merston	Chilcotin Valley.
7. O. B. N. Wilkie	North Thompson Valley.
8. G. M. Downton	Western and Southern Lillooet District.

Mr. Monckton was engaged in laying out small lots for summer home-sites at Lakelse Lake, which, owing to the scenic attractions and the proximity of rather remarkable hot springs, are likely to be in considerable demand, especially by residents of the City of Prince Rupert. He also resubdivided certain lands in the same vicinity into parcels suitable for pre-emption.

Messrs. Schjelderup and Campbell surveyed lands along the Grand Trunk Pacific Railway for settlement purposes, including the subdivision of certain lands which reverted to the Crown under the "Soldiers' Homestead Act," previously surveyed into lots of 640 acres.

Mr. Haggen surveyed a few scattered pre-emptions mostly held by men entitled to free grants under the "Soldiers' Free Grants Act." He also traversed portions of the Cottonwood and Quesnel Rivers, necessitated by the staking of numerous placer leases on these streams, and which are now recorded on departmental reference maps to prevent conflict between claims of this description and other surface alienations.

Mr. Farrow surveyed lands in various portions of Lillooet District for settlement purposes, the majority of his work covering hay meadows which are increasingly in demand in that

district. Similar work was done by Mr. Merston in the Chilcotin Valley, combined with traverse-work tying in isolated and floating lots.

Mr. Wilkie surveyed certain unsurveyed pre-emptions in the North Thompson Valley, together with Crown lands for pre-emption purposes. A new area was laid out by this party in the Raft River Valley, across a low divide from Irvine Station, on the Canadian National Railway.

Mr. Downton's work consisted of miscellaneous scattered surveys in the western and southern portions of Lillooet District, including the laying-out of a few additional lots in the town of Lillooet.

Southern Interior.

In the Southern Interior, comprising all that portion of the Province south of the Dominion Government Railway Belt, the following surveyors were employed:—

Surveyor.	Locality.
9. P. W. Gregory	Vicinity of Princeton.
10. A. H. Holland	Kettle River Valley.
11. S. S. McDiarmid	Slocan and Lower Arrow Lakes.
12. A. H. Dawson	Kootenay, Trout, and Upper Arrow Lakes.

Messrs. Gregory and Holland were employed on scattered land surveys for settlement in their respective districts, while Messrs. McDiarmid and Dawson were engaged on miscellaneous surveys in West Kootenay District, the former in the southern and the latter in the northern part of the district, including an attractive subdivision in the vicinity of Arrow Park, which will no doubt be in considerable demand when placed on the market.

In addition to the above, A. Cummings, B.C.L.S., of Fernie, laid out six parcels on the Elk River near that town on logged-off and abandoned timber licences. A number of acreage parcels were laid out at Creston by C. Moore, B.C.L.S., which were dealt with at a recent Government auction sale held at Creston.

Coast and Vancouver Island.

The following surveyors were engaged on work on the Mainland Coast and Vancouver Island:—

Surveyor.	Locality.
13. W. G. McElhanney	Vicinity of Squamish.
14. M. W. Hewett	New Westminster and Sayward District.
15. John Davidson	Sayward and Coast Districts.
16. J. M. Rolston	Queen Charlotte Islands.
17. A. S. G. Musgrave	Kilbella River and Rivers Inlet.
18. A. W. Harvey	West Coast, Vancouver Island.

Mr. McElhanney subdivided logged-off lands near the junction of the Cheakamus and Cheekye Rivers. Approximately eighty parcels of about 10 acres were laid out. As these lands are on the Pacific Great Eastern Railway, only about 7 miles from Squamish, they are within easy reach of Vancouver City and should consequently be attractive from a settlement standpoint.

Mr. Hewett was engaged on the subdivision of logged-off lands, including a good agricultural area on Cortes Island, and home-sites near Seechelt and Skookumchuck Channel. These home-sites are particularly suitable for men engaged in the fishing or lumbering industries who wish to establish a home more or less convenient to their work.

Mr. Davidson made certain miscellaneous surveys in Sayward District and Range 1, Coast District, while the greater portion of the season was spent on control surveys, including the triangulation of Bute Inlet and tying in his work and that of the previous season to two stations of the Geodetic Survey of Canada.

Mr. Rolston made miscellaneous surveys on Queen Charlotte Islands.

In the vicinity of Rivers Inlet Mr. Musgrave laid out a number of 40-acre parcels on Kilbella River (formerly known as Kildalla River). These are logged-off lands consisting of fertile river-bottom and should support a good little settlement, there being a ready market for produce at adjacent canneries and logging camps.

Mr. Musgrave also monumented the triangulation surveys in Dean, Burke, and Labouchere Channels, which were done before the present system of monumenting was inaugurated.

Mr. Harvey made miscellaneous surveys on the west coast of Vancouver Island, including Crown land surveys on Nootka Island, some scattered pre-emptions, and various traverse and triangulation control surveys.

Control Surveys.

The following surveyors were engaged on work which was designed chiefly for purposes of control:—

Surveyor.	Locality.
19. J. T. Underhill	Milbank and Laredo Sounds.
20. A. E. Wright	Surf Inlet and Douglas Channel.
21. F. C. Swannell	Lake area, south and west of Ootsa Lake.
22. R. P. Bishop	Chilko Lake.
23. W. S. Drewry	Clearwater Lakes.

Messrs. Underhill and Wright were engaged on the extension of the Coast triangulation system. Several ties were made this year between this system and the Hydrographic and Geodetic surveys, thus permitting our work to be placed into more accurate geographic position, having up to this year been dependent upon astronomic stations at Bella Coola and Prince Rupert.

Mr. Swannell continued the triangulation and topographical reconnaissance surveys on which he has been engaged for the past three years in the lake area lying east of Gardner Canal and south of Ootsa Lake. It is hoped that on receipt of Mr. Swannell's final returns for the past season it will be possible to publish a map of this comparatively little known area.

Mr. Bishop was employed in a similar survey in the Chilko Lake area. It was hoped to get a triangulation connection between the head of Bute Inlet and the 124th meridian, but owing to smoke and weather conditions this was not effected. A good deal of information regarding this area has, however, been obtained, and an interesting feature of Mr. Bishop's report is his reference to a possible water-power.

Mr. Drewry was engaged on a traverse and triangulation up Clearwater Lake and River with a view to establishing a link between surveys carried easterly from the 52nd parallel throungh Mahood Lake and northerly from that parallel through Crown land surveys and the triangulation of Quesnel Lake.

PHOTO-TOPOGRAPHICAL SURVEYS.

Two parties in charge of R. D. McCaw and G. J. Jackson respectively were engaged on the continuation of the photo-topographical work which was originally commenced in 1914.

Mr. McCaw covered an area south of the southern boundary of the Dominion Government Railway Belt, extending from Salmon River to the east to the western watershed of Stump Lake on the west.

Mr. Jackson covered the valley of Similkameen River between the Ashnola River and Hayes Creek, and the tributary valleys of Hedley, Sterling, and Paul Creeks.

In all, about 800 square miles of territory were covered in spite of the fact that smoke from forest fires greatly hampered the work, especially in the month of July.

The nature and utility of this work has been described in previous reports. A sketch-map showing the areas covered up to date by this class of surveys will be found facing page 112 of this report.

A new camera specially designed for the enlargement of the survey plates, constructed locally this year, is proving very satisfactory.

ALBERTA-BRITISH COLUMBIA BOUNDARY.

The Interprovincial Boundary Commission, consisting of A. O. Wheeler, the British Columbia Commissioner, and R. W. Cautley, representing both the Dominion and Alberta Governments, continued their work during the year in accordance with the programme laid down at a conference of representatives of the three Governments held in Edmonton in October, 1921. It is anticipated that this work will be brought to a conclusion in two more seasons, when the boundary will be completely surveyed from the International Boundary as far north as about latitude 57°, being about 25 miles north of the north-east corner of the Dominion Government Peace River Block.

SURVEYORS' REPORTS.

General reports prepared by the various surveyors employed during the season are appended to this report.

PRIVATE SURVEYS.

Surveys of Crown lands made at the instance of and paid for by private parties, such as surveys of pre-emptions, applications to purchase or lease, coal licences, mineral claims, etc., are known departmentally as "private surveys."

The past year shows a decrease in the acreage of private surveys dealt with by this Branch, as shown in Table A, appended to the report of the Chief Draughtsman.

Two parties under L. S. Cokely and W. G. McElhanney were employed during the past season on the survey of long-term timber-sales. These surveys were made under direct instructions of this Department and paid for out of funds deposited by the purchasers. It is anticipated that with increased activities in the pulp industry this class of work will increase in the near future.

Under the provisions of the "Forest Act" the time for the survey of special timber licences finally expired on December 31st, 1922, the time having been extended over one year by the Legislature at the 1921 session. Only forty-five licences were surveyed during the year. This marks the end of timber licence surveys, which have been carried on more or less extensively during the past fifteen years and which, in some years, exceeded 1,000,000 acres, giving employment to a considerable number of surveyors. The records show that 7,401,222 acres have been surveyed as timber licences and leases to date.

A total number of 11,713 licences have been surveyed, which indicates that some 1,700 limits which were staked and licences issued for have been abandoned or forfeited for non-compliance with the statutory requirements.

OFFICE-WORK.

The office staff is divided into two main divisions—namely, the Survey Division and the Geographic Division. The Survey Division deals with general correspondence, supplying survey information, blue-prints, etc., the preparation of survey instructions, plotting of final plans from survey returns, compiling departmental reference maps, clearing all applications, and other incidental work.

The Geographic Division deals with the compilation and drawing of maps for reproduction, the compilation of the Standard Base Map of the Province, the indexing of maps, plans, etc., the photostating of plans and other documents, the distributing of lithograph maps, and the correspondence incidental to the Division.

The work of these divisions for the year is covered by the reports of the Chief Draughtsman and the Chief Geographer appended to this report.

I have the honour to be,
Sir,
Your obedient servant,
J. E. UMBACH,
Surveyor-General.

REPORT OF THE CHIEF DRAUGHTSMAN.

December 31st, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on the work of the Survey Division for the year ending December 31st, 1922:—

The personnel of the staff at the end of the year numbers twenty-two, being the same as at the end of 1921.

OFFICE-WORK.

This includes the examination and plotting of field-notes of the various surveys received, together with the preparation of official plans from same, and also the compilation and daily revision of reference maps, as well as the clearance of all land and timber applications.

Considerable time was also devoted to correspondence and attending to the requests and inquiries of surveyors and the general public for information as to lands, surveys, etc., throughout the Province.

The preparation of plans, field-notes, etc., to accompany the instructions issued to surveyors employed by the Department was also the subject of considerable work, particularly during the months of May and June. This work is increasing and getting more complicated each year owing to the tying-in and retracing of existing surveys.

The work of clearing of applications and inquiries for reverted lands now takes up nearly the half of one man's time during the year. This work is somewhat complicated and necessitates considerable correspondence with the Registrars regarding descriptions and the obtaining of copies of their registered plans.

The comparative tables of work done this year and the previous year show decreases in some instances. This is accounted for mainly by a falling-off of private-survey work, such as pre-emptions, purchases, and timber licences.

The following records give (as well as it is possible to do so in figures) an outline of the work carried out.

FIELD-NOTES.

During the year 650 field-books were received, as against 1,031 received during 1921. The various surveys contained in these field-books consist of 889 land lots, 152 mineral claims, 45 timber licences, and 96 traverse connections or triangulations.

During the same period 938 lot surveys were plotted and found to be in order. Notice of their acceptance duly appeared in the Gazette. Tracings of these lots were prepared and forwarded to the respective Government Agents.

The following table gives an analysis of the acreage of the various kinds of surveys gazetted during the year:—

	Acres.
Pre-emption surveys	1,268
Purchase surveys	6,160
Mineral-claim surveys	4,637
Timber-licence surveys	37,966
Coal-licence surveys	2,520
Lease surveys	3,094
Government surveys	98,841
Total	154,486

A comparison of these figures with those of previous years, as far back as 1900, may be found by reference to Table A attached to this report.

TIMBER SURVEYS.

Field-notes covering the survey of 45 licences were received during the year, as compared with 100 during 1921.

RIGHT-OF-WAY PLANS.

The recording and examination of the plans of railway rights-of-way, logging railways, and pole-lines has been carried on as heretofore. During the year 250 miles of various railway right-of-way plans were examined and finally cleared for Crown-granting purposes.

CLEARANCES.

As in previous years, clearance reports have been furnished by this Branch on all applications for lands dealt with by the Lands Department. These include 969 applications for pre-emption, 165 applications to purchase, 650 applications for reverted lands, 236 coal licences, 122 miscellaneous leases, 1,295 Crown-grant applications, together with 991 timber-sales and 288 hand-logger licences.

DEPARTMENTAL REFERENCE MAPS.

Attached hereto, and shown as Table C, is a list of these maps, giving the price for which the blue-prints of same can be obtained. There are now 123 such maps in use, as against 79 at the end of 1912. During the past year 17 new maps were compiled and 1 retraced.

Placer Leases.

It has been decided that all placer-mining leases issued by the various Gold Commissioners should be shown on the departmental reference maps. With this end in view, the twenty-five Gold Commissioners were communicated with during the year, and detailed lists of all the leases in good standing have now been obtained. Monthly returns to this office of new leases issued, or cancellations effected, are now made. It is calculated that there are 885 placer-mining leases in good standing, and these have all been shown in position on the reference maps.

Information supplied to Surveyors and Others.

A nominal charge is made for the preparation of copies of field-notes, blue-prints, etc., required by surveyors and others. The revenue derived for the copying of field-notes was $350, while the sum of $1,942.70 was paid in for blue-prints. It is calculated that 274 rolls, 50 yards each, of blue-print paper were used during the year.

The following is a statement of the blue-prints made:—

Mail and counter	1,123
Surveyor-General's Branch	3,666
Forest Branch	11,770
Other branches of Government service	19,679
Total	36,238

There were also prepared 1,295 tracings (in duplicate) to be attached to Crown grants and 122 tracings (in duplicate) to accompany land leases.

Correspondence and Accounts.

During the year 6,228 letters were received and 5,988 sent out, which does not include inter-Departmental memoranda.

Table B, attached to this report, gives a summary of the office-work for the year 1922 and comparative figures for 1921.

I have, etc.,
F. O. Morris,
Chief Draughtsman.

APPENDIX TO REPORT OF CHIEF DRAUGHTSMAN.

Table A.—Showing Acreages of each Class of Surveys gazetted each Year since 1900.

Year.	Pre-emptions.	Purchase.	Mineral Claims.	Timber Limits.	Coal Licences.	Leases.	B.C. Govt. Surveys.	Totals.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1900	22,873	4,419	33,441	59	.....	664	10,057	71,513
1901	26,493	16,401	33,400	2,027	.....	593	.....	79,094
1902	35,297	29,652	31,057	1,040	626	1,026	.....	98,698
1903	37,615	26,787	18,115	127,992	.....	2,003	800	213,312
1904	48,124	36,468	20,549	155,279	48,670	3,009	179	312,278
1905	42,660	58,705	15,535	214,841	137,218	806	107	469,872
1906	33,573	66,668	9,894	77,829	41,312	9,566	.....	238,842
1907	50,460	162,218	10,017	83,016	20,367	4,387	113,968	444,433
1908	66,788	147,980	14,607	167,925	9,821	2,580	97,072	506,773
1909	71,316	145,325	10,744	426,121	8,310	15,239	512,373	1,189,428
1910	79,273	455,356	12,499	509,201	43,363	5,864	302,536	1,407,912
1911	89.485	1,352,809	21,325	686,909	120,938	6,500	948,644	3,226,610
1912	99,461	1,011,934	16,645	804,730	99,236	8,560	826,362	2,866,997
1913	55,202	508,062	18,043	1,181,355	72,719	4,740	1,014,366	2,854,487
1914	45,551	234,580	7,546	1,105,635	36,098	4,209	1,078,579	2,512,198
1915	22,746	41,551	8,339	512,628	29,245	841	705,170	1,320,520
1916	14,335	8,771	7,677	302,903	10,983	5,145	124,953	474,767
1917	12,632	802	8,386	275,538	2,843	2,960	111,256	414,417
1918	10,835	1,634	9,247	223,768	953	2,342	60,311	309,090
1919	8,514	153	10,264	165,289	160	1,495	77,121	262,996
1920	8,172	5,992	12,580	347,729	22,143	3,227	63,505	463,348
1921	3,078	8,122	6,290	247,766	4,423	11,884	127,797	409,360
1922	1,268	6,160	4,637	37,966	2,520	3,094	98,841	154,486

TABLE B.—SUMMARY OF OFFICE-WORK FOR THE YEAR 1922 AND COMPARATIVE FIGURES FOR 1921.

	1921.	1922.
Number of field-books received	1,031	650
,, lots surveyed	1,383	889
,, lots gazetted anad tracings forwarded to Government Agents	1,923	938
,, miles of right-of-way plans dealt with	297	250
,, applications for purchase cleared	360	165
,, applications for pre-emption cleared	1,495	969
,, reference maps compiled	16	18
,, Crown-grant applications cleared	1,699	1,295
Total number of letters received by Branch	6,500	6,228
,, ,, Crown-grant and lease tracings made in duplicate	1,803	1,417
,, ,, blue-prints made	31,501	36,238
Total revenue from sale of blue-prints	$2,004.60	$1,942.70

TABLE C.—DEPARTMENTAL REFERENCE MAPS.

Price-list of Blue-prints.

		Scale.	Price.
1.	West Coast, V.I. (Barkley Sound, Southerly)	1 inch to 1 mile	$1 00
1A.	West Coast, V.I. (Toquart Harbour, Alberni Canal, and Great Central Lake)	,, ,,	1 00
1B.	West Coast, V.I. (Barkley Sound, Northerly, and Clayoquot Sound)	,, ,,	1 00
2.	West Coast, V.I. (Nootka District)	,, ,,	1 00
3.	Belize and Seymour Inlets and Smith Sound	,, ,,	1 00
3A.	Quatsino Sound and West Portion of Rupert District	,, ,,	1 00
3B.	Gilford, Cracroft, and Broughton Islands	,, ,,	1 00
3C.	Nimpkish River Valley and Lake	,, ,,	1 00
3D.	Central Portion of Rupert District	,, ,,	1 00
4.	Knight and Loughborough Inlets	,, ,,	1 00
4A.	Sayward District, Thurlow and Quadra Islands	,, ,,	1 00
4B.	Bute Inlet	,, ,,	1 00
5.	Texada Island and West Portion, New Westminster District	,, ,,	1 00
5A.	Jervis and Seechelt Inlets	,, ,,	1 00
5B.	Howe Sound and Cheakamus River Valley	,, ,,	1 00
5C.	Harrison Lake and Lillooet River Valley	,, ,,	1 00
6.	Redonda Islands, Powell Lake, and Toba Inlet	,, ,,	1 00
6A.	Nicola Valley	,, ,,	1 00
6B.	Aspen Grove and Tulameen	,, ,,	1 00
6C.	Princeton, Ashnola, and South Similkameen River Valleys	,, ,,	1 00
7.	North Okanagan and Vernon	,, ,,	1 00
7A.	Penticton, Kelowna, and Okanagan Lake	,, ,,	1 00
7B.	Oliver and South Okanagan	,, ,,	1 00
8.	Greenwood, Rock Creek, and Beaverdell	,, ,,	1 00
9.	Mission Creek and Kettle River Headwaters	,, ,,	1 00
10.	Mabel Lake, Lumby, and Sugar Lake	,, ,,	1 00
11.	Clearwater and Murtle River Valleys	,, ,,	1 00
11A.	North Thompson River Valley	,, ,,	1 00
12.	Dean and Burke Channels and Bella Coola Valley	,, ,,	1 00
12A.	Dean (Salmon) River Valley	,, ,,	1 00
12B.	Kimsquit and West Side of Dean Channel	,, ,,	1 00
13.	Rivers Inlet and Fitzhugh Sound	,, ,,	1 00
14.	Banks and McCauley Islands	,, ,,	1 00
14A.	Graham Reach, Gardner Canal, and Kitimat Arm	,, ,,	1 00
14B.	Kitlobe River and West End of Eutsuk and Whitesail Lakes	,, ,,	1 00
14C.	Grenville, Squally, and Douglas Channels	,, ,,	1 00
15.	Moresby Island, Northern Portion	,, ,,	1 00
15A.	Moresby Island, Southern Portion	½ inch to 1 mile	1 00
16.	Graham Island, North-east Portion	1 inch to 1 mile	1 00
16A.	Graham Island, South-east Portion	,, ,,	1 00
16B.	Graham Island, West Portion	,, ,,	1 00
17.	Portland Canal and Observatory Inlet	,, ,,	1 00
17A.	Skeena River Valley (vicinity of Hazelton)	,, ,,	1 00
17B.	Nass and Kitwancool River Valleys	,, ,,	1 00
18.	Upper Fraser and Morkill River Valleys	,, ,,	1 00
18A.	Tete Jaune Cache and Upper Fraser River Valley	,, ,,	1 00

Table C.—Departmental Reference Maps—*Continued.*

Price-list of Blue-prints—Continued.

		Scale.	Price.
19.	Lower Skeena and Zymoetz River Valleys	1 inch to 1 mile	$1 00
19A.	Skeena and Kitsumgallum River Valleys	" "	1 00
19B.	Prince Rupert, Mouth of Skeena and Nass Rivers	" "	1 00
20.	Bulkley River Valley (Hazelton to Moricetown)	" "	50
21.	Barkerville, Willow and Bowron River Headwaters	" "	1 00
21A.	Fraser Lake, Endako River, and South End of Stuart Lake	" "	1 00
22.	Bowron and Upper Fraser River Valleys (vicinity of Hutton)	" "	1 00
22A.	Fraser River, Fort George, South	" "	1 00
22B.	Portion of Nechako, Stuart, and Salmon River Valleys	" "	1 00
22C.	Blackwater and Chilako River Valleys	" "	1 00
22D.	Fraser and Cottonwood River Valleys	" "	1 00
22E.	McBride, Goat and Upper Fraser River Valleys	" "	1 00
23.	Quesnel Lake (North and East Arm)	" "	1 00
23A.	Quesnel Forks and Swamp River	" "	1 00
23B.	Fraser River, Quesnel, South	" "	1 00
23C.	Nazko River Valley	" "	1 00
24.	150-Mile House and Harpers Camp	" "	1 00
24A.	Anderson and Seton Lakes, Lillooet District	" "	1 00
24B.	Lillooet District (Clinton, Bridge River and Taseko (Whitewater) Lakes)	" "	1 50
25.	Mainland Coast, Princess Royal and Adjacent Islands	" "	1 00
25A.	Bella Bella and Milbank Sound	" "	1 00
26.	Porcher and Adjacent Islands	" "	1 00
27.	Fraser River Valley (Williams Lake and Soda Creek)	" "	1 00
27A.	Fraser and Lower Chilcotin River Valleys and Lac la Hache	" "	1 00
27C.	Green Lake and Canoe Creek Valley	" "	1 00
28.	North Part of Babine and Takla Lakes	½ inch to 1 mile	1 00
28A.	Stuart, Pinchi, and Trembleur Lakes and Middle River	1 inch to 1 mile	1 00
28B.	Nation River and Lakes	" "	1 00
29.	Chilcotin, West of 124th Meridian	" "	1 00
29A.	Anahim and Abuntlet Lakes	" "	1 00
29B.	Chilcotin River Valley, vicinity of Alexis Creek	" "	1 00
29C.	Hanceville, Big Creek, and Taseko River	" "	1 00
30.	Bonaparte River Valley and Canim Lake	" "	1 00
31.	Bulkley Valley	" "	1 00
31A.	Francois and Babine Lakes	" "	1 00
32.	Crooked River, McLeod Lake, and Upper Parsnip River	" "	1 00
32A.	Tatlayoko Lake	" "	1 00
32B.	Homathko and Klinaklini River Valleys	" "	1 00
33.	Fraser River Valley, Fort George, North	" "	1 00
34.	Lot 4593, Kootenay District, West Portion, Flathead River	2 inches to 1 mile	50
34A.	Lot 4593, Kootenay District, East Portion, Flathead River	" "	50
35.	Saltspring, Gabriola, and Adjacent Islands	1 inch to 1 mile	1 00
36.	Upper Fraser River (vicinity of Hansard and McGregor River Valley)	" "	1 00
36A.	Headwaters of Wapiti and Herrick Rivers	" "	1 00
37.	Nechako River, Cluculz and Bednesti Lakes	" "	1 00
38A.	Groundhog Coal Area, East of Meridian	" "	1 00
38B.	Groundhog Coal Area, West of Meridian	" "	1 00
38C.	Upper Nass River Valley	" "	1 00
39.	West End of Ootsa Lake	" "	1 00
39A.	Eutsuk Lake	" "	1 00
40.	Euchiniko and Tetachuck Lakes	" "	1 00
41.	Upper Nechako River and East End of Ootsa Lake	" "	1 00
42.	Big Bend, Kootenay District	" "	1 00
42A.	Adams Lake and River	" "	1 00
42B.	Canoe River Valley	" "	1 00
42C.	Columbia River Valley (vicinity of Bush River)	" "	1 00
43.	Peace River, South of Dominion Government Block	" "	1 00
43A.	Peace River, North of Dominion Government Block	" "	1 00
44.	Kiskatinaw, Murray, and Sukunka Rivers	" "	1 00
44A.	Wapiti, Murray, and Head of Parsnip Rivers	" "	1 00
45.	Foreshore of Vancouver Island (E. & N. Railway Belt)	" "	1 00
46.	Saanich District and Islands	" "	1 00
47.	Peace River, West of Dominion Block	" "	1 00
48.	Parsnip and Nation Rivers	" "	1 00
49.	Misinchinka River and Pine River Pass	" "	1 00

TABLE C.—DEPARTMENTAL REFERENCE MAPS—*Continued.*

Price-list of Blue-prints—Continued.

		Scale.	Price.
50.	Halfway River	1 inch to 1 mile	$1 00
51.	Mesilinka, Osilinka, and Finlay Rivers	,, ,,	1 00
52.	Atlin Lake and vicinity	½ inch to 1 mile	1 00
53.	Telegraph Creek and Stikine River Valley	,, ,,	1 00
54.	Upper Nass River Valley and Meziadin Lake	1 inch to 1 mile	1 00
55.	Salmon River Headwaters and McLeod River	,, ,,	1 00
56.	Driftwood River and North End of Takla Lake	,, ,,	1 00
57.	Manson Creek and Omineca River	,, ,,	1 00
58.	Finlay Forks, Parsnip and Pine Rivers	,, ,,	1 00
59.	Ingenika and Mesilinka Rivers	,, ,,	1 00
15–0.	Upper Elk and White River Valleys	,, ,,	1 00
15–9N.	Fernie and Crowsnest vicinity	,, ,,	1 00
16–9S.	Elko and vicinity	,, ,,	1 00
16–9N.	Kootenay River Valley and Cranbrook	,, ,,	1 00
16–9S.	Moyie River Valley	,, ,,	1 00
17–0S.	Duncan Lake and North End of Kootenay Lake	,, ,,	1 00
17–9N.	Kootenay Lake, vicinity of Kaslo	,, ,,	1 00
17–9S.	Nelson, Salmon River Valley, and South End of Kootenay Lake	,, ,,	1 00
18–9N.	Edgewood and Slocan River Valley	,, ,,	1 00
18–9S.	Rossland and South End of Lower Arrow Lake	,, ,,	1 00
18–20.	Nakusp and Upper Arrow Lake	,, ,,	1 00
21–23.	Columbia and Windermere Lakes	,, ,,	1 00
27–29.	Columbia River Valley, Wilmer and Spillimacheen	,, ,,	1 00
30–32.	Trout and Upper Arrow Lakes	,, ,,	1 00

NOTE.—These reference maps show lands alienated and applied for, "Timber Limits," "Coal Licences," etc., surveyed and unsurveyed. They are compiled from all available data and are constantly being amended, and their accuracy is therefore not guaranteed. They were prepared originally for departmental use, and, having proved of value to the public, blue-prints of same are now on sale.

Victoria, February 1st, 1923.

REPORT OF THE GEOGRAPHIC DIVISION.

January 2nd, 1923.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the report for the Geographic Division for the year ending December 21st, 1922.

The chief work of 1921 in connection with the Pre-emptors' Series and the enlarging of the number of copies printed of these maps enabled us to expend more time in the preparation and completion of new map-sheets during 1922.

One change in the number of the staff occurred during the year. Mr. Tait, who is employed operating the multigraph, "Ditto," and mimeograph, was transferred to the direction of Mr. Peterson's office.

In the work of the past year the organization and standard quality of the Division have been maintained.

The map production for 1922 is as follows:—

PRE-EMPTORS' MAPS.

Name.	No. of Copies.	Date of Issue.	No.	Scale.	Area in Sq. Miles.
Peace River. Corrected and properly redrawn	4,300	March	3E	4 m. to 1 in.	10,000
Bulkley. Reconstructed and brought up to date	6,100	Sept.	3D	3 m. to 1 in.	9,000
In Course of Preparation.					
Fort George. Compiled and drawn. In hands of printer	10,200	April, 1923	3A	3 m. to 1 in.	9,000
Stuart Lake. Compilation at present in hand—about three-fourths completed	.....	July, 1923	3C.	3 m. to 1 in.	9,000

The compilation of the Fort George area, embracing and properly combining all the old and new surveys, represented many difficulties which were successfully surmounted, mainly, by the Standard Base Map system.

The data available for the building-up of the Stuart Lake Sheet do not allow of the construction of a strong, permanent map-sheet throughout. The compilation and construction has been carefully made from the available surveys and will be a great improvement on the old sheet.

DEGREE SHEET SERIES.

Name.	No. of Copies.	Date of Issue.	No.	Scale.	Area in Sq. Miles.
Kettle Valley. Compiled to projection. Comprising land surveys, topography, etc., and drawn for reproduction.....	6,000	March, 1923.	4K	2 m. to 1. in.	3,100

This is the first time a map of this area has been produced on detailed scale. The topography appearing on the westerly portion of the map is from the photo-topographical surveys made by R. D. McCaw, B.C.L.S., whilst the contoured areas shown at Beaverdell, the easterly and southerly boundaries of the map, are from the topographical surveys of the Geological Survey of Canada and the International Boundary Survey. The map is now in the course of printing and the issue will be available in March, 1923.

The initial work in connection with the production of Degree Sheets covering the Rossland, Nelson, and Cranbrook quadrilaterals is being undertaken in connection with the Standard Base Map system, and it is hoped it will be possible to make a commencement of the compilation of these sheets in the ensuing year.

LAND SERIES MAPS.

Name.	No. of Copies.	Date of Issue.	No.	Scale.	Area in Sq. Miles.
Powell Lake. Compiled to projection and drawn for reproduction.....	8,000	May, 1923.	2D	4 m. to 1 in.	15,000

With the production of the Powell Lake Sheet, the south-western portion of the Province will be entirely mapped on the scale of 4 miles to the inch. The work of the Powell Lake Sheet proved to be more intricate than had been anticipated. To judge from the demand, this sheet will fill an urgent need in connection with the timber industry and development of this area. A considerable portion of the area of this map has not before been compiled and available on printed maps in detailed scale. This map is now in the hands of the printer.

DISTRICT AND DIVISION SERIES.

Name.	Date of Issue.	No.	Scale.	Remarks.
Map of B.C. Land Divisions.....	1923	1J.	31.56 m. to 1 in.	

The new map of the Province was completed by the end of 1922, in so far as the black, blue, and red colours were concerned, and is now in the hands of the printer. The new map is on the scale of 1/2,000,000 (31.56 miles to 1 inch), printed on one sheet, 37 by 28 inches, and is published as "Commercial Map of B.C."

In the first "advance" issue (December 19th, 1922) the map was shown in three colours—black, blue for the sea and tints, and red showing main roads and trails, outlining Land District boundaries, the mountain names, and other particular features.

It is proposed to issue various series of this map, which will show the different divisions and districts into which the Province has been subdivided for administrative purposes, such as the land recording divisions, mining divisions, Provincial electoral divisions, Dominion electoral divisions, assessment districts, land registry districts, and counties; and on the copies of a portion of the main issue it is planned to show the "precipitation" throughout British Columbia. Sufficient of each issue will be printed to cover the anticipated public demand.

Method of Production.—The entire work of this map, including compilation, preparation, and drawing of the original, and the printing, has been completed within the Province; the only thing produced outside of the Province is the paper on which the map is printed. Printing-paper of such required grade is not as yet manufactured in British Columbia.

In the plotting of this map the polyconic projection was used.

Design of the Map.—The Province, measuring roughly 1,260 miles from the south-east corner to the north-west corner, in width averaging about 400 miles, and about 800 miles north and south, makes a peculiar figure which is difficult to arrange to conform with the usual printing sizes. The present map, embracing the whole of the Province, is compact in form, the sheet being of a size easy to handle.

The title, scale, and legend balance well with the rest of the map, and the area usually taken up by Pacific Ocean is used for valuable general data covering tables of distances of the Coast, roads of British Columbia, railway connections to principal points in British Columbia and this continent, with another comprehensive table connecting principal points in British Columbia with those of the world.

Filling up the spaces between these distance tables there is interesting geographical data, the type of information having been carefully selected.

On the right-hand side of the map there appears an index of post-offices, which should make the map doubly valuable. When one does not know the location of a feature, it is usual to hunt for it throughout the whole map before being successful in finding it. In this index of post-offices, which is a departure from the usual indexing system, any post-office is found in a few seconds. Commenting on the indexing system, it would appear an improvement on the customary one of lettering the quadrilaterals A, B, and C, etc., south to north, and 1, 2, and 3, etc., east to west. In this "geographical" system the figures actually denote the latitude and longitude, approximately, so that these figures are applicable to any map of the same area, so long as the latitude and longitude lines appear thereon.

An inset is given which shows the connection from the most southerly part of the Province with Seattle. Such a connection has not appeared on the past maps of the Province, and it is thought that this will be most useful to many. Spokane, Calgary, and Edmonton have also been included in the map area.

The distance tables should be of value to travellers, automobile traffic, to our commercial interests, and to those who are shipping material throughout or to and from the Province, who can, from these tables, practically connect themselves by road, rail, or steamship with any point of the world. From these small charts there are hundreds of distances obtainable, and in the road chart the main ferries throughout the Province are noted and calculated. The main roads and trails are clearly indicated.

For the first time upon our maps of British Columbia the parks of the Province are outlined.

IN COURSE OF PREPARATION.

Name.	No.	Remarks.
Map of B.C.....	1J	Showing rivers, railways, roads, trails, parks, etc.; also land districts.
"	1J-A	" " " " precipitation.
"	1J-B	" " " " forest and grazing districts.
"	1J-C	" " " " land recording divisions.
"	1J-D	" " " " mining divisions.
"	1J-E	" " " " assessment districts.
"	1J-F	" " " " Provincial and Dominion electoral divisions.
"	1J-G	" " " " land registry districts and counties.

GEOGRAPHIC SERIES.

Upon the completion of the Powell Lake Land Series map, we were able to proceed with the preparation of the new map of the south-western portion of British Columbia referred to in the report of this Division for last year, and steady progress upon this new map has been made to date.

WALL-MAP OF BRITISH COLUMBIA.

As early as possible after the completion of the various issues of the one-sheet map of the Province, the compilation of a new wall-map of the Province, upon the scale of 1/1,000,000, or

15.78 miles to 1 inch, will be proceeded with. Upon this map it is proposed to show the contours wherever such have been reliably surveyed. The areas of the Province topographically surveyed comprise the Alaska-B.C., the B.C.-U.S.A. International Boundaries, the B.C.-Alberta Provincial Boundary, and those "economic" portions of the Province which have been topographically mapped for geological, mining, timber, or reconnaissance purposes upon varying scales. The production of this proposed map, showing contours, will be the first attempt at compiling the topographical information into one map publication. As only reliable contour information will be compiled into this map, besides conveying the relative difference of elevation, it will serve as an index to the public of the particular portions of the Province of which detailed contour information is obtainable; it will also serve as an index showing the parts of the Province which remain to be topographically surveyed.

Geographical Naming.

The compilation in connection with the Geographical Gazetteer of British Columbia has cleared the way for the thorough revision of the geographical naming in the principal map-sheets prepared during the past year. The time taken to carefully edit the naming in these map-sheets interfered with the progress of the Gazetteer, but gave permanent accuracy, and absorbed less time than would formerly have been necessary for a restricted effort at such work.

The geographical naming appearing in Dominion map-sheets of British Columbia areas, submitted to the representative for British Columbia on the Geographic Board of Canada, was referred to this Division to be carefully edited and passed upon, which necessitated reliable research of data and records. Credit is due to the assistant in charge for the smooth accomplishment of this work.

In addition to individual requirements received from the Geographic Board of Canada, and correspondence connected therewith, the following is the list of sheets edited for geographic naming during the year:—

1. Northern Interior of B.C., Eutsuk Lake, G.S.C.
2. Barkerville Sheet, G.S.C.
3. Kettle Valley Degree Sheet, B.C. Government.
4. Powell Lake Map, B.C. Government.
5. Alaska-B.C. Boundary Survey, names submitted by J. D. Craig.
6. Alberta-B.C. Boundary Survey names.

Gazetteer.

Although progress in the compilation of the new Geographical Gazetteer of British Columbia was retarded by the work above outlined, by the end of the year the compilation was practically completed, the exception being the latitude and longitude location of mountain features.

The next step in this production will be the alphabetical indexing, after which the design and editing for publication can be undertaken.

Cost-card System.

The cost-card system introduced in 1921 has proved valuable in the efficiency of the Division.

Apart from the production of departmental maps, which is of first importance with the staff, the demands upon the Division for the departments and the public were filled and charged for accordingly, the amount being $871.21, comprising twenty-three separate items.

Map-mounting.

This branch of work has exceeded in number the demands of the preceding year, although during the summer there was less demand than formerly. The mounting and joining-up in connection with photostat orders has extended considerably, whilst several new classes of work have been accomplished, such as mounting of photographic illustrations, making up photostat copies of valuable books and papers into book form, rebinding field-books, etc.

Work worthy of special note was the map-mounting for the loose-leaf books prepared for the British Ambassador at Washington and for the Agent-General for British Columbia.

A synopsis of the work accomplished during the year is as follows:—

Loose-leaf map-books prepared	9
Loose-leaf map-books brought up to date	2
Maps cut to fold and mounted	389
Blue-prints mounted	654
Photostat prints fitted, joined up, and mounted	685
Photostat prints trimmed only	601
Photostat copies of books arranged in book form	10
Official maps repaired	38

In addition to carrying out the map-mounting requirements of the Survey Branch, the cash receipts and credits for the period January 1st to December 31st amounted to $1,030.48.

PHOTOSTAT.

Photostat reproduction prepared for departmental requirement exceeded in number of requisitions those of 1921 by about 30 per cent., whilst the number of requirements for the public were some 15 per cent. less than those of last year.

The photostat equipment has maintained its usefulness, and has saved a large expenditure of time which the lack of this equipment would have necessitated.

Types of reproduction have comprised official plans, field-books, Crown grants, tracings, certificates, maps, charts, copies of old documents. Many of the photostats were reductions or enlargements to precise measure.

Requisitions for 1922:—

	Receipts and Credits.
Departmental, 750	$2,380 00
Public, 172	635 65

MAP STOCK AND DISTRIBUTION.

The distribution of maps to public and to the departments of the Government showed an increase in number over last year; the same is true of the number of maps received into geographic stock. The organization of this branch of work has been maintained satisfactorily, evidenced by the smoothness and speed with which the demands for maps have been filled.

1. The total number of maps issued to the departments and public..	17,047
2. Maps received into geographic stock	18,663
3. Cash receipts for printed maps and draughting, January 1st to December 31st, 1922	$1,372.39
4. Credits (Lands Department) for printed maps and draughting, January 1st to December 31st, 1922	$1,250.98
5. Credits (Government Agents) for printed maps	$473.10
6. Value of printed maps issued free to Government Agents and public, January 1st to December 31st, 1922	$1,392.68

A large proportion of the requests was for single maps. Initial correspondence from those interested in the possibility of obtaining land in the Province was carefully dealt with.

Letters received and answered during the year totalled 1,318, this being a slight increase over the correspondence of the previous year.

STANDARD BASE MAP.

The system of running traverse routes throughout the Province, as the skeleton for the compilation of the Standard Base Map, referred to in report of 1921, was completed during this year in so far as the survey data at present available will allow. The receipt of new surveys during 1922 necessitated revising a number of the old routes. These revisions, together with the new skeleton traverses, made a total of 2,727 miles of traverse laid down. Of these routes, thirty-three were balanced and thirty-five computed.

The second operation of the scheme, that of plotting the skeleton routes on the scale of 1 mile to 1 inch, was carried on into those particular areas which were especially required for mapping purposes. Twelve sheets of 30-minute area, plotting all the skeleton routes contained in the area, were completed in 1922. These, with those completed in 1921, make a total of thirty-three sheets.

The experience of the Standard Base Map gained to date suggests that its importance in connection with the cohesion of our surveys and strength and permanency of our mapping cannot be overestimated. What was said in this connection in the 1921 report has been fully borne out in our experience in 1922. Never before in the mapping of British Columbia has it been possible to secure such accuracy, co-ordination of effort, and smoothness of working, both in the production of our printed maps and in the preparation of new departmental reference maps.

An especial illustration of the efficiency of the Standard Base Map system occurred during the past year in connection with the detailed topographical surveys carried out by the Branch in Nicola and Similkameen. The former practice required that the topographic surveyors make a separate compilation of the land surveys, which was compiled in to their topographical survey as well as possible. This year the Division laid out a preliminary plot of the land survey within the areas to be topographically mapped, giving the geographical determination of control points therein, which could be then tied into the topographic work by survey in the field. During the summer, while the topographical surveyors were in the field, the Division proceeded with the preparation of the 10-minute quadrangle sheets on the scale of 20 chains to 1 inch (the Standard Base Map), covering the area being topographically mapped, these sheets being available immediately the topographers returned from the field. The report to date from the topographers is that the scheme is very practical and highly advantageous, a saving in their time, and giving a cohesion of surveys with accuracy and permanency not before procurable.

LAND REGISTRY PLANS.

Owing to illness our librarian was absent for six months, and the work in connection with the Land Registry plans and Central Index suffered in consequence. During the year 589 Land Registry plans were received and indexed.

This work has proved its worth in the constant reference made to it during the year, and the ease and speed with which the plans sought were forthcoming.

The tabulation of maps and plans for the Central Index has progressed as steadily as possible. During the year 17 per cent. of the total number to be registered was entered. This, with the numbers filed in former years, brings a total to date of 52 per cent.

I have, etc.,

G. G. AITKEN,

Chief Geographer.

VICINITY OF LAKELSE LAKE, RANGE 5, COAST DISTRICT.

BY P. M. MONCKTON.

TERRACE, B.C., September 10th, 1922.

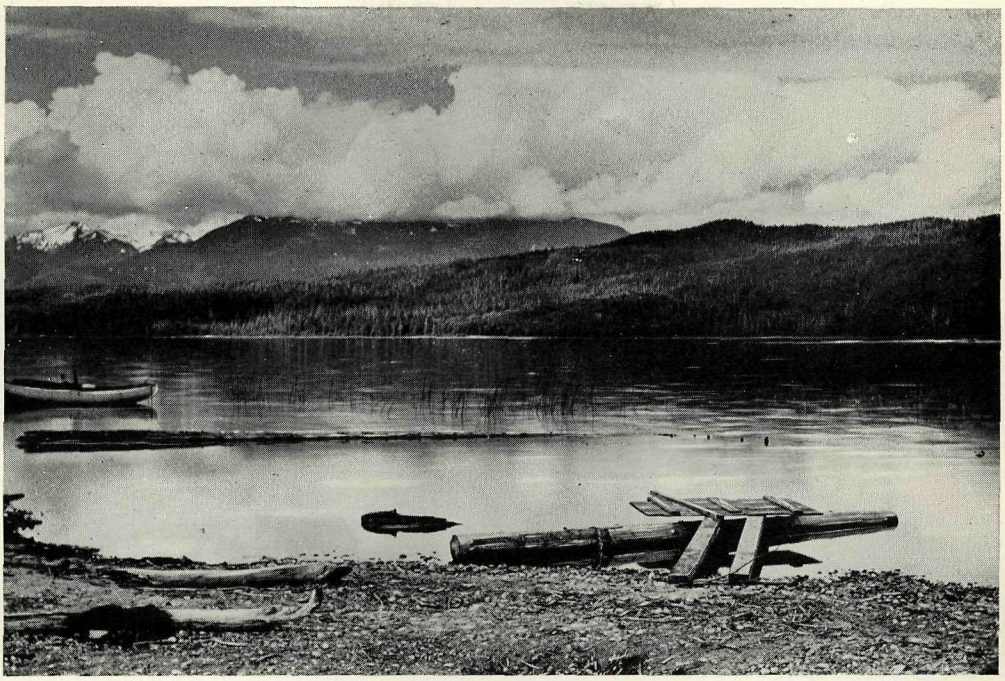
J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to report as follows on the work carried out by me during the summer of 1922:—

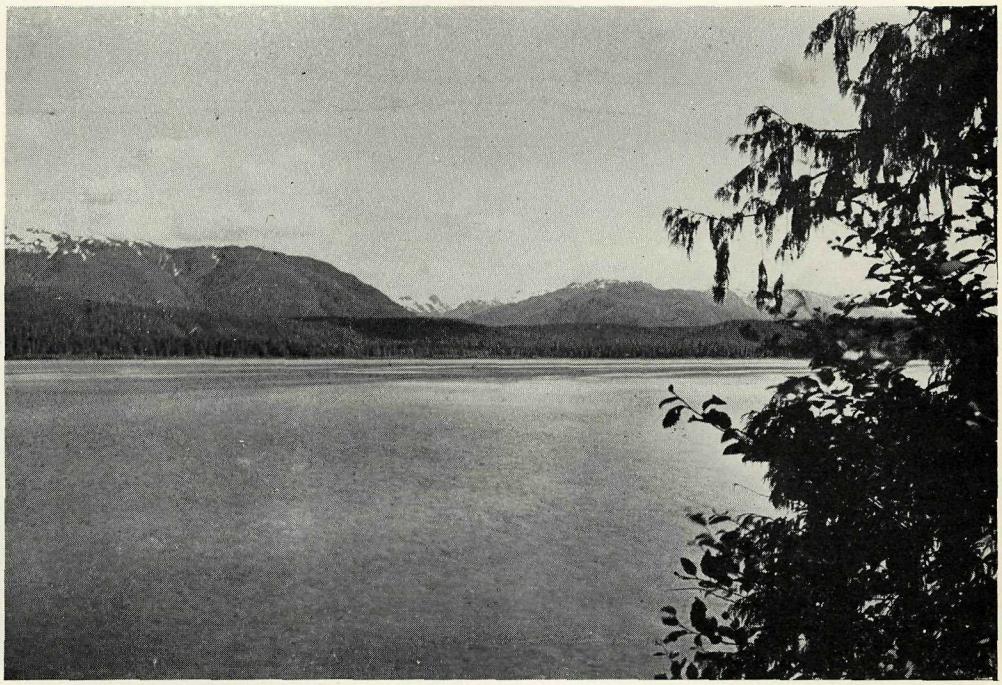
Work was started on June 9th and the first camp was made near the 6-Mile post on the Terrace-Lakelse Lake Road. Here Lot 655 was subdivided into five blocks of varying acreage. There is some very good land on Blocks D and E, which are for the most part low-lying and consist of a black loam top soil overlying clay. The other three blocks are not so good, being rather gravelly. There is a settler on each block, D and E, and a good deal of improvement was being done at the time of our visit. During July all this district was swept by heavy bush fires and a lot of the fallen debris cleaned up.

On June 19th we moved to Muller's ranch at the north-west corner of Lakelse Lake, and commenced to work on Lot 5137, the water-front of which we subdivided into summer-home sites, and left the remainder unsubdivided as the surface was too rough to be of any value. There are thirteen water-front lots here, each with a frontage of about 3 chains, the depth varying with the proximity of the hill at the back. Next, Lot 4782 was laid out into Blocks A, B, C, and D. This is a very broken area and only Block A is of any use at all. Nearly all of this is at

least 500 feet above the lake. Here and there is a small valley a hundred feet or so in width and a few hundred long, which is filled with a wet, black soil; otherwise it is all granite-outcroppings or gravel hillside. To the south of this lies Lot 4475, which was divided into Lots 6796, 6797, 6798, and 6799, each of 160 acres. These lots are high at the north, falling towards the south, and much cut up by ravines and outcrops of rock, with here and there a small valley with an acre or two of wet swamp. Lot 4473 was divided into two parts; this lot is very rough, rising sharply from the lake-shore to a height of 700 feet along the west boundary, with slopes of 45° and with much broken rock and many bluffs. The only land on it is a small flat, which is about equally divided between the two parts. On the northern of these blocks there is a small lake of about 3 acres near the south-west corner. After completing this part of the work camp was moved by rowboat and canoe to Lot 3987 on July 22nd. We found that Lot 421 was not suitable for summer-home sites, being too low, and so a part of Lot 3987 was substituted and included with part of Lot 5140, the whole making a block of twenty lots, with 3 chains or more of water-front per lot. These are the best lots we saw and I anticipate that there will be very keen competition to obtain Lot 6, on which we were camped. Lots 6 to 20, which front on the main part of the lake, have a good beach and a gentle slope facing east, while the woods are open and easy to pass through. Lots 1 to 5 face north-east and front on the arm, which is narrow and more sheltered from the winds and also has good sites for building. The remainder of these Lots 5140 and 3987 was in each case left in one block and each has some good land and some mountain, without much timber of value. The next work undertaken was the subdivision of the large area at the south end of the lake. This had been surveyed into Lots 5139, 3989, and 3990 and had a total acreage of about 1,300 acres, including the vacant land to the south. Practically all of this land is good; it is flat and rather low, and no doubt at high water that part near the lake is wet; however, we saw it the lowest water after a very dry summer, when it all seemed quite dry. In dividing this land I laid out Lots 6800 to 6809, which average about 140 acres, and in all cases are accessible by water, either by Lakelse Lake or by the Clearwater or Andalas Creeks. The former, true to its name, is a stream of very limpid water, and where it crosses the south boundary of Lot 6809 is about 50 links wide and 5 feet deep, widening to 12 chains at the mouth. Its banks are well defined and its current runs at about 2 miles per hour. We used to take our 16-foot rowboat up to the south line with six men aboard without difficulty after cutting the over-hanging boughs. The Andalas is much the same as regards size and speed, but its water is very cloudy, as if it were glacier-water, and is very cold. The two streams flow into the lake only a couple of chains from each other and at the mouth have deposited a shallow bank, which extends out for several hundred yards and is covered with a thick growth of tules and goose-grass. This is literally alive with wild duck and swans in the fall of the year. All these lots have good soil, but are liable to flood, and should be drained or dyked; those to the south are the best, being higher; on these the soil is all silt, covered with a thick growth of crab-apple and willow, with scattered spruce. A subdivision of Lot 6262 was made, laying out some fifteen lots along the water-front of the same size as in the case of Lots 5137, 5140, and 3987. These are also very good lots. There is a good gravel beach, rather shallow, with a few rushes, but not enough to bother. The ground rises about 15 or 20 feet to a flat bench which would make a good building-site; the soil is good, a grey clay, except at the south, where the rocky outcrops are again in evidence. The remainder of Lot 6262 was left as one lot and has perhaps 33 per cent. of soil that some day will be of agricultural value when the timber has been removed. Having completed this, we hired the gasolene-launch of the Lakelse Hot Springs Hotel to tow us and moved to the foot of the trail, which we had made, leading to Hai Lake. Thus we were at the foot of the trail at 10 a.m. and reached Hai Lake by the same evening. This lake is a small body of water perhaps 30 chains long and 15 wide and covering about 25 acres. It is fairly deep and has the reputation of being the home of some very large trout, but none of our amateur Izaak Waltons had any success. We laid out Lot 5149 into two parcels, both of them rather rough. The south portion is of the least value, being a steep valley with some swampy land in the middle, and falling towards the Lakelse River in the south. The northern part is flatter and has some clay benches with rocky outcrops. About this time the weather, which had been as dry as any surveyor could dare hope for since May, turned wet and we were in consequence never dry again. Camp had to be moved nearer to Lot 5146 and a trail was blazed out to the north-east corner of Lot 5149; thence we packed over the survey-line. Lot 5146 seems



Lakelse Lake, showing land subdivided for summer home-sites.



Lakelse Lake, looking south-westerly from summer home-sites.

to be a better agricultural proposition than any of the others we worked on, as it is high and dry and at the same time the ridges of rock are absent, the soil being of a clayey nature, though in places much cut up by small ravines. This lot was divided into two blocks. Field-work was finished on September 4th, and the next day we packed everything down as far as the lake and camped there for the night, being met the next day by a truck which took the party into Terrace, where it was disbanded.

Topography.

All that country to the immediate west of Lakelse Lake is rough and broken. Here and there will be found small patches of marshy land. For the rest it is either gravelly hillside, or else bare bluffs and ridges of granite. To the west of this rise the country is a plateau, elevated some 500 feet above the lake and containing three small lakes—Hai, Hermon, and the small unnamed one on Lot 4473. Of the hills, the most prominent is Hermon Mountain, which rises about 1,300 feet above Lakelse Lake. The country to the south of the lake is low and flat and liable to flood. If the lake could be lowered here it would be the finest land in the valley, but as it is so shallow the advantage might be more than offset by the detriment thus caused to the fisheries.

Timber.

The usual coast species. Western hemlock up to 36 inches, and for the most part rotten at the heart when over 18 inches. Sitka spruce of good quality in places where the soil suits it, and up to 60 inches. Balsam up to 48 inches and sound, in large quantities. Cedar of great size (for Northern British Columbia) and often sound. A particularly good stretch can be seen on the lower part of Lot 5138. Fir is never seen this far north. Near the lakes some very big silver birch grow, and where the soil is rich enough cottonwood up to 60 inches occurs. Lodge-pole pine up to 15 inches is seen at odd places in thick stands.

Climate.

Being only 25 miles from the salt water at Kitimat, this valley has more the climate of the Coast than the Interior. At Terrace (altitude 223 feet) the rainfall averages about 35 inches and the snowfall about 60 inches. But local conditions cause great local variations and the snowfall records kept at the old hatchery at the outlet of Lakelse Lake showed one year with a fall of 243 inches; at Hermon Lake the usual depth on ground in midwinter is 6 feet. This will have cleared by early May and affords a good protection against late frosts. Lakelse Lake freezes completely over in December and remains so until April. During the last winter the lowest reading at the lake was 16° below zero, but this was more severe than most years, when around 10° below would be the limit. These cold spells are alternated by warm spells, and the south-east wind will blow for several days at a stretch and raise the temperature as high as 35°, even in January. The last frosts will occur during the third week in May, and from then until October 1st one may rely on fairly warm weather. This year the highest reading was 89°. October and November are the rainy months, when 50 per cent. of the fall comes.

Settlement and Accessibility.

Terrace is the distributing-point for the valley. It lies some 95 miles north-east of Prince Rupert, on the Canadian National Railway, and is served by a daily train in either direction. From Terrace wagon-roads radiate north 21 miles to Kitsumgallum Lake, and thence a trail reaches 59 miles to Ayansh, on the Nass; south 12 miles to Lakelse Lake; thence an old trail reaches 35 miles to Kitimat. Westerly a road runs along the south of the Skeena 10 miles to Remo and east 4 miles to Copper City. A ferry gives a fairly satisfactory service to points on the south side of the Skeena, and there is in summer a service of Fords to Lakelse Lake. To the north of the Skeena there live about 500 people and to the south only some fifty or so. This is owing to lack of a bridge across the river, for there can be no doubt that the best of the land is on the south side. At Lakelse Lake the only permanent habitations are the hatchery of the Dominion Government and the Hot Springs Hotel, both on the east side of the lake. When the latter is further developed it should bring a great many visitors to the lake to visit "the largest hot springs in Canada." It is a pool about 75 feet across and has a temperature of 186° F. It is reported to contain lithia, but whether this is so I should not like to say.

MINING.

Within 20 or 30 miles of Terrace there are very many promising prospects, those that come the nearest to being within the scope of the area we were working in being the various claims on Thornhill Mountain, between Terrace and Lakelse Lake and on the east side of the valley. Many different minerals are found and reports circulated about them, so that it is hard to sift fact from fiction. However, there is no doubt that rich ore is to be found, as in the case of the Iron Hat, where Dahl and Olsen took out $3,200 of free gold in a few weeks' work.

AGRICULTURE.

This and logging are to-day the mainstay of the valley. Around Terrace there are many 10-acre patches, partly cleared off, and their owners are making a living off them, chiefly in small fruits, for which the valley is well suited owing to its very mild climate.

GAME.

Black bear are common and are to be seen everywhere. Grizzly are also common and a very large one was killed this year at Lakelse River. The white bear, *Ursus kermodei*, is known and one was trapped by an Indian at Kitsumgallum Lake this spring. Deer are very rare; so are caribou, though they have been seen. Timber-wolves are present, though not many; while in winter coyotes are often heard and are rather plentiful. There are many grouse, both blue and willow, and in the fall the lake teems with wild duck, geese, and swans. The fishing in Lakelse Lake is very good, cut-throat and Dolly Varden trout predominating.

Before going out to the lake everybody had warned us against the flies, but this turned out to be quite unjustified, as we were never seriously bothered by them, and I never found them half so bad as they were right on the salt water in the season of 1921 on Principe Channel. Towards the latter end of the season wasps were rather too plentiful, and everybody in the party was often stung by them.

I have, etc.,
P. M. MONCKTON, B.C.L.S.

RANGES 4 AND 5, COAST DISTRICT.

BY V. SCHJELDERUP.

BURNS LAKE, B.C., December 6th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—During the season some 4,800 acres of Crown lands were surveyed and 7,200 acres subdivided. In addition to these surveys a considerable number of miscellaneous tie-lines and traverses were run in various parts of the district. The work was very scattered and necessitated a great deal of moving about by a variety of transportation methods, such as back-packing, pack-horses, wagons, motor-cars, Grand Trunk Pacific Railway, motor-boats, and canoes.

BABINE LAKE.

About 7 miles west of the head of this lake and on the north shore some 900 acres of Crown lands were surveyed. Two of the parcels surveyed are occupied by W. W. Hawthorn and J. Wiggens and their families. A detailed report on each of the lots surveyed has been filed with the field-notes.

From my last year's traverse of 15-Mile Creek a tie was made to the Queena Mineral Claim, Lot 6285, Range 5, and one to M.P. 10-W. on the north shore of the lake.

P.R. 1310, E. Boling, between M.P. 10 and 11-W., was surveyed as was also P.R. 1521, T. G. McAvoy, at the lower end of Babine Lake. On both these pre-emptions both garden-truck and potatoes have been grown very successfully for several years.

Babine Lake is some 100 miles long and lies in the usual north-west and south-easterly direction at an elevation of 2,222 feet above sea-level. The report of R. P. Bishop, B.C.L.S., published in the Annual Report of the Minister of Lands for the year 1921, deals with Babine

Lake and vicinity, where Mr. Bishop worked for the greater part of the season 1921, and was thus able to write a more lengthy and reliable report than I might do, as my stay on the lake was only of short duration.

While on Babine Lake a trip was made to the east end of Taltapin Lake, where Lot 5017, Range 5, was tied in to my last year's triangulation survey of this lake, and on my way back to Burns Lake some connection traverses were run from lot corners to posts on the old Decker Lake–Babine Lake Trail traverse.

The mail to Fort Babine still goes in via Hazelton, while practically all the freight, both for the Hudson's Bay Company and stores owned by Indians, goes to Babine via Burns Lake.

The distance from Burns Lake to Donald's Landing on Babine Lake is about 22 miles. The road has this year been greatly improved by the Public Works Department, although it is still far from being a good wagon-road. Local freighters have built a scow on Pinkut Lake capable of comfortably carrying two teams and loaded wagons from Pinkut Landing to the end of the lake, a distance of about 3½ miles, which saves a lot of time and hard work, as until the scow was built one had to drive the horses around the lake over an old and very poor pack-trail, while loads and wagons (taken to pieces) were brought down the lake by boats lashed together.

Francois Lake.

Francois Lake is 65 miles long, with an average width of 1½ miles, and lies at an elevation of about 2,375 feet above sea-level.

In Bulletin No. 10 (Land Series) full particulars of the Francois–Ootsa Lakes District have been published. A copy of the said bulletin may be had by applying to the Government Agent at Fort Fraser, B.C.

This season quite a number of subdivision-lines were run in the Francois Lake vicinity in lots surveyed years ago, covering land then held under application to purchase, and consequently not subdivided into quarter-sections.

On the north shore and about 6 miles west of the outlet of the lake some 1,800 acres of Crown lands were surveyed. This area was formerly covered by T.L. 7044P, 7045P, and 7048P, which have been abandoned owing to the fact that there is practically no timber of commercial value on the whole area.

On the south side of the lake and 1 mile west of the mouth of the Nithi River one lot containing some 180 acres was surveyed. The land is not exceptionally good, but it has been staked several times for purchase.

Francois Lake may be reached from several stations on the railway. From Houston there is a road to the west end of the lake, a distance of 36 miles. This road continues to Wistaria, where it connects with the road from Burns Lake. The east end of the lake has an outlet by road to Fraser Lake Station. The distance is some 6 miles. From Endako there is also a road to the east end, but as yet there is no bridge across the Stellako River, so this road only serves the people living on the north side of the lake and river. Burns Lake is the most favoured route and by far the best for any one wishing to visit the Lakes District. The road between Burns Lake and Francois Lake is 14½ miles long and the grades are very easy. The Public Works Department has commenced to gravel this road as the motor traffic is too heavy for a dirt road. There is a Government ferry across Francois Lake which connects the road from Burns Lake with the road from Francois Lake to Ootsa Lake and Wistaria. The ferry now operating on the lake was built this year and is a model of completeness and up to date in every respect. The trip from shore to shore, a distance of 2 miles, is made in twelve minutes.

During this last summer the cable for Francois Lake arrived and was immediately laid, completing the Dominion Telegraph branch line from Burns Lake to Ootsa Lake and Wistaria, and thus putting the people of this remote section of the Lakes District in direct touch with Burns Lake and the railway.

The Prince Rupert Logging Company has again secured a contract for cutting railway-ties on Francois Lake. The ties cut last winter were successfully brought down the lake and the Stellako River to Fraser Lake, where they were loaded. Great assistance was rendered by the steamer "Enterprise" in towing the ties down the lake to the head of the Stellako River. The "Enterprise" is 16 by 65 feet and has a 30-horse-power steam-engine. It was built some years ago but only operated for a short period, since when it has been lying idle at the east end of Francois Lake. The present owner, Albert Irwin, has run the steamer all summer, but as

yet there is not traffic enough on the lake to warrant the operation of such a boat. The "Enterprise" makes an average speed of 10 miles per hour and has a capacity of some 10 tons.

BULKLEY VALLEY.

In this valley I surveyed a few pre-emptions; a tie-line to Lot 146, Range 5, on Canyon Creek, and some subdivision-lines were run.

The Bulkley Valley has shown remarkable progress during the last few years. Smithers, incorporated under the "Village Municipalities Act," is the largest town in the valley and its growth, especially this last year, is marvellous. The reason for this sudden activity is the development of the mining properties acquired by Mr. Duthie, of Seattle, situated on the south side of the Hudson Bay Mountain. The showings so far are very encouraging and the prospects are that the property will develop into a big producer within a short period. Several other groups of mineral claims on the Hudson Bay Mountain have been bonded over to Eastern capitalists.

Telkwa, at the junction of the Telkwa and Bulkley Rivers, is another thriving little town. It is more of a farming centre than Smithers. There are large deposits of coal on the Telkwa River and the Betty Mine is shipping on a small scale.

At the junction of the Buck River with the Bulkley River the little town of Houston is situated, which is the hub of Pleasant Valley and the gateway to Owen Lake and the west end of Francois Lake.

The Attorney-General, the Hon. A. M. Manson, writes in an article on Central British Columbia, published in the *Interior News* on November 16th, 1921, as follows:—

"The population of the Bulkley Valley has increased in the last five years by at least 300 per cent. and is increasing each day. In the valley are the villages of Smithers, Telkwa, and Houston. The two former are thriving most vigorously and are vying with each other in a neck-and-neck race as to which shall be the hub of the valley. In the Bulkley one finds many settlers from the Prairies, many from the North-western States, and a goodly number of returned soldiers. With very few exceptions they are making a distinct success, and if you ask them why they came they will tell you that they did not like the drought and hail and bleak winds of the winter in the places from which they came, and although they found that the poplar and spruce of the valley makes pioneering a little slower than on the Prairies, yet they were willing to undertake it in view of the richness of the soil and the equable character of the climate.

"Although the thermometer drops sometimes to 20° or 30° below zero there for a day or two, it is not accompanied by wind. The snow of the winter runs from 18 inches to 3 feet. The timber is spruce and poplar for the most part, with open patches here and there, and costing, according to the method of clearing in this particular locality, from $20 to $75 per acre to clear. The day was when the Bulkley Valley was considered frosty, but in the last few years one has heard less and less of frost and it is no menace at all. Thorough cultivation, early grains, and early sowing will solve that difficulty beyond a doubt. There are no crop-failures in the Bulkley. There are crops below average and above average, but in the worst year the farmer will get by. It is a mixed-farming country. Dairying will be its future, and where there were a few dairy cattle a year ago to-day there are several hundred head."

OWEN LAKE AND MISCELLANEOUS.

Practically all the good agricultural land at Owen Lake was until a few years ago held under application to purchase or Crown-granted. Now the greater portion of this land has reverted to the Crown and opened up to settlement and quite a few pre-emptors have already located here. The soil is very productive and there is a luxuriant growth of wild grass, peavine, vetch, etc.

The settlers have cut a good trail out to the Houston–Francois Lake Road, a distance of some 14 miles. This trail has been cut wide enough for a wagon to be taken in over it with a small load, but the grades are so steep that even for a winter road the route is impracticable. The distance to Houston is about 28 miles by this route. At the time I left Owen Lake last September the construction of a road to the west end of Francois Lake had been commenced. From Owen Lake to Francois Lake by the old pack-trail is about 12 miles.

North-east of Owen Lake and about 1½ miles distant two lots containing 800 acres were surveyed. The quality of this land is good and there is a very fair proportion of first-class land—i.e., open wild-hay lands.

From my surveys a tie was made to the triangulation station erected by F. C. Swannell, B.C.L.S., on Nadina Mountain, lying immediately to the south-west of Owen Lake and being a well-known landmark in the district.

One lot containing 160 acres was surveyed adjoining Lot 6420 on the Buck River. The land has been applied for by A. Reopel, the owner of Lot 6420, who is a great believer in the future of the district and a very industrious farmer.

P.R. 821, Walter Smith, situated on the north side of Cheslatta Lake and about 4 miles west of I.R. No. 2, was surveyed during the season. The land included in this survey lies half a mile back from the lake and about one-third of it is open wild-hay land. The late Mr. Smith was killed at the Front.

Cheslatta Lake and vicinity was dealt with in my 1920 report, published in the Annual Report of the Minister of Lands of the same year.

On Burns Lake I subdivided Lot 1886 and on Tchesinkut Creek Lots 3822, 3826, and 3827. These lots have reverted to the Crown and thrown open to pre-emption.

GENERAL.

Last winter but very little snow fell until the month of February, and the result was that the frost went down into the ground far deeper than is usual in this northern district, and when spring came and the snow melted only a very small percentage of the moisture went into the ground. Thence came the warmest and driest season on record, and the district came nearer to having a crop-failure than ever before since the first settlers commenced to till the soil some twenty years ago. The timothy suffered worst and I doubt that the crop averaged more than one-third of that of any ordinary season. The grain-crop turned out much better than was first expected and so did the root-crops. The upland wild hay was, generally speaking, considerably below the average and in places not worth cutting, but the lowland meadow and swamp hay was good, and owing to the dry weather and the low water everywhere existing a much larger area was cut this year than is possible to do in a customary season.

The Public Works Department was very active this year, resulting in a distinct improvement on the trunk roads of the district. At Quick a fine new bridge was completed over the Bulkley River, and at Houston a bridge was also built over the Bulkley River and a road constructed connecting Houston to the eastern part of the district by a direct route. A party was in the field for several months on a survey to determine the most suitable route for the trunk road to be constructed next year from Burns Lake to Endako, and thus allow through traffic from Hazelton to Ashcroft and the southern parts of the Province.

South of Burns Lake there are now eleven schools, eleven post-offices, five general stores, three hotels, one hospital, and good roads in all directions, and it seems but a short time since we thought the country was doing fine with a post-office both at Francois Lake and Ootsa Lake and some of the pack-trails cut out wide enough to be used as winter roads. The nearest stores in those days were Bella Coola, Aldermere, and Fort Fraser, and the only method of transportation was pack horses.

I have, etc.,
V. SCHJELDERUP, B.C.L.S.

VICINITY OF CANADIAN NATIONAL RAILWAY, CARIBOO DISTRICT.

BY J. F. CAMPBELL.

PRINCE GEORGE, B.C., September 15th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit herewith the general report on the surveys made and the country covered by me during the past season. The surveys consisted of a few isolated pre-emptions, subdivisions of land reverted under the "Soldiers' Homestead Act," a small block in the vicinity of Averil Creek, and the completion of surveys near the Canoe River.

My surveying operations extended from some 30 miles west of Prince George, east to the Canoe River, a tributary of the Columbia. Naturally while moving over such an extensive terri-

tory many different conditions as regards soil, climate, agricultural possibilities, and topographical features of the country were encountered.

WEST OF PRINCE GEORGE.

The country west from Prince George and paralleling the Nechako River is essentially a farming district and is usually classed by agriculturists as a mixed-farming country. There is a certain amount of timber that can be profitably utilized for milling purposes, but the areas available are so scattered that I doubt if the timber would be of much value unless it is cut for local use. In the few places where the timber is of commercial value it is generally spruce and Douglas fir. The principal growth, however, is poplar, which is by far the most abundant, lodge-pole pine, spruce, balsam, birch, and a few scattered patches of tamarack in some of the swamps. Willow and alder grow along the streams and borders of lakes, and often a scattered growth of willow is on the hillsides. Nowhere does the timber reach any great size, the poplar varying from saplings up to 8 inches. The spruce would average a little larger, but is scattered and usually found in swampy depressions or close to water.

On most quarter-sections there is usually some fairly open land that the settler can clear up the first year, gradually extending his clearing to the more heavily timbered land. It is noticeable in clearing land that if the trees are felled in summer when the sap is in the upper limbs, the stumps, and especially the poplar, will rot in a few years and can be easily removed, but in many instances the felling is done in winter when the sap is down, making the removal of the stumps much more difficult, as they do not rot as readily.

The actual valley of the Nechako for 50 miles west from Prince George is not wide, seldom exceeding 2 miles, and is usually less than that distance. But the low bench lands adjoining the river are generally called valley lands and there is little difference between the bottom land and the land on the lower benches. The soil on the bench is usually a brown clay silt, while lower in the valley it is a little lighter, with a mixture of fine sand. Both soils have vegetable mould on top and support a good growth of peavine, vetch, and wild grass. In many places the peavine and vetch attain a height of 2 or 3 feet, with creepers twice that length. In the meadows the wild grass, especially red-top, grows to 5 feet and is very dense. Where the soil has been cultivated timothy yields an excellent crop, and from what different farmers have told me I should say that timothy varies between 2 and 4 tons per acre. Oats and barley seem to do well, but I have not seen any wheat fully ripened, although I understand that farther west wheat is a success. Vegetables are something that can be depended upon, and I do not know of a year in which a failure has been reported, although this year in some localities the potatoes were touched by frost early in June. This, however, is an exception; although there are occasional summer frosts in May and June, they generally are not severe enough to do any damage.

There is plenty of range for cattle in summer and a great abundance of wild feed. In winter the stock requires to be fed, as the snowfall is too heavy for them to range out. The length of the winter is variable. Some winters snow may not fall until well on in December and be off the ground by the end of March, while other winters the snow may come late in October and stay until early in April. For this reason it is advisable to have feed for cattle for at least five months. The country is peculiar in its snowfall owing to the fact that the depth varies in very short distances, and it is difficult to place the average snowfall for the whole district. I should think it would run between 2 and 4 feet, some parts being possibly a little deeper in a winter of heavy snows. The rainfall in summer can be depended upon, the average from June until September, inclusive, being 1.50 inches per month, with the lightest rainfall in September. The temperature for these four months would average 56° F., with August the hottest month. The average mean temperature for the winter months is about 22° F. Both the rainfall and temperature is averaged over three years.

The Grand Trunk Pacific Railway follows the Nechako River on the south bank. Wagon-roads parallel the river a few miles back on either side, with cross-roads running to the railway. To the south of the river the cross-roads go to the railway-stations, while on the north bank there is usually a ferry or small boat to cross the river to the railway. More ferries are required on the Nechako and these are being installed as traffic warrants them.

Many new settlers have located during the past few years, the majority being either from the Prairie Provinces or the United States. Some have brought live stock and farm implements from their former homes and expect to make permanent homes on their new locations.

East of Prince George.

The country east of Prince George for about 100 miles, and paralleling the Grand Trunk Pacific Railway, is at present, with the exception of small areas, more adapted to the lumbering industry than to farming. This does not apply to the west side of the Fraser River on the stretch from Prince George to where the river bends to the east, a distance of about 40 miles. There is a vast extent of land to the west that has at one time been subjected to a severe fire and the present growth is principally small poplar and willow. The land is easily cleared and quickly brought under cultivation, and there are many excellent farms in operation. The country in that vicinity is more generally referred to as the Salmon River lands, upon which I reported some years ago.

I resurveyed three sections, Lots 815, 816, and 760A, on the west bank of the Fraser, opposite Shelley, on the Grand Trunk Pacific Railway. The majority of the land is bottom land with a deep rich soil. The growth of peavine and wild grass is heavy and the clearing of the poplar, willow, and cottonwood fairly light. It is, however, rather badly cut up by what is known as the Goose Country Slough, and I should think that a large part of the land adjacent to the river and the slough would flood at high water. This is especially true of the southern half of Lot 760A and part of Lot 816.

On completion of this survey I moved to Newlands, where a pre-emption and a small tract of vacant land was surveyed.

Newlands is on the Grand Trunk Pacific, 30 miles east of Prince George. It lies in the centre of a long, narrow valley that has very fertile soil. This valley, evidently an old lake depression, extends from the Fraser River, at the mouth of the Willow, east for 25 miles, where the Fraser River is again reached. The Grand Trunk Pacific follows the valley and there are five stations in the 25-mile stretch—Willow River, Giscome, Newlands, Aleza Lake, and Hansard. The valley at one time had a very heavy growth of large fir, spruce, and balsam, but a large part of the timber adjacent to the railway and especially in the vicinity of Newlands, has been logged off and the land brought under cultivation. There are still large tracts of timber available for milling purposes, notably near Eaglet Lake and Aleza Lake, and it will be many years before the timber is exhausted.

The land fit for cultivation is principally bottom land, the soil being a deep rich black loam. The most successful crops are timothy-hay, oats, and vegetables. The best stand of timothy and oats I have seen this year was growing on the land adjoining that surveyed. This has been a year of light rainfall, but even with this lack of moisture the crops in this valley appear to be quite up to normal.

Most of the farmers have gone into mixed farming and success is attending their venture. On the farm of W. P. Ogilvie, a mile east of Newlands, there is possibly 20 acres under cultivation, and from four to six men with teams have been employed during the past summer clearing and making ready for the plough additional land. One of the best and most modern barns has been built on this farm and a silo is in the process of construction. On the farm adjoining this to the south there are 30 acres under hay and oats. Opposite Newlands Station is the farm of J. Keenan, from which the heavy timber has been cleared, and excellent crops of hay, oats, and strawberries are raised. The strawberries from this farm will stand comparison, both for quality and profusion of growth, with points in British Columbia that specialize entirely in berries. There are many other farms in the valley that are successful, and in the older-settled parts near the mouth of the Willow River the amount of land under cultivation is quite extensive.

There are five sawmills in the valley, the one at Giscome being the largest in Central British Columbia, with a cut of over 100,000 feet per day and employing a few hundred men. At the eastern end of the valley, near Hansard, there is a lime-deposit and a plant is under construction for the mining and burning of lime.

The snowfall in winter is heavy and cattle have to be fed about five months. The rainfall is, from indications, heavier than west of Prince George, and I should judge that the snowfall is also deeper.

Ness Lake.

Ness Lake is about 20 miles west from Prince George and 10 miles north of the Nechako River. Two sections near the east end of the lake, Lots 971 and 972, were subdivided into 160-acre blocks. About a quarter of the land is an old beaver meadow that has been under

water for many years. A large amount of ditching has been undertaken by the settlers and the majority of the land is drained and will shortly be fit for cultivation. The settlers, who are farmers from the Western States, have seen the same class of land under cultivation, and claim that no better land is wanted if properly drained and cultivated. Only a few acres have been seeded this year and the results obtained so far have been very promising. There are large tracts of similar land, often mistaken for muskeg, in British Columbia, and I am sure, if similar methods of reclaiming were used, these tracts, at present considered worthless, would soon be producing crops.

The land in the vicinity of Ness Lake is being settled very rapidly by energetic farmers and within a few years should be one of the best producing areas in the Fort George District. Most of the settlers have substantial buildings and areas under cultivation varying from 2 to 20 acres. The crops raised are those usual throughout the district—timothy-hay, oats, potatoes, berries, etc.

The road from Prince George to Ness Lake passes along the north boundary of Lot 972, while 3 miles to the south is a road to Miworth, on the Grand Trunk Pacific Railway. These roads have been connected by the settlers with a good road along the west boundaries of Lots 972 and 971. Miworth, the nearest railway-station, is 10 miles distant, and at that point a Government-operated ferry is on the Nechako River.

CHIEF LAKE.

About 20 miles to the north-west of Prince George are three lakes that lie within a mile or so of one another—Nukko Lake, Swamp Lake, and Chief Lake, of which Chief Lake is the largest. The area surrounding these lakes is known locally as the Chief Lake District, and for the past few years the area of land under cultivation has been steadily increasing. This is due to the excellent quality of the soil, a market at Prince George within a day's travel, and convenient roads. Adjoining Swamp Lake, which is the southernmost of the three lakes mentioned, and extending south-east, are seventeen sections that have reverted under the "Soldiers' Homestead Act." These were subdivided into 160-acre blocks.

The land in the vicinity of Chief Lake, in common with the rest of Northern British Columbia, had at one time been covered with large spruce and Douglas fir, but with the exception of a few hundred acres near Swamp Lake and Nukko Lake, which still have the original growth, the prevalent timber is poplar, spruce, and lodge-pole pine. The poplar seldom exceeds 10 inches in diameter, the average size probably being about 4 inches, while the spruce and pine would average considerably less. The clearing of the timber would not be heavy, but there is very little land that could be cultivated until clearing is undertaken. There are a few beaver meadows, often erroneously termed muskeg, that could be drained and the surface moss burnt off and put under cultivation. These will usually produce a good crop of hay the first or second year, but unless thoroughly dry will not produce good vegetables.

The land lies on a low divide between the Nechako and Salmon Rivers and is well watered by numerous creeks that have their sources in the many small lakes that dot the country. The soil is clay with a small mixture of sand and varies in depth from 3 feet and greater. Below this soil is clay, in places intermixed with light gravel.

The area is well supplied with roads, the main Chief Lake Road passing north-west through the block surveyed, while two other roads branch from the main road, one passing along the southern limit of the block, while the other parallels the land to the east. Both the last-mentioned roads are in fair shape for team and wagon. I hauled 2,000 lb. from near the centre of the block to Ness Lake along the road that passes through the southern part of the block and had no trouble in making 2½ miles an hour. Motor-cars can be used for about 15 miles on the Chief Lake Road, and after some repairs are made to the bridges there should be no trouble in motoring from Prince George to the lake.

There is a post-office and school at Chief Lake, but as the land surveyed lies midway between Chief Lake and Prince George, the latter would be more convenient for the settlers on this particular block.

AVERIL CREEK.

Averil Creek empties into the Fraser within a mile of where the river turns south after reaching its most northern point. A range of hills standing about 2,000 feet above the river turns the Fraser south, and Averil Creek comes through a narrow canyon in the same range. For a mile north along the creek there is a series of canyons, then the creek-valley widens into

a basin three-quarters of a mile wide and 1½ miles long. The land in this basin is very open, almost prairie-like in aspect. On all sides hills rise above the basin or valley for 2,000 feet, and for the most part are heavily timbered with spruce, fir, and balsam, although there are occasional patches that have been swept by fire and have a dense growth of mountain-ash and willow. The land in this valley was surveyed into small holdings.

There are two mines in the vicinity of Averil Creek. Both these have a number of men employed, and it is for those who may be employed at the mines and decide to locate that the land was surveyed, as the position nullifies it for settlement except for those immediately interested in the mining development.

On the mine operated by the North Point Mining Company, three tunnels have been driven into the hill. The tunnel upon which most of the work is at present concentrated is about 700 feet long and has been driven through solid rock. Silver and lead are in paying quantities and there is also a small amount of gold. Most of the work done so far is in the vicinity of Lot 9606, about a mile west of Averil Creek. On Averil Creek, half a mile from the mouth, there is another mine under way, and although the work and development is not as large as on the North Point Company's property the showing is considered to be as good. About thirty claims have been staked and a certain amount of work has been done on a few of them. J. D. Galloway, the Resident Mining Engineer for the district, visited the properties while I was camped at Averil Creek, and no doubt his report on this group of mines will be published in this year's Annual Report of the Minister of Mines. Also parties from the East who are interested in the development of the property paid short visits and evidently were well satisfied with the outlook.

Averil Creek is 12 miles north of the Grand Trunk Pacific Railway, but as there is no road connection all supplies have to be brought down the Fraser River from Hansard, a station on the railway, 40 miles up-stream.

Canoe River.

To close my season's work I moved to the Canoe River, the most northern tributary of the Columbia, to run the outside boundaries of some previously surveyed land, and to complete the surveys of some pre-emptions shown on the map but not run on the ground.

As there is no direct rail connection between Prince George and Swift Creek, the nearest station to my work, I moved by the Grand Trunk Pacific to Lucerne. Spending the night there, I made the balance of the trip by the Canadian National, retracing my previous day's journey for about 50 miles, as the Canadian National and Grand Trunk Pacific use the same track from Lucerne to Red Pass, a distance of 25 miles, and parallel one another for another 25 miles, when the Canadian National turns south through the valley of the McLennan. These two railways at one time had separate road-beds through the Yellowhead Pass, but during the war the rails of one were removed from Edmonton to Red Pass, which lies at the western end of the pass. I understand that the abandoned road-bed is to be repaired and used as a wagon-road. If this is done there will be a few hundred miles of unexcelled road on which the grades are so light that they will be unnoticed.

The Canoe River has its source at a glacier in the Selkirk Range, about 15 miles west of Cranberry Lake, a short distance south-west of Mount Robson Park. Swinging in a horseshoe bend, it empties into the Columbia near the big bend of that river. The low divide that separates the watersheds of the Fraser and Columbia is between Cranberry Lake and Canoe River, the distance between those two points being about 1½ miles. The Canadian National Railway follows along this divide where it passes from one watershed to the other.

The Canoe River flows through a narrow valley on either side of which rise snow-capped mountains. In many instances the mountains rise abruptly from the valley-floor without any intervening slope. The height of the mountains varies from 7,000 to 9,000 feet, with a few of the peaks higher. The scenery is similar to that in Mount Robson Park, a few miles to the north, and I have no doubt that as soon as the country is better known to tourists and connected by good motor-roads to the Prairie and Coast cities, the valley will be one of the most favoured in British Columbia. Fifteen miles down the valley from the Canadian National Railways are a number of hot springs that I would liked to have visited, but the short time at my disposal prevented this.

A large number of farms are under cultivation both in the Canoe River Valley and the valley of the McLennan River, a few miles north. Some of the farms have 40 and more acres under cultivation and the usual crops of hay, oats, vegetables, berries, etc., are raised. Irrigation

is used on many of the farms, this being necessary as the rainfall is light. Most of the water for irrigation purposes is obtained by diverting one of the numerous mountain streams and running it in ditches through the farm. When sufficient water is obtained the stream is turned back into its usual channel.

Some of the streams are large in size, notably Swift Creek and Packsaddle Creek, both being about 100 feet in width and carrying a large flow of water. A mill in operation on Swift Creek uses a water-turbine which is driven by an overflow from the creek. Some of the settlers have water-wheels on their farms and obtain enough power to drive small saws for the cutting of firewood.

The snowfall in the valley is light, seldom exceeding 2 feet, and the cattle feed out nearly all winter, though I noticed that all farms put up enough feed for a few months in case a severe winter develops. There are some fairly large herds of cattle in the valley and many flocks of sheep and all appear to be in first-class shape.

The mountain-sides up to 5,000 feet are heavily timbered with Douglas fir, pine, spruce, and balsam, and the logging chances are easy. There are a few sawmills operating, but there are still good chances for more, as the timber is convenient and transportation handy.

MINING.

As previously mentioned, there is considerable mining activity at Averil Creek, where galena has been found. A few miles south of Prince George a dredging outfit is working on Government Creek and the prospects are bright. At Fraser Lake a very good coal prospect is being worked. Coal from this vicinity has been used in the past by the old Hudson's Bay post at Fort Fraser, though it is only in recent years that any attempt has been made to develop it. There is always a certain number of prospectors in the hills and occasionally a find is reported, but so far nothing startling has been found.

LUMBERING.

The lumbering industry in the Fort George District has been dormant for a number of years, but is now beginning to pick up. There are vast areas of timber close to the railway to draw from, but for the past two years the low price of lumber in the market has prevented any large cut, and most of the mills have been closed or working part time. During the past summer most of the mills have started cutting again and the majority will continue logging operations this winter. The Giscome mill, the largest in Northern British Columbia, has been idle for five years, but this summer has started cutting and logging. Other mills have started and a few new mills have been constructed.

GAME AND FISH.

Game is very plentiful throughout the district. The moose are numerous and it takes very little skill or time to find and kill one. Many were seen during the summer, but none were killed by members of the party, as they were generally encountered in out-of-the-way places. At both Averil Creek and Canoe River there were many indications of grizzly bear, but none were seen. The black bear are plentiful, but are more destructive to farm gardens than harmful to man, although two members of the party had an unpleasant experience with one, which necessitated the use of the axe. A few mountain-sheep were seen on the higher peaks in the vicinity of Canoe River. Fish are plentiful in most lakes and streams, rainbow trout predominating, and it is not difficult to make a good catch.

I have, etc.,

J. F. CAMPBELL, B.C.L.S.

VICINITY OF BARKERVILLE AND VAN WINKLE, AND TRAVERSES NEAR COTTONWOOD, CARIBOO DISTRICT.

BY R. W. HAGGEN.

QUESNEL, B.C., October 24th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—In accordance with your instructions of June 26th, I completed surveys of unsurveyed pre-emptions in good standing in the Cariboo District, and also made traverses of Cunningham Pass, Cottonwood Valley, from the Barkerville Road to near the Pacific Great Eastern Railway Crossing, Cottonwood–Ah Bau Lake Trail to surveyed timber licences; Van Winkle–Swift River Road to Lot 9884, Swift River; Barkerville–Fraser River Trail to Wolverine Creek, tying in surveys, and made a resurvey in Beedy Creek Valley. On the Cunningham Pass and Cottonwood River traverses numerous placer-lease location posts were tied in.

A total of 32 miles of horse-trail was built in connection with the work, and this trail will fill a much-felt want for settlers, prospectors, and trappers.

INDIAN POINT AND ISAACS LAKE.

Three pre-emptions were surveyed in this locality. The first survey covered land at the outlet of Indian Point Lake, which lies 7 miles north-easterly from the outlet of Bowron Lake, to which point there is a good road, 18 miles in length, northerly from Barkerville. This trail was built about 1912, connecting Barkerville with the mouth of Goat River; it was at that time the intention to build a road from Barkerville to the Grand Trunk Pacific Railway to give a shorter freight-haul, this road being some 200 miles shorter than the Cariboo Road. The building of the Pacific Great Eastern, however, altered the situation, as Barkerville is now 58 miles from the railway at Quesnel; under the old Cariboo Road conditions the distance was about 280 miles.

At the outlet of Indian Point Lake there is a small open flat which grows good hay; potatoes mature and gardens do well; however, in common with most pre-emptions in the Barkerville section, the area of agricultural land would be insufficient to support any one who had no other means of earning a livelihood. There is little market for produce, but the settlers usually raise produce and horse-feed for themselves; sell a little, and earn a livelihood by a happy combination of farming, trapping, and guiding.

Pre-emptions were also surveyed 7 miles and 14 miles north-easterly along the old trail, one being on the portage between Indian Point and Isaacs Lake and the other on Isaacs Lake at the mouth of Wolverine Creek. The holders of these pre-emptions had all enlisted.

The two last-mentioned pre-emptions can hardly be classed as agricultural land; they are densely wooded with hemlock, spruce, cedar, and fir, and cost of clearing would be above any possible value as agricultural land; the soil is sandy, rather lacking in nutrition, and transportation conditions are unfavourable. However, garden-patches are fairly productive and the lands lie in a good trapping country.

This old Goat River Trail has been little used since 1914; during construction it was in great demand for the transportation, by pack-horse, of certain commodities which Barkerville could supply. Along Isaacs Lake there has been a large fire since that time and the trail is now completely blocked with windfall. In order to get my camp to Isaacs Lake it was necessary to build an entirely new trail from Kibbee Lake to the west end of Isaacs Lake, about 10 miles; a raft was used to convey the outfit on Isaacs Lake.

TIMBER.

While the agricultural land in this locality may not be a great asset, there is a tremendous body of virgin timber in the locality. Tributary to Bowron River, that is on Bowron and Indian Point Lakes, a common average is from 5,000 to 10,000 feet of spruce to the acre. On the streams and lakes tributary to the Quesnel River, the area including Isaacs Lake, the North Fork of Quesnel River, Quesnel Lake, and Horsefly River, the Commission of Conservation of Canada gives the quantity as 5,736,000,000 feet B.M., the approximate percentages being: Spruce, 40 per cent.; red cedar, 30 per cent.; hemlock, 10 per cent.; balsam, 15 per cent.; Douglas

fir, 3 per cent.; and lodge-pole pine, 2 per cent. This timber is all available for floating, by river, to Quesnel when conditions warrant its development.

I have neither seen nor had any authentic information concerning any minerals in this section; at a few bars on Bowron River some placer-mining has been done.

CUNNINGHAM PASS.

A traverse was made from the Waverly Mine on Grouse Creek to the mouth of Cunningham Pass Creek at Cunningham Creek.

A road leads all the way from Barkerville, the 5-Mile post being at the easterly boundary of the Waverly ground and 12-Mile at Cunningham Creek.

From the Waverly the road descends into Antler Creek Valley, which is followed for 3 miles; at the lower end of the Nason ground the road forks, one branch continuing up Antler Valley to Sawmill Flat, where it connects with the Keithley trail; this section of Antler Creek was very rich, yielding some $8,000,000 in the days of the gold-rush. At the Nason claim the ground becomes deeper and wet and drifting was impracticable. At the Nason ground there is a little flat leading through to Cunningham Pass Creek, and good results were obtained by prospectors there this season. It is known as Whisky Flat, and there are a number of old cabins still in existence there; it must have been a popular residential quarter once. The Cunningham Pass Road leads thorugh a low pass from Antler, Whisky Flat entering the pass at the Yellow Lion claim, half a mile from the forks. From the Yellow Lion the drainage of the pass is to Cunningham Creek, a tributary of Quesnel River.

The valley of Cunningham Pass Creek, and of Cunningham Creek as far as was visible, has been fire-swept and is now wooded with poplar, growing among the brulé. There would seem to have been little mining done on the creek, though prospectors who worked there this summer got very promising results. One company had a drill in operation at the junction of Cunningham Pass and Cunningham Creeks, while House and Reid, of Barkerville, are busy this fall setting up a hydraulic plant to operate on a bench of Cunningham Creek next season. Cunningham Creek was a fairly good producer and was worked until quite recently with good results. Of course, no information is available as to the prospects found by the drill.

At the divide between Cunningham and Harvey Creeks a good quartz strike is reported, Ernest Moore having been engaged in development-work there all season; the ledge is reported to be 60 feet in width and assays very encouraging.

This section is purely a mining area. In the Barkerville field the past season was a poor one for hydraulicking owing to the continuous dry weather, which compelled the claims to suspend operations much earlier than usual. On the other hand, several unexpected strikes were made. The nicest gold I saw was taken by Al. Saunders out of quartz near the Lowhee Mine; he made a good stake during the season, maintaining a larger average than I have ever heard of in quartz mined by hand-work only, without even an arrastra. Leo Muller, working on Dragon Creek, averaged 9½ oz. to a set (4 by 10 feet), and McComish and Ross took out considerable gold on 8-Mile Creek. Possibly as a result of the Cedar Creek excitement more prospecting than usual was done during the past season and all reports are encouraging.

VAN WINKLE TO SWIFT RIVER.

From Van Winkle, on the Cariboo Road, 44 miles from Quesnel and 14 from Barkerville, a traverse was run over a road which follows up Last Chance Creek, crosses the head of Peters Creek, and follows down the valley of Fountain Creek to Swift River, a tributary of the Cottonwood. A pre-emption had been taken up by a returned soldier and covered some hay meadow and open hills near the Swift River.

In this section there is considerable good land and a luxuriant growth of summer feed. At some future date there will be a settlement between the Quesnel River and Fountain Creek; at the present time it is too remote for settlers to make a success there. The district is evidently quite well adapted to dairying and mixed farming; the winters are of too long duration for cattle to be raised profitably. While a surveyor can do no more than express an opinion of virgin country, it would seem reasonable to expect that splendid hay-crops could be grown, that hardier root-crops would do well, and that potatoes could be grown on the slopes; the depressions would probably be subject to frost. Under present conditions the land is 60 miles from railway; under the best conditions, say a road in a fairly direct line to Quesnel, it could

hardly be less than 40 miles, and under present conditions in the district settlers would be well advised to locate nearer the railway.

There is gold on all the creeks in this section, though it is hardly rich enough for individual miners to make profit. There is a probability of good dredging-ground, and one company proposes the installation of a dredge next season on ground which was drilled this year.

Ah Bau Lake Trail.

From Cottonwood Post-office, on the Barkerville Road, a tie was run along the old trail to Ah Bau Lake. Along this section there are numerous pine ridges, with swampy ground, wooded with spruce, intervening. The section contains no agricultural land; in fact, it is difficult for horses to find feed within 6 miles of Ah Bau Lake. Transportation conditions now preclude any value attaching to the timber, but it may ultimately become of value. Some mining has been done on Graveyard Creek, the miners making wages; a quartz ledge beyond Ah Bau Lake a few miles is reported to contain a good deposit of galena and it has recently been examined by engineers.

Graveyard Creek, draining out of Ah Bau Lake, is the North Fork of Cottonwood River, entering the latter stream below the Pacific Great Eastern Crossing, the course being generally westerly.

Cottonwood River.

The Cottonwood River, which flows in a valley 500 to 800 feet deep, was traversed from the Barkerville Road (Cottonwood Post-office) to near the Pacific Great Eastern Crossing.

The valley does not greatly belie its name, there being numerous benches lightly wooded with aspen. These benches are narrow and gravelly and do not appear to be very well adapted for agriculture. The lower flats and uplands are wooded with a fairly heavy growth of pine and spruce. A few of these lower flats would be suitable for agriculture on a limited scale, and undoubtedly root-crops would do well, while hay can be raised without irrigation. There is little or no range land in the valley and it could not be considered suitable for stock-raising.

Between 10 and 11 miles from Cottonwood Post-office the river flows through a canyon, the walls of which were so rugged that it was necessary to swing the traverse back a considerable distance; this canyon is half a mile in length, terminating in falls some 10 feet high.

From 16½ miles the stream enters a series of canyons, the last of which is at the crossing of the Quesnel–Fort George Road, 8 miles from the head of the canyon. Several of these canyons are quite impassable near the river for a man on foot.

The top gravels along the Cottonwood Valley are all auriferous and in some places carry values of several dollars per yard. It seems very likely that men with rockers could average from $4 to $7 per day for wages. The gravels are rather richer than those of the Quesnel and Fraser Rivers, on both of which considerable work of this kind has been done. Drilling was done on one section of the river at the head of the 8-Mile Canyon.

It is a rather general condition of river gold that it is found within the top 8 inches on the bars, the deeper ground carrying small values or being barren; a dredge has, of course, to excavate a considerable depth to work ahead, and this barren ground so reduces the average per yard as to make it unprofitable to dredge ground on which individual miners, rocking the top gravels only, can make fair wages. The present generation does not seem to fancy this class of work, though, and very little is being done in the district now.

Beedy Creek.

One parcel was surveyed on Beedy Creek, a tributary of the Beaver River, which drains into the Quesnel River 30 miles from Quesnel. This parcel lies 11 miles by road and trail from the mouth of the Beaver, and also has access from a road 12 miles in length from McInnes's ranch on the Beaver Lake–Alexandria Road. McInnes's place is 20 miles by road from Macalister Siding, on the Pacific Great Eastern Railway.

The Beedy Creek Valley contains some rich bottom land and good crops are raised; owing to its position the activities of the settlers are pretty well confined to stock-raising, and with beef selling at a price below cost of production, except under the most favourable conditions, their position to-day is not good. This valley, in conjunction with the Beaver Lake District, will probably develop into a dairying and mixed-farming section in a very short time. The creamery

at Quesnel is now an assured success, and cream is being shipped in from points down the railway as far south as Forest Grove; it will be necessary for the settlers in the Beaver Lake section to have some arrangement among themselves for the delivering of cream to the railway. When the district does make development along these lines it will be one of the most prosperous farming sections in the Province.

GAME.

Throughout the season we were working in a good game country; in fact, big game, moose, bear, and deer, are decidedly on the increase at the present time; the moose continue to drift southerly. Eleven years ago I worked on Bowron River, and the "moose country" did not then begin within 50 miles of Bowron Lake; about eight years ago they began to become plentiful around Bowron Lake and on the North Fork of Quesnel River; this year I saw two on the Cariboo Road south of Soda Creek, and they have been seen at Clinton and Alexis Creek. I do not think it is so much a case of changing their haunts, as there is no report of them becoming scarce in the northern country, but probably they are becoming more plentiful from natural increase and ranging over a larger area. The moose is in the happy position of being a good fighter, and well able to protect itself against natural enemies.

In the Barkerville area a number of big-game hunters were in the bush this fall, and the district becomes more popular each year as a hunting-ground.

There seem to be more deer throughout the district this year than for some time past; caribou are reported as holding their own. Bear are quite numerous, grizzlies being frequently seen in the Barkerville section and black bear being numerous throughout the whole district.

Of fur-bearing animals there is a diminution, beaver and musk-rats being plentiful, but otter, marten, weasel, mink, fox, and fisher being decidedly scarcer that they were a few years ago. Coyotes, which used to be a great pest in the country, have decreased considerably.

Grouse, which were scarce for several years, are once more becoming very plentiful and coveys of prairie-chicken are frequently seen.

The rabbit, a very valuable aid to economy, is once again with us, and there is less worry concerning the winter's grub-stake than has been the rule.

Throughout the district there are numerous streams and lakes in which the fishing is good, trout being the most-sought species. On Upper Bowron River there are schools of kokanees. Salmon are under the ban and have been fairly scarce during the past few years, but they seem to be rather more plentiful than latterly in this district. In the Fraser River there are sturgeon and ling. In some of the streams there are myriads of suckers, and in these it is noticeable that trout are becoming quite extinct. Whitefish are fairly plentiful in some lakes and streams.

GENERAL.

Conditions in the district during the past year have not been good, though there has been little unemployment. Those settlers who have dairy stock are making a living. The stock industry is at a standstill owing to its low prices. A sawmill has operated at Quesnel throughout the season. The mining industry has been more active than usual, a number of men being in the hills prospecting. The Penobscott claim on Cedar Creek has been a good producer all year, and the Kitchener Mine on Keithley Creek should show good return. It will be rather strange if other workable ground is not struck in the Cedar Creek area in the near future, as it seems unlikely that rich ground will be found in one spot and nothing of much value elsewhere in the locality—rather contrary to placer experience.

Generally I see no reason for pessimism in regard to the future of the Cariboo and Lillooet Districts. They contain a large aggregate area of very productive agricultural land, with abundant summer range, and both districts are well adapted to mixed farming. Pulp-milling, tie and pole timber are to be found in large quantities, and given favourable transportation conditions the timber industry is bound to develop. Placer-mining will continue to be carried on for a number of years and quartz prospects are encouraging. The non-metallic mines will produce soda, magnesite, and epsomite as required; they will probably continue to work intermittently as market conditions warrant.

Climatically the Cariboo District is not one subject to extremes. The depth of snow varies from 1½ to 3 feet in winter; the winters are usually pleasant, with occasional cold snaps, but

comparatively little wind; in summer extreme heat is unusual, 80° to 90° being the extreme. There is usually ample rain during the summer to ensure good crops, though, as is common to all countries, there is occasionally a long dry spell.

I have, etc.,

Rupert W. Haggen, B.C.L.S., D.L.S.

NORTH LILLOOET DISTRICT.

By R. C. Farrow.

Vancouver, B.C., October 10th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report on the surveys made by me this season in the North Lillooet District:—

I left Vancouver with my party on May 29th, and proceeded via Pacific Great Eastern Railway to Clinton, my point of organization. I picked up my truck and supplies here and proceeded by road to Green Lake, where I made my first camp.

General.

My work this season was scattered over a very large area, extending from Green Lake on the south to a few miles north of the Cariboo District boundary on the north, and from Sheridan and Canim Lakes on the east to 141-Mile House on the west. This involved long and frequent moves, though fortunately, for the most part, they were over good roads. I had altogether twelve camps and moved my outfit over about 500 miles of road. I surveyed a total of 10,122 acres, partly the subdivision of 640-acre lots and partly original surveys. In addition, I made a number of tie traverses and check surveys, running a total of 115 miles of line.

Southern Portion of Work.

The southern portion of the work—that is to say, all which lay south of the 100-Mile House—was scattered over the high undulating plateau which, roughly speaking, commences along the line of the Bonaparte River–Kelly Creek and stretches away to the north-west; bounded on the east by Bridge Creek and the San Jose Valleys and on the west by the Fraser River. This plateau varies in elevation from 3,600 to 4,500 feet; it rises very gradually from the south and west, reaching an eminence in the neighbourhood of the 83-Mile House, where two rocky butts rise on either side of the Cariboo Road, Mount Begbie on the east and Mount Rosemary on the west, the latter having an elevation of about 4,550 feet; from here north-west it undulates with about the same average elevation of 3,900 feet, except where it is broken by creek-valleys.

Practically the entire plateau is of glacial origin, having a drift-soil, very stony in places, sometimes boulders and sometimes rock in place; this varies in places to a deep clay soil, there being practically no difference between the surface and subsoil, except in the meadows. The plateau is almost uniformly timbered with jack and lodge-pole pine, with occasional patches of fir.

The only lands of any value for settlement in this area are wild-hay meadows, which are dotted about over the entire area and vary in size from mere pot-holes of 1 or 2 acres to extensive meadows. Practically all these meadows are the result of beaver working and without them this area would be useless for any form of ranching or farming. The work of these industrious little animals, past and present, is therefore of great economic value. They are still to be found there in considerable numbers, despite the yearly toll which the trappers take.

It is upon the meadows that the ranchers rely for hay for winter feed for stock, as it is impossible to raise crops at that altitude in such a northerly latitude, even if the soil and water were adequate. Potatoes and other vegetables have been tried, but without success.

If this area is to be populated, therefore, it will be necessary to locate and survey all the existing wild-hay meadows and improve the ones already taken up with a view to increasing the hay-crops. As I was directed to some and found others myself within a few miles of the Cariboo Road, between 83-Mile Creek and 93-Mile Creek, it leads one to believe that numerous other meadows must exist in the large unmapped portion of the plateau which lies between the

Cariboo Road and the surveyed land along the Fraser River. This assumption is partly justified by reports which I have received from trappers to the effect that in their trips over their trap-lines in winter they have come across extensive open areas, although, of course, as they were covered with snow, they were usually unable to tell whether they were lakes, meadows, or muskegs.

It is extremely difficult to locate meadows in such a country, as one may pass within a few chains of one without seeing it, and there are no eminences of sufficient height to locate them from. I found it slow work cruising the country on foot looking for them, and it would be scarcely quicker, though certainly easier, to do it on horseback. The ideal way of locating them and noting their position for future reference would be from an aeroplane by photographic resection.

DETAILS OF WORK ON THE PLATEAU.

Commencing work at Green Lake, along the North Bonaparte Road I subdivided nine sections, according to instructions; they are in undulating country, timbered with pine and some fir on a glacial drift-soil, very stony in places; the average elevation is about 3,750 feet. Scattered through the timber are a number of meadows of various sizes, this year mostly dry and therefore having a sparse growth of grass, but in normal years they would probably be wet.

I then moved north-east to Sheridan Lake and subdivided two sections, both of a similar nature to those in the vicinity of Green Lake. The only land of any value on them is under application.

I then moved west again to the Cariboo Road and up to the 74-Mile House, where I tied in Lot 4420 to adjoining survey. Moving on to the 83-Mile House, I surveyed one Government lot on 83-Mile Lake; it contains a large wild-hay meadow.

Moving on again, I camped about 1½ miles west of the 87-Mile House, which is now deserted. In this vicinity I surveyed ten Government lots, all but one lying to the west of the Cariboo Road; all contained wild-hay meadows of various sizes. This portion of the plateau is only very slightly undulating and has a slight westerly slope. It is dotted with numerous small lakes, most of them drained by a creek which flows in a westerly direction and appears to be the headwaters of Dog Creek. Those lakes which are not thus drained are slightly alkaline. The average elevation here is about 4,100 feet. The soil is a deep clay; there is no surface soil or humus to speak of. The country surrounding the meadow is densely timbered with jack-pine.

I then moved on and camped on 93-Mile Creek. From here I surveyed six more Government lots, all containing large meadows; four of them are situated on 93-Mile Creek and the other two on the Cariboo Road at about 90-Mile. The country here is exactly similar to that about the 87-Mile House. This completed my work on the high plateau country.

NORTHERN PORTION OF WORK.

From 93-Mile Creek I moved through the 100-Mile House and up Little Bridge Creek to the west, where I surveyed a Government lot containing a small meadow and a lot of excellent willow bottom. In the course of this work I found it necessary to remake the tie between Lot 253 and Lot 278. The lot which I surveyed here, No. 5310, takes in the only remaining land of any value along Little Bridge Creek.

Having completed my work here, I moved out again to the Cariboo Road and up to the 108-Mile House, where I camped. From here I surveyed one Government lot about 4 miles to the north-east, adjoining Lot 4209 to the west. I then moved on to the 141-Mile House, where I surveyed P.R. 2037 as Lot 8114, Cariboo District. Having completed that, I retraced my steps as far as the 122-Mile House, and from there tied in Lot 355 to Sections 31 and 32, Township 28, according to instructions.

From the 122-Mile House I continued back along the Cariboo Road to the 100-Mile House, and thence in over the Canim Lake Road, and camped on Bridge Creek inside the Indian reserve (No. 1). Here according to instructions I checked up the encroachment of the adjoining surveys to the west and adjusted the intersection posts accordingly. It was not my original intention to do any work on the south boundary of the reserve, but as a deputation of Indians awaited on me and complained that Lot 5044, situated about the middle of the south boundary, encroached on the reserve, I decided that it would be best for me to check that also whilst on the ground. I found no encroachment, however.

I next moved by pack-train via Ruth Lake up Bradley Creek, across the divide, and camped on the Cariboo–Lillooet District boundary, adjoining Lot 9105. Here I surveyed six Government lots, four in Cariboo District and two in Lillooet. Of these two, Lot 5313 contains a large shallow beaver-pond, with a large muskeg meadow at its head. This would well repay draining and clearing up, as it would make an excellent hay meadow. The other five lots are all of a similar character, consisting of a certain amount of willow-bottom land and slightly sloping hillside, heavily grown with poplar and willow, with soil throughout a deep loam.

This completed my work for the season.

CHARACTER OF COUNTRY—FOREST GROVE AND BRADLEY CREEK–MURPHY LAKE.

Going east from the 100-Mile House on the Cariboo Road, the country undergoes a marked change by the time the Forest Grove area is reached. Situated in the valley of Bridge Creek, which here is wide and deep, the natural growth is fairly heavy, consisting of fir, some pine, poplar, birch, willow, and alder. This indicates that the rainfall is considerably heavier than along the Cariboo Road; and such, in fact, is the claim of the local settlers. The country is somewhat broken into undulating benches, all sloping more or less towards Bridge Creek.

There is quite a large settlement in this area now, somewhere in the neighbourhood of a hundred families. With the exception of one or two of the older ranchers, all are going in for mixed farming and dairying.

All kinds of tame hay, wheat, barley, and oats, field roots (swede turnips, mangels, etc.), potatoes, garden-truck, and small fruits are all grown successfully.

Practically no wild-hay meadows exist, so that all the land has to be cleared, and as the clearing is fairly heavy it precludes successful stock-raising, although some of the ranchers keep small herds and stall-feed, thus producing small amounts of high-class beef.

The district boasts of three small stores, a school, a post-office at Forest Grove, about 3 miles west of the Indian reserve, and another post-office at the west end of Canim Lake. It is served by an excellent road from the 100-Mile House and Exeter Station, on the Pacific Great Eastern Railway.

North of the Forest Grove area lies Bradley Creek and Murphy Lake. Bradley Creek flows through a comparatively narrow valley, with, however, a strip of excellent land along the bottom, interspersed with occasional meadows. At present there are only three settlers in this section, the development of which has been retarded through lack of a road. These settlers have to resort to pack-horses for transportation. Despite this drawback, seven families have gone into Bradley Creek Valley this summer. They are a splendid type of settler and trekked in from Oregon with complete outfits, including stock and poultry.

The valley of Bradley Creek continues north beyond its headwaters right to Murphy Lake. A number of small creeks rise in it and tributary valleys and flow down to Murphy Lake. The divide between them and Bradley Creek is almost indeterminate. From the headwaters of Bradley Creek, for about 3 miles up the valley, there is no land of any value for settlement. Then from a short distance this side of the Cariboo boundary the valley widens and both bottom and hillsides are excellent land, with a very heavy growth of poplar, birch, willow, and alder, and a luxuriant undergrowth of herbs and weeds. The rainfall here is evidently even heavier than in the Forest Grove area, and, as at Forest Grove, irrigation should prove unnecessary. There is only one family above Bradley Creek at present, though R. H. Vaughan, the settler who is there, informed me that he was expecting several friends in there next year.

Mr. Vaughan had a number of different small experimental crops in—wheat, barley, timothy, and clover, alfalfa, field roots, and garden-truck. All have done extremely well, the stand of wheat in particular being very heavy.

The elevation here is about 2,900 feet, about 100 feet lower than Forest Grove Post-office. Murphy Lake is about 2,700 feet.

TRANSPORTATION.

The whole area through which I worked this season is served, as to its main traffic arteries, by the Pacific Great Eastern Railway and the Cariboo Wagon-road, which parallel one another from Clinton to Williams Lake. While the railway does not give a service which entirely satisfies the settlers, it has undoubtedly been the means of speeding up settlement and gives the settlers a measure of transportation which could not be done over long miles of road.

The Cariboo Road I found in splendid condition, and while not as much travelled as in former days, it still has a considerable traffic. A daily motor-stage operates both ways between Ashcroft and Williams Lake.

As feeders to the railway and Cariboo Road, there are various sideroads which tap the outlying settlements; notably the North Bonaparte Road, the Lone Butte Road, and the Canim Road, all of which were in very fair condition this year. Some of the smaller side-roads, however, are very poor, although, of course, allowance must be made for the sparcity of settlements.

CLIMATE.

The climate of the area over which I worked varies considerably. South of the 100-Mile House on the high plateau the summer is short and the rainfall very slight. Summer frosts are a frequent occurrence. The winters are more or less severe. Farther north, in the vicinity of the 100-Mile House, Lac la Hache, and down the San Jose Valley, which, of course, is from 400 to 700 feet lower than the plateau, the summers are longer, summer frosts are fewer and less severe, though the rainfall is about the same.

Along Bridge Creek, in the Forest Grove and Bradley Creek areas, as mentioned before, the rainfall is very much heavier. They have a good growing summer and summer frosts are slight and more local in their occurrence. The snowfall here is considerably heavier than farther west and the winters less severe. All this is probably on account not only of the lower altitude, but also on account of the protection which is afforded by the high mountains which lie to the north and east.

GAME.

Throughout the high plateau country game is still fairly plentiful, despite its accessibility from the Cariboo Road. Small fur-bearing animals, as well as beaver and lynx, are found, and trappers work through the country in the winter. West of the Cariboo Road there are bear and a few deer and moose. Grouse were fairly plentiful throughout the district this year.

In the Forest Grove–Canim Lake–Bradley Creek country the game is plentiful; practically all the fur-bearing animals native to British Columbia are found there. Beaver are very numerous. Bear, moose, and deer are also very plentiful. There is excellent fishing in both Canim and Murphy Lakes—rainbow, silver, and cut-throat trout and ling.

CONCLUSION.

The area over which I worked this summer will never be intensively settled owing to its nature, but it is capable of a very much greater development than at present exists. On the high plateau it is probable that for a great many years stock-raising will be the only form of ranching which can be profitably followed. In the valleys, and particularly to the east of the Pacific Great Eastern Railway, there are, however, many localities which are suitable for mixed farming, dairying, and poultry-raising, such as Sheridan and Bridge Lake, Bridge Creek Valley, Forest Grove, Bradley Creek, and Murphy Lake. In order, however, to foster this development, more and better roads, giving access by the shortest possible routes to the railway, are a necessity. The establishment of creameries would also be a big aid to development. A number of ranchers have tried shipping cream to both Quesnel and Vancouver, but the existing express rates render it hardly profitable. If local creameries were established at convenient points for both collection and shipping, there is no doubt but that the finished products could be profitably shipped. The distance of this country from the nearest markets can thus best be overcome.

I have, etc.,

R. C. FARROW, B.C.L.S.

CHILCOTIN VALLEY, CARIBOO AND LILLOOET DISTRICTS.

By W. Merston.

Victoria, B.C., November 1st, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to report that in accordance with your instructions I left Victoria on May 29th to carry out my surveys for the season. My work this year consisted of linking up previously surveyed lands in the Chilcotin by means of transit traverse. In this connection I have joined forty-five lots by running 170 miles of tie-line. The majority of the lots tied in were shown on the map in approximately their correct positions, but some, as in case of Lot 556, were shown about 6 miles out of place, while Lots 239 and 240 were shown on the wrong side of a range of hills. In addition to running tie-lines, I surveyed eight lots containing 1,290 acres of good-quality wild hay.

Williams Lake.

I travelled to Williams Lake again this year by the Pacific Great Eastern Railway. This line is now much more comfortable to travel on than it was last year. The trains keep more to schedule, enabling passengers to get their meals at regular intervals. With addition of a sleeping-coach the two days' journey from Vancouver to Quesnel would be comparatively comfortable.

I outfitted at Williams Lake, getting my first month's food from Fraser & Mackenzie, who have the largest general store in the district.

Williams Lake is now a thriving railway and outfitting village and is to the Cariboo country much what Ashcroft was before the days of the Pacific Great Eastern Railway, when all travel came into the country by the Cariboo Road. During my short stay I noticed three hotels, three or four general stores, two banks, a drug-store and a butcher-shop, a garage, a barn, a church, a school, and a Government Liquor Store.

The professions are well represented by two lawyers and a doctor, while a land surveyor has opened up a branch office. The Government offices formerly at the 150-Mile House are now located at Williams Lake, and a fine new building has been erected to house the Government Agent and his staff.

Good motor-roads radiate in all directions from Williams Lake, with motor-stages running to Ashcroft, Quesnel Dam, and the Chilcotin.

Beecher's Prairie.

My first work took me through a country locally known as Beecher's Prairie. Here thousands of cattle graze all summer on open lands dotted with small lakes and scattered poplar. This country was surveyed into townships some years ago and put under reserve to be used as a common grazing area by cattle-ranchers in the vicinity. A large portion has been set aside for a military area, and in days to come should be a valuable asset to the Dominion Government.

On completing my first ties we travelled westerly across the open prairie to the Stack Valley Road, then followed up this to Shell Creek and on up Macklin Creek, where five old surveys were seen tied together. There are several settlers along the Stack Valley Road who appear to be doing well with small bands of cattle. The meadows covered by surveys up Macklin Creek have been taken up by a rancher named McRae, who has built wagon-roads to connect his various holdings, and this year has constructed a new road from his pre-emption (Lot 5780) to some meadows he has purchased on Narcosli Creek. The country along McRae's Wagon-road between Callanan Lake and Narcosli Creek is very stony and, with the exception of many small scattered meadows, is valueless. I estimated that between Lots 182 and 5780 there are approximately 640 acres of good meadow land which, if surveyed, will one of these days be taken up. At present these surveyed meadows are being used by McRae. The cattle in this vicinity had a hard time last winter and in one spot twelve carcasses were seen lying together. A large brown bear had made this place his headquarters and was living on the dead meat.

Macklin Creek.

On completing the ties of McRae's meadows we moved to the Straus meadows (Lot 179), and then ran a tie-line connecting this meadow with Moon's meadows (Lot 383) on Macklin Creek. The wagon-road joining these meadows follows up the South Fork of Riske Creek, which

flows through a narrow gorge with steep jack-pine-covered side-hills for about 3 miles, then climbs about 200 feet in half a mile to Macklin Creek.

The local Indians have constructed a dam across Macklin Creek and divert water into the South Fork of Riske Creek by means of a ditch about half a mile long. They take water out of the South Fork of Riske Creek again at the Toosey Indian Reserve No. 2 and use it to irrigate their lands. All the good land around here has been alienated and there is no land worth surveying in this vicinity.

RAVEN LAKE.

Some 4 miles south-east of Moon's meadows (Lot 383) and across a range of hills are a group of surveys covering Durrell's meadows. A good wagon-road connects these and runs in a south-eastern direction to the main Chilcotin Road at Harpers Lake. I connected these meadows by tie-line and at the same time traversed part of the westerly shore of Raven Lake. The lake lies at an elevation of approximately 4,000 feet; it is a mile wide and three-quarters of a mile long. No streams could be found either entering or leaving the lake, which must be fed by underground springs and snow-water. The general lake-level is slowly sinking and in years to come the lake-bottom will turn into a wild-hay meadow.

The group of meadows around Raven Lake are all wild swamp-hay meadows surrounded by small jack-pine-covered land which is valueless for agriculture. On completing my ties here, I moved back to main Chilcotin Wagon-road and then on through Hanceville and Alexis Creek up the Chilcotin River as far as the Siwash Bridge.

NEWTON'S WAGON-ROAD.

The road across the Chilcotin at the Siwash Bridge has fallen in and some difficulty was experienced in getting my wagon across the river.

Mr. Newton, an old-time rancher, has built a good wagon-road from the Siwash Bridge to his hay meadow near the Nemiah Valley Road. The road leaves the Chilcotin River and climbs about 900 feet to the general level of the surrounding country, which about here is approximately 3,000 feet, then runs 23 miles due south through small jack-pine-covered land. The soil is very rocky and with the exception of two small pot-holes there is no water or horse-feed along the road. The people who use the road make the drive from Newton's meadows to the Chilcotin River in one day. About a mile to the west of Newton's meadow is a bare hill rising some 300 feet above the level of the surrounding country and locally known as Newton's Mountain. On the top of the hill Newton has staked a mineral claim and has done some development-work, taking out ore containing gold, silver, and copper. The claim has not been sufficiently developed to give any idea of its future value.

From Newton's meadow a new wagon-road has lately been constructed by Indians, giving access to the Nemiah Valley Road, which runs from Hanceville to Whitewater Crossing and then on into the Nemiah Valley. The road is not very good, but passable by a Ford car. All the meadows along this road have been taken up and the few isolated patches of dry open land seen were not considered worth surveying.

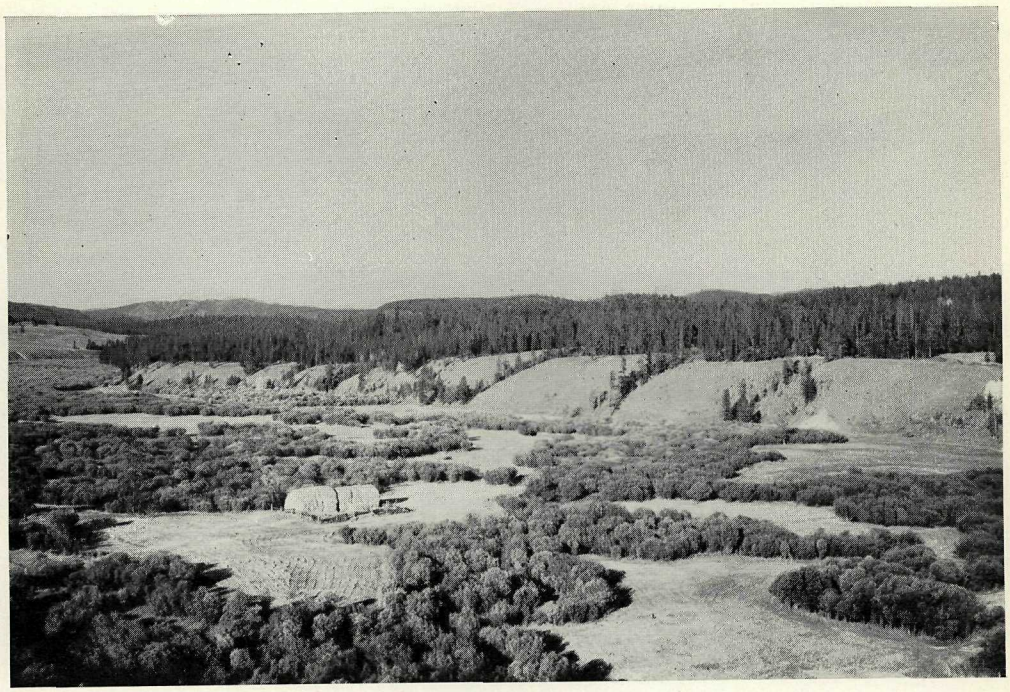
ANAHIM CREEK.

My next work took me to Macaulay's meadows on the South Fork of Anahim Creek. The best of the land in this valley has been taken up for some years, but there are one or two open flats, in all about 640 acres, which I consider worth surveying.

The South Fork of Anahim Creek is a small stream sunk about 20 feet below the level of the surrounding jack-pine-covered country. At the head of the South Fork of Anahim Creek is a large level swamp which with draining could be turned into good hay land. Macaulay used to cut hay here, but has not used it lately. All the meadows in this vicinity are fenced with the fences built well outside the survey-lines on Government land. The Indians know this and make a habit of leaving gates open and bars down so their cattle and horses can get feed. This summer several meadows were completely spoiled in this manner and no hay could be cut on them.

PELICAN LAKE.

From one of Macaulay's meadows, Lot 148, a wagon-road runs to the north-east. I followed it up for a distance of about 12 miles and came to a large lake not shown on any map, but locally known as Pelican Lake. I estimated this to be about 4 miles long and in places 2 miles wide.



Hay meadows, headwaters of the Nicola Basin.

Typical Chilcotin meadow.

There are two small islands in the lake which were covered with pelican and in the distance looked like white ships in full sail. This lake, although containing no fish, but heaps of frogs, is the headquarters of the pelican for the whole of this part of the country. Flights were seen leaving Pelican Lake daily, travelling north to the Nazko and west to Chezacut Lake.

Both to the north and to the east of Pelican Lake are extensive hay meadows used by the Indians. On one meadow alone are 640 acres of level land on which more than twelve large haystacks were counted. In this vicinity I estimated there are about 2,000 acres of hay lands worth surveying. The drawback to this country is that it lies at an elevation of about 3,800 feet and would be very difficult to irrigate. Pelican Lake derives its water almost entirely from the winter snow, and if used for irrigation purposes would soon dry up, as there are no streams either entering or leaving the lake. A good wagon-road runs along the east shore and continues about 4 miles to the north of the lake, running through and joining up hay meadows.

The Indians from the Anahim Indian Reserve seem to look on these meadows as an extra Indian reserve. No Indian leases or application for leases appear to cover any of the meadows in this vicinity, and the sooner these lands are surveyed, the less chance will there be of friction at some future date with the Indians. I spoke to several families who were cutting hay and told them that most likely the Government would survey these lands next year. No objections were raised.

Upper Alexis Creek.

On completing my work around Pelican Lake, we moved up Alexis Creek and on to Bell Creek, where I surveyed a pre-emption belonging to an old-timer called Bayliff. The wagon-road from Alexis Creek Road to Bell Creek was the roughest piece that I encountered this summer or that I have ever encountered. Indians will not take a wagon over this road without extra pay, and Bayliff has never been known to get to his meadow without breaking a wheel or a king-pin. We were comparatively lucky and escaped with a broken queen-rod.

There are six surveys on Bell Creek covering good hay meadows. Between these surveys are small pot-holes which also grow good hay and have been cut in the past when hay was scarce.

Moving on up Alexis Creek, past Alexis Lake, we followed a fairly good wagon-road past Morgan's place (Lot 4837) and on to a pre-emption taken up by John Maindley. I surveyed two parcels here. The land is not much good and only a few acres of the parcels I surveyed will grow even hay. Maindley appears to have taken up these two pieces to be in the vicinity of his friends rather than for the agricultural possibilities of the land. There are several small unsurveyed meadows around here which I did not have time to survey this season.

Tautri Lakes.

I picked up my last six weeks' food-supplies at Tom Lee's store at Alexis Creek and moved up to the Isaac meadow (Lot 531). I then ran a tie-line from the Spring meadow (Lot 8342) through to Martin's half-way meadow (Lot 554) and on to Martin's far meadow (Lot 352).

About 4 miles south of Martin's half-way meadow a wagon-road passes an old cabin and barn built near Tautri Lake by Long Johnny. I triangulated Tautri Lake and found the three sheets of water to be about 7 miles long and not more than a quarter of a mile wide. The water is very shallow and will eventually dry up from the accumulation of decaying vegetable matter. Some years ago these lakes were comparatively deep, now it is hard to float a raft on them, and in years to come they will turn into wild swamp-hay meadows.

Along the northern side of the first lake is a dry patch of open hay meadow where Long Johnny cuts his hay for the winter. He was very anxious for me to survey this piece for him and insisted that he should pay for it himself. He had an idea in the back of his mind that, although he had no claim to the land, the payment of the survey fees would give him some sort of a title. When I explained to him that I was only surveying for the Government and that I could not take any pay from him, he remarked: "Government no good; they take my land from me." As he has no claim to this piece I did not dispute his statement, especially as he remarked that he was not feeling well and that he thought he would die this winter.

Along the north side of Tautri Lake runs a good pack-trail to McComb's meadow (Lot 9696) on Narcosli Creek and then on to McRae's meadows (Lot 9697). At the end of these meadows is a small lake that corresponds to the lake that Lieutenant Palmer marked on his old maps as Taharti Lake. It is probable that McRae's meadows were at one time part of this lake, which would then correspond very closely to the size and shape of Taharti Lake as shown on the old

maps. According to the Indians, there is no other lake anywhere in this vicinity that could correspond at all with Palmer's Taharti Lake.

At the west end of Tautri Lake there are about 400 acres of land worth surveying. About 6 miles to the north of Tautri Lake I surveyed four parcels of good hay meadow which I found last year. Indians at one time or another have built a wagon-road into these meadows and put up a small quantity of hay. One large meadow containing approximately 320 acres of open land would require draining before any hay could be cut. The lie of the land is suitable for easy and cheap drainage.

GAME.

I saw more game this summer than I have seen during the past three seasons. Willow and Franklin grouse were very plentiful and made a welcome change to our usual diet of pork and beans. Prairie-chickens are not allowed to be shot this season and are multiplying very quickly. Several coveys containing from twenty to thirty birds were seen on the open lands north of Alexis Creek. About 10 miles north of Alexis Creek mule-deer are plentiful, and the Indians, with dogs, have no difficulty in getting one any time they wish. Moose are on the increase; fresh tracks were seen almost daily. With the hard winter last season and consequent death of many cattle the brown bear were numerous.

I have, etc.,

W. MERSTON, B.C.L.S.

NORTH THOMPSON VALLEY, KAMLOOPS DIVISION OF YALE DISTRICT.

BY O. B. N. WILKIE.

VICTORIA, B.C., January 19th, 1923.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—Having received your instructions to carry out certain surveys in the Nicola and North Thompson Valleys, I have the honour to submit the following report:—

Having organized my party at Merritt, in the Nicola District, from which point I completed the surveys assigned to me there, we left for Badger Lake, in the North Thompson Valley, where some resurveys were carried out. On completing the work at Badger Lake we moved camp to Mud Lake, near Blue River, stopping at Louis Creek en route to survey a pre-emption at Fishtrap Creek and an application to lease near Louis Creek.

We arrived at Blue River, a station on the Canadian National Railway, where a canoe was obtained from Mr. Horne, the Forest Ranger, by which we moved our camp outfit down the Thompson and up the Mud River to Mud Lake and camped. A triangulation was made of Mud Lake and a returned soldier's pre-emption surveyed. High water and smoke delayed our operations here to some extent.

From Mud Lake the party was moved to Raft River, where several lots were laid out for settlement and a general traverse of the valley made and tied to existing surveys in the North Thompson Valley, near the mouth of Raft River, and also to Lot 2606, east from Irvine Station.

After completing the work on Raft River the party was reduced and some isolated surveys were made at Blackpool, Alex Creek, Blackpines, and Clapperton Creek, Nicola. The latter work completing my instructions, I disbanded the party at Merritt. The following is a general description of the country covered:—

MERRITT.

Merritt, at an elevation of nearly 2,000 feet above sea-level, in the Nicola Valley, is a city having a population of about 1,500 situated on a branch of the Canadian Pacific Railway 40 miles from the main line at Spences Bridge. This branch line connects Spences Bridge with the main line of the Kettle Valley Railway at Brookmere. At Merritt coal-mines are operated and also several sawmills. A great deal of farming is carried on in the vicinity and cattle-ranching in particular. The land mostly requires irrigation. In addition to cattle and general farming, there are several silver-black fox farms, some of which have been operating many years. Good roads radiate from this locality in all directions.

North Thompson Valley.

The principal town in this vicinity is Kamloops, which is situate at the junction of the North and South Thompson Rivers. The Canadian Pacific Railway main line follows the South Thompson and the Canadian National Railway has its route along the North Thompson. Both are transcontinental lines and both run into Kamloops. Kamloops, which has an elevation of 1,150 feet above sea-level, is the centre of a large farming district as well as being a divisional point for the railways. It is about ten hours' run from Vancouver.

Good roads radiate in all directions, some of which run up the North Thompson Valley as far as Avola, a distance of 130 miles from Kamloops, and I understand surveys are being made with a view to extend the road system farther on. Free ferries are operated by the Government at Vinsulla, McLure, Chinook Cove, Mount Olie, Blackpool, Raft River, Birch Island, Vavenby, and Avola to give settlers access to the railway. The main highway from Kamloops up the North Thompson crosses the river on a bridge at Barriere. The lower portion of the valley is well settled and the district is dotted with good farms and comfortable homes. General farming is carried on, but more attention is given to stock-raising.

The soil is mostly sandy loam and requires irrigation. The valley is about a mile wide, but widens near its junction with the South Thompson at Kamloops. The timber is principally pine, fir, poplar, alder, and willow for a distance of 50 miles up the river, after which the character of the country changes; it has more underbrush, cedar-trees show up, and there is more moisture generally. The soil is sandy clay on the bottoms, becoming more gravelly on the benches. The hills on each side of the lower valley are fairly well timbered and afford good pasture. Some good farms are scattered through the adjacent valleys. Near Raft River Crossing considerable attention is given to the growing of strawberries and potatoes are of a splendid quality.

Settlement is more scattered beyond Vavenby; this may be due to the fact that the clearing is harder and not that the soil is less fertile. From Avola to Blue River little settlement was noted.

Mud Lake.

Mud Lake (elevation 2,100 feet) is situated across the North Thompson about 2 miles from Blue River Station, on the Canadian National Railway, and can be reached only by boat or canoe. It is a nice stretch of water about 5 miles long, surrounded by timbered mountain land. Its shores are rocky and little agricultural land will be found, except at the east end, where the Mud River enters the lake. On this land some wild-hay meadows were found, but generally there is a growth of scrub fir, spruce, cedar, and alder.

Many large dead trees are standing in the bottoms, evidently killed by too much water. The soil in the bottoms is a clay silt and gravel subsoil. A peculiar point about the Mud River is that the main channel is on the high side of the valley, and at high water the overflow runs across the valley to the south side. The country was inundated when we were in there at end of July.

Raft River.

Raft River empties into the North Thompson from the north at a point about 75 miles from Kamloops. Birch Island Station, on the Canadian National Railway, is the nearest station; from there a fair wagon-road crosses near the mouth of Raft River and continues south along the Thompson Valley to Kamloops. The distance from Birch Island to Raft River is 5 miles. From the wagon-road a rough trail was cut following the Raft River Valley on the north side for 15 miles, at which point it crosses to the south side and joins the trail from Irvine. The trail reaches an elevation of 1,200 feet in order to avoid a deep canyon some 4 miles long. About 8 miles up the Raft River the valley widens and some good bottom land from a quarter to three-quarters of a mile wide will be found. The soil is principally sandy clay with gravel subsoil.

The lower part of the valley and above the canyon has some good patches of timber—fir, spruce, cedar, and balsam—but the valley generally has been subject to heavy fires, which has either burnt or killed the adjacent timber. A great deal of timber has fallen, between which a second growth has come up and makes clearing expensive. In places vegetation is very rank; fireweed, skunk-cabbage, berries, and grasses predominate.

About 15 miles up the valley is about 1½ miles wide. In this vicinity I cut some ten parcels for settlement. This land has been burnt over; in some parts fairly clean, but the most

of it is covered by windfalls and second growth. The soil is sandy clay on the bottoms and gravelly clay on the benches.

The elevation in this vicinity lies between 2,300 and 2,500 feet above sea-level. From Lot 4700, one of the parcels surveyed, a trail has recently been cut to connect with the North Thompson Wagon-road on Lot 2606; this lot is about 2 miles east from Irvine Station, on the Canadian National Railway. The distance by this trail from the wagon-road to Raft River is 5 miles. The trail rises 1,500 feet to summit of ridge; then descends 800 feet to Raft River Valley, where there is between 2,000 and 3,000 acres of good land.

From Lot 4700 up the river many log-jams have formed, which tend to divert and make new channels for the river. The river forks about 20 miles from its outlet, after which the valley narrows down, being not more than a few hundred feet wide in places.

The mountain-slopes adjoining are steep and mostly burnt over. In the river small brook-trout are plentiful, but in Skunk Lake (a small lake about a mile above the forks) the fish are much larger (averaging 1½ lb.) and are also very plentiful. A trail was cut from this lake to connect with trail from Lot 2606 near Irvine.

Except for old pre-emptions near mouth of Raft River, no settlement has been made in the valley, probably due to its timbered nature and the lack of trails. Raft River is a clear, fairly swift stream about 100 feet wide and has its source in the high mountains.

I am informed game such as moose, caribou, deer, bear, cougar, and coyote are found, as well as many fur-bearing animals, such as beaver, mink, skunk, and ermine. No frosts were noticed till late in September; the snowfall is said to be between 2 and 3 feet.

I have, etc.,

O. B. N. WILKIE, B.C.L.S.

SOUTH-WESTERN LILLOOET DISTRICT.

BY G. M. DOWNTON.

LILLOOET, B.C., September 6th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on the area covered by my survey operations in the Southern Lillooet District during the past season:—

My work this season consisted of ties in the vicinity of Empire Valley and Dog Creek; the survey of a pre-emption and some vacant Crown land north of Alkali Lake; some leases and vacant Crown land near Big Bar Lake; subdivision of two sections of land which have reverted to the Crown, and which are needed for settlement, north of Meadow Lake; vacant Crown land on Pigeon Creek, between Meadow Lake and Dog Creek; vacant Crown land at Jesmond; additions to the townsite of Lillooet; vacant Crown land on the Bonaparte River and Loon Lake Creek, and the subdivision of a reverted section on the latter creek; and finally the re-establishment of two timber leases on the Birkenhead River, the boundaries of which were in question owing to poor definition and survey, and a tie on Anderson Lake to a previously established triangulation point.

The whole of the above surveys, with the exception of those in the townsite of Lillooet, at the Bonaparte River, and at Anderson Lake, are in a territory confined almost entirely to cattle-raising, and which is, owing to the general altitude and distance from markets, unsuitable at present for any other agricultural industries, excepting possibly the raising of sheep.

The lowest altitude of any of the surveys carried out in the area above mentioned was at 2,000 feet on the Bonaparte River, the highest at Jesmond, 3,900 feet, while the average altitude of the surveys near Meadow Lake is 3,700 feet. This limits the area to the raising of hay and oats where water is available, and, where it is not, to range, a general term for practically all the area not actually under cultivation or which is not capable of ever being cultivated except under certain conditions of soil and situation under the system of dry-farming.

Such an area can never probably support any but a rather scattered population, as the question of raising enough hay for winter feeding of cattle is the controlling factor where water is scarce and where the lands suitable for raising hay are few and far between, and

separated from one another by miles of dry upland range, and the areas where dry-farming has been carried on with any degree of success are very limited in extent.

My work this year was very scattered and small in extent at any one point, and I therefore took one experienced man with me and picked up local help where necessary. The country is served with passable roads and I was able to use my car with considerable advantage, and thus was able to cut down my travelling time and expenses.

I left Lillooet on May 29th and commenced my work at Lone Cabin Creek. The country in this locality is exceedingly rough and mountainous, but very sparsely timbered.

The soil over a very large area of this country is a light sandy loam, very shallow in most places, on a subsoil of boulder-clay; large water- or ice-worn boulders outcrop in many places, while in others these large boulders lie about on the surface in enormous quantities.

The hills are rounded in outline and covered with timber, except in the case of the Marble Mountains, a considerable limestone range lying parallel to the Fraser River on the east side, whose summits are bare and in some cases very broken and precipitous.

From the summits of this range an extensive view of the plateau to the east and north can be obtained, and the impression gained is one of an immense level plain, densely wooded, and with lakes of a considerable extent dotted about on it. The timber is almost exclusively jack-pine, and the only variation is the fringes of willow which border small swamps and meadows and stunted Douglas fir which crowns the summits of some of the knolls above the main plateau.

The only town in this area is Clinton, at the southern end of the plateau. The Pacific Great Eastern Railway, running from Clinton north towards Williams Lake, passes some distance east of most of the country traversed this summer, but Chasm Station, 12 miles north of Clinton, is the nearest cattle-shipping point for the southern part of the area.

Besides Clinton, there are six post-offices in the area—Jesmond, Big Bar, Dog Creek, Alkali Lake, Springhouse, and 70-Mile House (Cariboo Road). Neither Springhouse nor the 70-Mile House, however, is in the area touched on this summer.

The country round Lillooet is entirely different in character. Here is the narrow valley of the Fraser River flanked by high mountains; the bench lands on each side of the Fraser (the altitude of which varies from 600 to 1,400 feet above sea-level) are suitable for fruit-raising, truck-gardening, and the raising of potatoes and alfalfa. The Pacific Great Eastern Railway traverses the Fraser Valley at this point, and if it is not closed down for financial reasons this valley promises to be a centre of fruit-raising in the near future, as it is the nearest point to the large areas in the north and north-west of the Province, where fruit of all kinds, including water-melons and peaches, can be grown. The climate compares favourably with the Okanagan Valley and the successful raising of fruit has been demonstrated for many years. My work in this area was confined to a small addition to the townsite of Lillooet.

The last area I was in this year was on the south end of the Pemberton Portage, along the Birkenhead River, which flows in an undefined channel through the valley and frequently floods in the early summer. This valley contains some fine timber which is now being logged off, two sawmills having been established here lately. The soil is sand and gravel washed down by the river and does not appear as if it was likely to be of much agricultural value after the timber is logged off.

The Pacific Great Eastern Railway traverses the river and has made the problem of getting the timber out an easy matter.

The last point I touched this season was at Anderson Lake. The agricultural land in this locality is confined to the north end of the Pemberton Portage, which ends at the lake. The lake-shores are uniformly precipitous and rocky and there is practically no land on either side of the lake, which is about 12 miles long, suitable for agricultural purposes.

I finished my work on August 30th and returned to Lillooet on August 31st.

I have, etc.,

G. M. Downton, B.C.L.S.

VICINITY OF PRINCETON, YALE AND KAMLOOPS DIVISIONS OF YALE DISTRICT.

BY P. W. GREGORY.

PRINCETON, B.C., December 2nd, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit herewith the following report on the surveys made by me in the vicinity of Princeton during the past season:—

My instructions were to survey lands suitable for settlement in certain scattered localities within the district, and also certain lands suitable for the cutting of hay at Teepee and Paradise Lakes, etc. As more than half of the work entrusted to me involved the use of pack-horses, I decided to hire the required horses at once and to devote my attention first to that portion of the work, starting with the most distant operations—namely, the survey of the aforementioned hay lands.

We left Princeton on June 22nd, travelling by wagon-road 27 miles to the Harvey Ranch, a small ranch situated midway between the Osprey Lake and Jellicoe Sidings of the Kettle Valley Railway, where the pack-trail leaves the road and climbs northward to the plateau upon which the hay lands are located, 1,000 to 1,500 feet in elevation above the valley.

I examined the hay lands around the Teepee Lakes, the headwaters of Galena and Siwash Creeks and Paradise Lake, and laid off fourteen lots, comprising in area about 1,700 acres, and embracing about 650 acres of hay land. These lands occupy the western end of a high and narrow plateau, known as the Trepanege Plateau, extending easterly to the Okanagan watershed, and bounded on the south by the deep valley containing Hayes Creek, flowing south-westerly to Princeton, with its headwater lakes, Chain, Link, and Osprey, and flowing in the opposite direction to the Okanagan is Trout Creek. On the north the plateau is bounded by the Quilchena Valley. The plateau is approximately 15 miles wide and its elevation ranges, generally speaking, from 4,000 to 5,500 feet above sea-level.

The particular section of it with which we became acquainted in surveying operations is dotted with many small lakes, roughly amounting in total area to about 1,000 acres, about 400 acres being tributary to Hayes Creek and 600 acres to Quilchena Creek. They afford an excellent opportunity of increasing water-storage with very little labour and at moderate cost.

Nearly all the lakes are protected by beaver-dams, and by reason of the flat character of the country surrounding them the streams that drain them are tortuous, meandering sluggishly through willow-swamps and wild-hay meadows. The largest of the meadows surveyed is the Paradise Lake meadow, about 200 acres in extent, whilst the next in point of size is one of the group of meadows at the head of Siwash Creek, approximately 100 acres in area.

The soil in the meadows is excellent, being deep, rich peaty soil. This could be much improved by breaking up and other work upon it and the hay production thereby considerably increased. The meadows should prove of value to the stock-ranchers of the district, particularly when, as during the present year, they find themselves short of feed. For the past few years some of the local cattlemen have wintered their stock at the Siwash Creek meadows. Apart from lakes and meadows, the remainder of the plateau comprises a succession of flats and low hills covered with a light growth of jack-pine and occasional spruce-swamps.

The lakes are very well stocked with trout and excellent sport can be obtained in nearly all of them, well repaying the fisherman the time and trouble taken in reaching them.

The main trail passing through the lands surveyed leads from the Harvey Ranch on the Princeton Wagon-road to Penask Lake and Quilchena Creek. It is undoubtedly a portion of the old Nicola–Penticton Trail, which passed down Trout Creek to the latter town. The country appears to have been a favourite resort of the Indians of a few years ago for fishing and hunting. The remains of old Indian teepees are to be found at several of the lakes, and the Teepee Lakes evidently derive their name from this fact.

On account of the lack of any prior surveys in the vicinity of the parcels laid off, I connected my work to the photo-topographical stations established in the previous year by the Provincial Government surveyors, R. D. McCaw and G. J. Jackson. My only difficulty in making these connections was due to the poor visibility, as intense smoke from numerous forest fires that burned in all directions during the month of July enveloped the hills on which the stations had

been erected. So bad indeed were these fires towards the end of the month, when we were camped at Paradise Lake, that we held ourselves in readiness to break camp at any moment.

Having completed the laying-off of these hay lands, my attention was next directed to the running of a connecting line between an isolated group of surveyed mineral claims on Siwash Creek and one of the near-by camera stations. The mineral claims lie on both sides of Siwash Creek, which at that part of the country runs through a deep canyon forming the west boundary of the Trepanege Plateau. There have been a number of mineral claims located in the vicinity and considerable prospecting-work has been carried out in shafts, tunnels, and open-cuts. The ore is silver-lead and the claims have the advantage of being but 5 or 6 miles from the Kettle Valley Railway. Placer-mining has been carried out on this creek for the past thirty years.

My remaining operations comprised the survey of lands suitable for settlement on Red Creek, a tributary of Hayes Creek 8 miles north-east of Princeton, the survey of certain lands in the vicinity of Summers and Allison Creeks, and the dividing-up, by the running of centre lines, of certain lots at Pike Mountain in the Otter Valley.

It would appear unnecessary to here repeat what I have already written regarding the district and town of Princeton, to which these lands are tributary. Its accessibility by road and railway, its mining development, its market for farming produce, have all been previously dealt with, and reference can be made to my report on surveys carried out in 1920. The Coalmont Colliery, located 13 miles west of Princeton, is now employing about 350 men and is shipping more coal than any other coal-mine in the interior of the Province. The plant of the Canada Copper Corporation near Princeton has been idle now for the past two years, and it is understood that the reason assigned to it is the inability of the mining corporation to reach an agreement with its smelting company. When operating, the plant finds employment for about 400 men, and therefore the local community is anxious to see the industry again active.

I have, etc.,

P. W. Gregory, B.C.L.S.

KETTLE RIVER VALLEY, SIMILKAMEEN DIVISION OF YALE DISTRICT.

By A. H. Holland.

Vancouver, B.C., November 1st, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—The work of the past season covered a wide stretch of country from Christina Lake to Rock Creek, and consisted of the survey of isolated agricultural areas for which application was being made to pre-empt either by new settlers or by those in residence on adjoining farms who wished to increase their holdings.

Christina Lake.

Starting at Eholt, where a few days' work was done, we soon moved to the vicinity of Christina Lake, which the exceptionally hot weather of the past season had made the popular summer resort for the surrounding country, and several new summer cottages were noticed, as well as many camping-parties under canvas who had come from Washington State and farther for the boating, bathing, and bass-fishing, the latter of which was exceptionally good this year.

In the Christina Lake District are included the valleys of Sutherland Creek and its tributary, Italy Creek, which have been the centre of a logging industry for twenty years and which still supply large numbers of ties and cedar poles from their wooded slopes. Logging and heavy forest fires in the past years have made small areas of agricultural land available for settlement and have reduced the cost of clearing, which in any case is heavy, but where clearings have been made, especially near Fife Post-office, the crops of apples and small fruits have been abundant and continuous. In this area two new settlers from the mountainous districts of Virginia had selected home-sites, and these were surveyed, together with four other lots which cover parts of some logged timber licences which will soon revert to the Crown.

Boundary Creek.

Small areas were surveyed on Boundary Creek, both east and west of Greenwood, but as this part of the country is so well known it requires no further description. It was the centre

of a large mining industry for twenty years, and through the decline of that industry has been gradually settling into a farming community, though there are still numerous prospects under development which no doubt eventually will make as good a showing as those of the past.

ROCK CREEK.

At Rock Creek, besides retracing some old surveys of thirty years ago, one lot was surveyed. This is situate on the bench land above the valley, where it is more or less heavily timbered with fir and tamarack, much of which is suitable for milling, and if a small portable mill was installed both ties and lumber could be shipped at a profit, while at the present time hauling logs to the river will not pay. The soil on the bench land is a clay loam and where clearings have been made good crops of grain are raised, but most of this area is used as range for a large number of cattle and horses from the valley below.

CHRISTIAN VALLEY.

The only lots surveyed by me for the Department which had not already been applied for were situate on the upper waters of the East Fork of the main Kettle River, and were a continuation of my work of 1921 in Christian Valley. Here a further block of 880 acres was surveyed along the river, which flows through a valley about half a mile wide between foot-hills, from which steep mountain ranges rise. The soil is a clay or sandy loam varying in depth from 2 to 4 feet above a gravel subsoil, and the valley is at present covered with a thick growth of scrub spruce and balsam up to 6 inches in diameter, which, together with a scattering growth of large cedar, will make fairly heavy clearing. A forest fire which burned from June to August of this year destroyed all the growth for the next 10 miles up the valley, including a heavy growth of merchantable cedar in the bottom and on the side-hills, but the fire was extinguished by the first rains in August before it reached the ground covered by my surveys.

The pack-trail which was cut out by me last season has this year been continued towards the mining camp on Lightning Peak, at the headwaters of the East Fork, the Works Department having made a small grant for this purpose, and a number of prospectors used it on their trip through the country earlier in the year and claim it to be the most feasible route for a wagon-road to this camp.

The Christian Valley Settlement has increased in size during the past year, and the settlers seem satisfied with their holdings, as they had more moisture during the past season than farther down the valley and their crops were proportionately better.

GENERAL.

Through all the district covered by me this season there is little unsurveyed agricultural land within easy access of the main highways, with the exception of certain logged or partially logged areas at present held under timber lease, but as soon as these revert to the Crown they should be surveyed and opened to settlement, as they cover some good bottom land.

I have, etc.,

ARTHUR H. HOLLAND, B.C.L.S.

SLOCAN AND LOWER COLUMBIA VALLEYS, KOOTENAY DISTRICT.

BY S. S. MCDIARMID.

ROBSON, B.C., November 15th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—The area in which my work lay had for its centre Robson, and comprised the Slocan Valley, Blueberry Creek, the Whatshan and Lower Arrow Lakes. Each of these sections will be dealt with separately.

SLOCAN VALLEY.

This valley is served by the Slocan branch of the Canadian Pacific Railway, connecting with the Slocan Lake steamer at Slocan City. The service consists of a mixed train that is never in a hurry, running three days in the week. With the falling-off in output of the mines and the policy of retrenchment inaugurated by the railway company, the present service is discouraging to the settler, but his protest has been of no avail.

Much of the new settlement has been at Appledale and Perry Siding, and the people in this neighbourhood seem ambitious and progressive. Their chief interest is in fruit-growing and poultry and they have organized in co-operative marketing. As many of these ranchers have needed favourable climatic and marketing conditions to help them through the pioneering stage, and since both have failed them this year, they have need of their stock of optimism. However, the season of 1922 cannot fairly be looked upon as a test of the possibilities of the valley and need not discourage intending settlers. With sufficient moisture, either through natural precipitation or by irrigation, the soil is productive. They have the advantage in being able to ship produce, either by train or by a very good wagon-road, to Nelson, which the pioneer in a newer district does not have.

Quite a considerable part of the arable land is held by the Doukhobors and the racial differences stand in the way of a community spirit developing. The English-speaking settler finds little in common with the Doukhobor and the latter is often unable to speak except in the Russian tongue. Until the growing generation is educated in the Provincial schools this barrier will remain.

There is still some lumbering being carried on, mostly in valleys tributary to the Slocan River, notably Goat Creek and the Little Slocan. The mining history of this district is too well known to need telling and it is expected that new developments will revive the industry.

There is generally more snow and a slightly lower temperature during the winter than in the Columbia Valley, while in summer the days are noticeably warm and never any danger of frost.

Away from settlements deer may be seen and during the past summer grouse were very plentiful.

Blueberry Creek.

The surveys on Blueberry Creek were of portions of expired timber lots considered suitable for pre-emption. This creek empties through a narrow rocky gorge into the Columbia River just south of the Blueberry Station on the Canadian Pacific Railway. The valley at this point is so narrow and rough that a road into the area surveyed must start from a spot near Kinnaird. The route at present consists of a fair wagon-road from Kinnaird to Lot 13094; thence along a rough trail for about a mile, where it terminates in Lot 12372.

Blueberry Creek Valley is an ideal spot for a timber reserve. The narrow rough valley at the mouth serves as a barrier to campers, hunters, etc., thereby reducing the fire hazard. At present the timber is too small for lumbering, but in twenty-five years the value would be considerable, and excepting the lots surveyed the land is quite unsuited for agricultural purposes, but would grow trees.

The three lots of 40 acres each which were laid out are the best pieces of land I have seen, for the most part quite level and having a deep loam soil free from stone. The surface can be cheaply cleared and a man could grow a partial crop from the first year. Their disadvantages lie in the isolation from school and neighbours, thus making hardships for the man with a family. The distance from Blueberry store and post-office would be about 5 miles by the feasible wagon route. It appeared that no irrigation would be necessary and the climatic conditions are desirable.

The only game seen consisted of grouse, but black bear are said to be fairly numerous in this locality.

Whatshan and Lower Arrow Lakes.

The surveys made on these lakes were at points remote from settlement and where there is little likelihood of much settlement at present. Whatshan Lake consists of three distinct bodies of deep water which are connected by shallow tortuous channels and empties through the Whatshan River into Lower Arrow Lake at Needles. The maps of the lake are inaccurate in so far as they attempt to represent the shape of this body of water. The west side of the upper lake is steep and unsuited for anything other than growing timber. The north and east sides are flatter and when the timber has been logged off may prove attractive to settlers. It is doubtful if there is a prettier lake in the Province and it would make an ideal summer resort. At certain stages of the water the fishing is excellent and the sport of hunting deer and black bear may be had.

There is a good road from Needles to the south end of the lake. It is proposed by a local lumbering company to dam the lake at the outlet for the purpose of fluming logs to Arrow Lake during the coming season. This will deepen the water in the links between the lakes and make the upper lake more accessible.

The lands adjacent to the North Fork of Bowman Creek and Cinnamon Creek which were visited are unsuited to settlement or agricultural development. These areas will prove most useful in growing timber. Pine, fir, and tamarack grow successfully, and aside from the danger of fire from lightning should be easily protected.

I have, etc.,
S. S. McDIARMID, B.C.L.S.

WEST KOOTENAY DISTRICT.

BY H. D. DAWSON.

KASLO, B.C., December 6th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following general report upon the miscellaneous surveys made by me in the Kootenay District during the 1922 season, the works including a triangulation survey of Trout Lake, traverse ties on Boyd Creek and the Upper Duncan River, shore traverses on the Upper Arrow Lake, Slocan Lake, and Kootenay Lake, with triangulation ties to scattered blocks of surveys, the subdivision of 960 acres into small parcels at Arrow Park, and some work on the Lower Duncan River.

TROUT LAKE.

I organized my party in Kaslo and left on June 17th at 7 a.m. by C.P.R. steamer to Lardeau; thence by train to Gerrard, at the south-east end of Trout Lake, arriving there at 3 p.m. A high wind blowing down the lake made navigation for launches and small boats dangerous, and it was 8 p.m. before we could safely leave for Haskins Point, 4 miles up the lake, on the north shore, where there is an old clearing and small cabin, which I had learnt afforded the best camping-ground at this end of the lake.

General Description.—Trout Lake is a charming piece of water 14 miles long and from a quarter of a mile wide at the lower or south-east end to about 1½ miles wide over the westerly or upper half. It is fed chiefly by the Lardeau Creek, which, with its tributaries, drains approximately 100 square miles of exceedingly wild country to the north of the lake up to the Lime Dyke Range, which includes such peaks as the Wagner, the Mohican, and the Badshot. Lardeau Creek flows into the lake at the west end at the town of Trout Lake. There are many small streams emptying into the lake along both shores, and the lake has its outlet into the Lardeau River at the town of Gerrard, at the south-east end. For the most part forest-covered slopes, steep, though not excessively so, descend to the water's edge and there is a fair amount of soil. At the mouths of the side-creeks there are small areas of flat lands, some of which are under water during the early summer. There is only one section on the south shore where cliffs descend to the water's edge, and on the north shore there are occasional stretches where it is inclined to be bluffy.

Timber.—All around the lake there is a bench from 500 to 1,500 feet above the water-level, on which some very excellent timber grows, and there has been a good deal of profitable logging carried on, the timber being taken down to the lake in a number of chutes. The timber consists of fir, cedar, spruce, and hemlock, averaging up to 3 feet on the butt.

The altitude of the lake is about 2,400 feet above sea-level and about 630 feet higher than the Kootenay Lake and 1,000 feet higher than the Arrow Lakes. High winds in summer blowing down the lake seem to be fairly frequent, springing up suddenly and lasting from two to four hours. Owing to the narrowness of the lake there is but little danger, as either shore can be readily reached and a stop made until the storm has died down. Frequent brief and localized rain-storms seem to be general. There is a peculiar charm attaching to this lake, in that outside

of a small area near the upper end there are no mosquitoes. It is said, however, that a few are occasionally to be found at Gerrard on Saturdays, this being the day the train comes in.

Business.—At one time this was a busy little lake. The Canadian Pacific Railway ran a daily boat up and down the lake; the mines, logging camps, and sawmills made a good deal of business. Now, unfortunately, the lake is deserted, few of the mines are working, and the lumber-mills and logging camps are closed down. One shingle-mill of 60,000 capacity operates on very short time near Trout Lake City. The boat which the Canadian Pacific Railway used to run has been bought by the owners of this shingle-mill, who will make an occasional run down the lake when required. At Gerrard there is a Dominion Government fish-hatchery, having their traps at the outlet of the lake. There is also here a hotel and dining-room and post-office. Trout Lake City is the outlet for a considerable mining country. There is a hotel and dining-room, post-office, school, mining recorder's office, and three general stores. The daily stage carrying passengers and mail between Ferguson, 5 miles to the north, and Beaton, at the head of the North-east Arm of Upper Arrow Lake, calls at the Trout Lake Hotel each trip. S. Daney operates a freighting and packing business. There are a number of motor-launches on the lake and the owners will usually be prepared to make a run up or down the lake on request.

Fishing.—Five-mile Creek on the south shore is the largest of the side-creeks flowing into Trout Lake, and from here to 8-Mile or Daney Creek on the same side there is some very good fishing. The fishing in the wider or westerly end of the lake is appreciably better than at the narrower end, 10- to 15-lb. Dolly Varden being taken.

Climate.—The climate is typical of the Kootenays; even in midsummer the days are not hot and the nights are cool, and blankets are always required for sleeping. On the nights of June 17th and 18th standing water in camp became frozen over. The lake freezes over during the month of January and remains frozen for two months or so. The winters are long and with excessive snowfall.

Land.—There is not much land suitable for farming purposes. The flats at the creek-mouths are gravelly, with little soil, and many of them are under water in early summer. They are covered with dense growths of cedar, cottonwood, and birch. The largest area that might be used for hay and cattle is about 4 miles from Gerrard on the south shore, at present covered by timber licence. Below Gerrard there is a small area of valley-bottom land which might be cultivated, and back of Trout Lake City there is considerable land which should be very good farming, but it has already been alienated from the Crown or is held under timber licence.

Mining.—The bed-rock at the lake-shore is mostly a hard metamorphosed schist with interlacing stringers of pure white quartz. On the surface gold has been panned and prospect-tunnels have been driven at different locations, but the values do not carry down and the claims have been abandoned. Some distance south of the lake is the northerly contact of a large granite intrusion coming closest to the lake about 2 miles up Abrahamson Creek on Hadow Mountain. On this south side and draining into the Lardeau River a little below the lake outlet is Mobbs Creek, along which valley, and in what is known as the South-west Mineral Belt of the Trout Lake Mining Division, are several deposits which have been opened up, notably the Senorita, from which ore assaying as high as 1,000 oz. in silver has been taken. In the same belt on the slopes of Trout Mountain are a number of deposits, including the Ethel and the Lucky Boy, both of which have made shipments of silver-lead ore aggregating several hundred tons.

Along the north shore and on the high ridge forming the divide between the valley of Lardeau Creek and the Trout Lake Valley, in what is known as the Central Mineral Belt of the Division, are a large number of deposits, many of high grade, and a very large amount of prospecting and developing has been carried on. Most of the deposits are silver-lead, some are gold, and a few copper. The Silver Cup is the largest mine and has shipped several thousand tons; the Triune has also shipped considerably, and the Cromwell, Fidelity, Winslow, and several others have made shipments. The Nettie L., the largest mine in the district, is in this mineral belt a few miles to the north-west, and is reached by wagon-road from Ferguson and Trout Lake. There is very little doing at any of these properties outside of a few parties leasing and a somewhat desultory prospecting, and the mining situation is very quiet. There is abundance of mineral to be exploited, but methods must be found by which the ores can be profitably extracted and treated, as on account of distance from transportation and other difficulties expenses are high. From the mining and geological standpoints the district has been most excellently described by Newton W. Emmens, M.E., in Bulletin No. 2 of the British Columbia

Bureau of Mines, under the title of "The Mineral Resources of the Lardeau and Trout Lake Mining Divisions." The nature of the deposits and their size and adaptability for economical mining have been adequately set forth. The wild upland scenery is shown in a number of very excellent photographic views.

Trails.—There are trails, not now in very good repair, on both shores of the lake up from Gerrard for about 2 miles, and on the north shore there is a very good pack-trail from Trout Lake to Burg Creek, or 7-Mile, with two excellent trails branching off to the Winslow, and from thence, on a very easy grade, easterly and up over the summit to the heart of the mineral-bearing grounds. There are trails leading to this summit along most of the side-creeks. There is quite a route of travel up to the summit from Gerrard; thence along the summit and down the Winslow Trail and so to Trout Lake, or instead of coming down the Winslow Trail, down the Silver Cup or Brown Creek Trails to the Lardeau Creek; thence by wagon-road to Ferguson.

Game.—Bear are plentiful, the black variety especially; goat, deer, and caribou may be found. Blue and willow grouse and fool-hens are plentiful and a few duck on the lake and also a few loons. In the higher altitudes ptarmigan are numerous, and fair numbers of eagles. Whistlers are in thousands.

I completed the work on Trout Lake on July 29th and travelled with crew by way of Trout Lake City and Beaton to Camborne by car, the outfit being taken in a relic of the old Cariboo days in the shape of a "Cariboo wagon," hung on leather straps instead of steel springs. From Camborne we used a pack-train for 12 miles up the Incomappleux River to a camping-ground situate half a mile up Boyd Creek from its confluence with the river.

The valley connecting Trout Lake with Beaton, a distance of 12 miles, is a nice valley averaging half a mile wide and contains some nice-looking ranches. The land around Beaton is well taken up and appears to be of good quality for general farming. A good deal of it appears to be held under timber licence and I would not think there is any unalienated Crown land available. But when the timber is logged off there should be a large area available for small parcels in convenient locations.

INCOMAPPLEUX RIVER VALLEY.

About 3 miles up from Beaton the Incomappleux River cuts deeply through a high mountain barrier, and all the waters draining about 250 square miles of some of the wildest land in the Kootenays, in the Wet Belt, pass through the narrow canyon so made. The road to Camborne has been constructed through the canyon on a trestle erected at heavy expense and considerable difficulty, and from it magnificent views of the turbulent masses of water may be gained. Above this barrier the valley broadens out again and in places approaches a full mile in width. There has been, and in many portions is yet, a splendid stand of very fine cedar up to 6 or 7 feet in diameter. Some stumps cut off 12 or 14 feet above ground-level are 5 feet across and quite sound. Most of this area appears to be capable of supporting a large farming community, the surface soil being, as far as could be ascertained, of considerable depth. Where side-creeks have overflowed their normal channels the surface soil has been removed and the boulders and rocks covering the valley-bottom are exposed. At present most of the land is held under timber licence and land purchase and there does not seem to be any area suitable for ranching unalienated from the Crown. About 8 miles up from Beaton the valley enters the Railway Belt, and from here on up the valley-bottom is entirely within this belt.

First Explorers.—The first comers into the Incomappleux River country came in from the Canadian Pacific Railway main line by way of the Illecillewaet River over the divide into the headwaters of the McDougal Creek, and thence down to the Incomappleux Valley. In following the river down towards its mouth they came to the canyon above mentioned, through which there was no passage. These early prospectors then found themselves in circumstances of considerable danger from starvation, and it was only at great expenditures of their last remaining energies that they returned up the valley, crossed the river by logs, and climbed a considerable height, and thus worked past the canyon and so down to the lake-shore.

The waters of this river are thick and turbid owing to the fact that the glaciers, from which most of the numerous tributary streams rise, overlie formations of lime, schist, and other soft rocks easily ground up by the action of the moving ice and so carried down by the waters.

Mining.—Around Camborne, on both sides of the river and up Scott and Menhinick Creeks on the west and Poole and Mohawk Creeks on the east, there has been considerable mining carried

on, it being a continuation north-west of the Central Mineral Belt of the district previously mentioned. The deposits, mostly, are gold quartz, though there is also silver-lead. Chief is the Eva, which has produced over 30,000 tons of ore running up to $5 per ton. The Oyster-Criterion, Silver Dollar, Beatrice, and many others have shipped at different times and there has been expended a large amount of money in the erection of mills, tramways, etc. Farther up the river, on the precipitous slopes of Goat Mountain, are a number of silver-lead deposits upon which a considerable amount of development has been done. These deposits are in the Lime Dyke Mineral Belt. Whilst near the headwaters of McDougal Creek cassiterite-tin ore deposits have been discovered, but, although a certain amount of prospecting has been done, there has not, to date, been found any commercial quantities of this ore. It is interesting, as there are very few places on the North American Continent where this ore has been found. I would again refer the reader to Mr. Emmens's interesting report on the mineral-deposits of this country, and also to the geological reports of M. F. Bancroft, of the Dominion Geological Survey. There will also be found reference to individual mines in the Annual Reports of the Minister of Mines by A. G. Langley, District Mining Engineer.

Survey.—My work in this country consisted in making a traverse tie from an established iron post on the southern boundary of the Railway Belt to a block of timber-licence surveys in Boyd Creek Valley, and to two separate blocks of mineral claims, one high up on Goat Mountain and the other near the headwaters of the creek, and then making a traverse over the summit into the valley of the Westfall River, Upper Duncan River, to a block of timber-licence surveys lying in the valley-bottom.

Boyd Creek.

Boyd Creek enters the Incomappleux River from the south-east about 17 miles from Beaton, and is a wild, glacier-fed creek about 9 miles long, debouching from its upland sources through a long, deep, and precipitous canyon. For the first 2 miles the trail up the valley is some distance from the creek and ascends steeply through good stands of timber. At about the crest of this steep stretch it leaves the Railway Belt and then ascends more gradually, crossing no less than ten deep gulches. At 7 miles it crosses swathes of burnt-over country, and 8 miles in the Devil's Gulch reaches open alpine meadow country. The Devil's Gulch is a wide, open, grassy gulch, heading for 1½ miles in a north-easterly direction and reaching the summit of the pass at 7,100 feet elevation. It is so named on account of a large hole, called the "Devil's Hole," about half a mile from the summit. It occurs in the siliceous limestone of the Lime Dyke bedded between slates. This limestone, where it crosses the bottom of the gulch, has been weathered away, leaving a hole about 100 feet across, 150 feet long, and 60 feet deep, with precipitous sides, into which a stream runs, which in August is 4 feet wide and 3 inches deep, and loses itself in underground channels, its outlet not being found as one stream again, although probably it comes to the surface again as small springs lower down. There is a second hole about 40 feet diameter and 20 feet deep lower down the gulch and numerous small holes a few feet wide and many feet deep. After crossing the Devil's Gulch the trail continues through belts of alpine timber—balsam and spruce—and open brush, up through the steep basin to the summit, also at 7,100 feet, over into the side of the basin of Silvertip Creek, a tributary of the Westfall, with a branch trail going up to the Winnipeg Mine at an elevation of 7,500 feet.

Scenery.—We are here in the midst of some of the wildest country in the Kootenays. In all directions, as far as the eye can see, are fields of snow and ice, jagged crags, and deep valleys. From the Devil's Gulch Pass Summit no less than twenty-two separate glaciers were counted, whilst from the Deadshot Glacier on the Goat Mountain slopes sixteen others could be counted. The landscape is wild in the extreme. One is led to clearly realize what a heavy proportion of the surface is situated away up in alpine table-lands and how small a percentage is in the valley-bottoms and habitable. It is nature at its wildest and human interest at its minimum. Where possible the uplands above timber-line support luxuriant growths of mountain grasses, mosses, and flowers. At the time of our visit in August these flowers were at the height of their beauty, the profusion of blooms ranging through colours from white to the deepest crimson and to the brightest blue.

The ascent to the pass summit in the Devil's Gulch is not so steep as are some, but on the north-east side the descent to the Westfall River is sharp, the first 300 feet or more being a series of rock steps and ledges 3 or 4 feet in height and quite narrow, and is such that from the river-bottom one would scarcely judge that here was a pass at all. The river is 2,600 feet

below the pass, or at an elevation of 4,500 feet above sea-level. From 6,000 feet down the slopes are covered with an excessively dense undergrowth of buck-brush, salal-brush, and blueberry. The timber is somewhat open and consists of alpine balsam and spruce, a few hemlock appearing just near the water's edge. The country exposed to snowslides occupies a very considerable area, and in such portions there is very dense growth of ground-slide alder and blueberry brush. Progress horizontally or up through any of this country is arduous and slow. It took us three and a half hours to make the return journey from the river's bank at 4,500 feet to the pass summit at 7,100 feet, as one has to haul oneself up by the strength of the arms.

WESTFALL AND DUNCAN RIVERS.

The Westfall River is named after its chief explorer, and is really the West Fork of the Upper Duncan River, joining the East River at the forks, about 38 miles up from Duncan or Howser Lake, or 60 miles from the Kootenay Lake. It is about 18 miles long, but drains a considerable area of country in a very wet belt, and it therefore has a considerable body of water, above the average for that length of creek. Practically all its streams have their sources in glaciers and its waters are thick and muddy. Fishing is not good, though, if the waters were clear, there is nothing to prevent fish coming this far up to spawn. The Upper Duncan River is navigable for motor-launches of small draught for 16 miles up to John Healy's ranch and road-house. From here log-jams and sand-bars obstruct progress, but there is a good pack-trail as far as Hall Creek for 12 miles, and a passable trail from there to Steven's Creek for 7 miles. Although there have been trails continuing on up, through disuse they have been neglected and there is no longer any good communication from here on up to the headwaters, a distance of 20 miles. At Hall Creek there is a good branch pack-trail up to the Red Elephant Mine, 4 miles up, and thence on up to the Bannockburn basin. There are then branch trails over the summits and thence down to Gerrard, Ferguson, and Trout Lake. Travel along the summits in summer-time is readily accomplished and is a delightful experience. In addition to prospecting and trapping, some future business could be built up, when the main valleys become more readily accessible by auto-roads, by utilizing for tourists these mountain trails through country of such surpassing scenery.

Game.—Game is plentiful here, partly on account of luxuriant growths affording feed and partly on account of present inaccessibility; bear, goat, deer, and caribou occasionally being seen and tracks and signs are numerous. A small herd of three caribou grazing on an alpine pasture at an elevation of about 6,500 feet, in an amphitheatre of huge crags, with glaciers and detritus at their feet before smoothing out into pasture land, the alpine timber creeping up to within 500 feet, in the distance the deep valley of the Duncan flanked by peaks and ice-sheets, made a very beautiful and grand scene.

Having completed my work in this country, we returned down Boyd Creek and Incomappleux River through Camborne to Beaton. Here we took the small C.P.R. boat to Arrowhead, and there transhipped aboard the C.P.R. boat, the "Bonnington," to St. Leon, on the Upper Arrow Lake.

UPPER ARROW LAKE.

St. Leon.—St. Leon consists of a hotel and a small number of summer cottages, owned principally by Revelstoke people who come here with their families for the summer holidays. They are situated on a flat about half a mile wide at the mouths of the Halfway and St. Leon Creeks. There is but slight covering of soil over the boulders, which are exposed over large areas, and the creeks themselves enter the lake through a large number of small channels. The ground could not be made use of for ranching purposes, except that, in small patches, there might be collected enough soil to make small garden-plots, with a few fruit-trees, etc. The beach, however, is mostly covered with a good depth of fine white sand and affords good bathing and a very pleasant summer playground for children. The hotel is now out of business and is inhabited by the owner, an old-time prospector.

Hot Springs.—About 2 miles up the St. Leon Creek along a good trail which was formerly a wagon-road, and at about 1,000 feet elevation above the level of the lake, or at an elevation of about 2,400 feet above sea-level, are a number of hot springs. The writer is not aware of the exact analysis of the water, but from inspection sulphur in appreciable amounts is present, but not much iron or lime. At the present time the owner is making no effort, or very little, to commercialize these hot waters as is being done at Halcyon, 6 miles to the north. In earlier

years the water was piped down to a bath-house constructed adjoining the hotel, but it is now out of repair and the pipe-line is broken in several places. There is just one small bath-house situated close to the springs and filled to a depth of about 3 feet by a ¾-inch pipe, the water being then of just sufficient temperature to bathe in comfortably.

The Lake.—St. Leon is situated in a bay about half a mile deep and a mile across, and the lake here is thus somewhat wider than its average, it being about 3 miles across to a sawmill at the mouth of Pingston Creek—the mill now being closed. The mountain-slopes on either shore are somewhat flatter than is usual in the Kootenay, and therefore the first impression received by one accustomed to living in the Kootenays is that of openness and expanse of sky. The lake-waters are thick and muddy owing to the great volume of glacial waters brought down by the Columbia and in a minor degree by the Incomappleux River. The waters partially clear toward the late fall.

Fishing.—Fishing is not good, though occasionally, it is said, 25-lb. salmon are hooked.

Ranching.—At Nakusp and up the valley toward Box lake there are considerable areas of good clay, with other areas of good black loam, which will make good ranching country. There is a small settlement at Galena Bay, near the North-east Arm; otherwise there are only a few scattered ranches on the east shore, and I do not think there is, outside of the pre-emption I surveyed about 7 miles north of Nakusp, any unalienated Crown land suitable for settlers. On the west shore there is considerable area that could be fit for settlement at Fosthall Creek, where the land is already held by a private company, which has subdivided its ground and sold a number of the blocks. At this time there is but one going concern. The soil is sandy and liable to be dry, but there are patches of sandy clay which would likely hold the moisture better. From a very brief visit which the writer made to this district he came to the conclusion that it would be very difficult to make a living on any of the ranches without a good irrigation system, but that with irrigation there should be many hundreds of acres capable of being worked into productive and profitable ranches. Fosthall Creek drains a considerable area of country and is of fair size, and water for irrigation could be ditched and flumed with little difficulty. Study would need to be given to the soil to determine what crops would suit best.

Timber.—Timber does not seem to be particularly good close to the lake, but up the creeks and on the low slopes of the hills on the west side timber is said to be good; in fact, the timber seems to do better in the valleys of the larger creeks than it does on the lake-shores. Disastrous forest fires have taken place from time to time, particularly on the east shores, and second growth is now in many portions very dense.

Survey.—My work consisted of making shore traverses, tying in the surveys to the south of Halcyon with the surveys around St. Leon, and from thence south to surveys south of Cape Horn, and then south again to surveys north of Nakusp, on the way making triangulation ties to two separate blocks of surveys on the west shore. About 1½ miles south of Cape Horn I surveyed a small area as Lot 12851 and made some corrections to a former survey.

Shore-line.—Practically all of the shore-line is most arduous for traversing. There are no great prominent cliffs such as exist on the Kootenay Lake, but the whole distance is a succession of steep or vertical bluffs up to 50 or 60 feet in height and descending sheer into the water, alternating with small beach or boulder bays, necessitating continual careful climbing, where a slip meant a ducking in the lake. The most prominent bluff, and by far the largest, is known as Cape Horn, about 10 miles north of Nakusp. This is of granite and extends out into the lake with vertical cliffs rising sheer from the water for 80 feet, and in order to safely pass over, one has to go inland some distance and climb about 300 feet. Over most of the distance I traversed, dense second growth inland makes going even slower than on the shore bluffs.

There is no unalienated Crown land suitable for ranching adjacent to the shore-line, except that which I surveyed, mentioned above. In time to come purchases may be made for the purpose of erecting summer cottages. There are many little sheltered coves in the bays between the rocky bluffs where boats could be drawn up in safety, and a few spots here and there could be cleared and houses built and small gardens planted.

Mining.—There is a large granite area on the east side of the lake and extending out under the water, the contact of which, with schists and slates, appears to run generally quite close to the east shore. Most of the shore-line between Halcyon and Cape Horn is granite, with occasional short stretches of schist and slate. The west shore-line is mostly schist and slate. There is practically no mining on the east side in the granite, but on the west side, on Big

Ledge Mountain, there is some prospecting, and a big gold ledge has been uncovered and certain work done on it from year to year. The vicinity of the Upper Arrow Lake does not appear to offer as good chances to prospectors as do the other Kootenay lakes.

Transportation.—The Canadian Pacific Railway runs a boat service on the Arrow Lakes, making the round trip from Arrowhead, on the Upper Lake, to West Robson, on the Lower Lake, three times a week. This boat has some regular stopping calls and at other places may be flagged, or may be hailed by boats or launches, for mail or small freight.

WEST ARROW PARK.

From St. Leon I moved camp and outfit to Arrow Park, on the west shore of the Columbia River, 14 miles south of Nakusp, to survey 960 acres into small parcels for settlement, 640 acres being lapsed timber licences and 320 acres being cancelled purchase holdings.

This area is 2 miles long, north and south, and three-quarters of a mile wide, east and west, and subdivision was made by east and west lines across the whole width, 10 chains apart, thus giving sixteen parcels of 60 acres each. The reason for this was that it was found that approximately the eastern half was level ground, whilst the westerly half covered the foot-hills of a steep and high ridge, which, other than for rough grazing, or for the timber, of which there was an occasional very good patch, the cedar poles and firewood, it would not be worth much, so that each parcel contains 25 to 30 acres of very good level land and the balance runs back up the foot-hills and is more or less steep. These sixteen lots are situated very close to the present Arrow Park Settlement and to the river; the elevation is but 1,800 feet above sea-level, and it is generally considered that when the area is thrown open the lots will be quickly taken up, for they contain land equal to the best in the Kootenays. For a detailed description of each lot reference should be made to the reports attached to the surveyor's field-notes.

Ranching.—There is considerable area of very good clay lands on both shores of the Columbia River, connecting the Upper and Lower Arrow Lakes, and there will undoubtedly, at some future time, be large settlements in the vicinity. At West Arrow Park there are now about thirty settlers, mostly occupying 10- or 12-acre orchard blocks. The usual Kootenay products all grow well here, but the chief difficulty the settlers have to contend with is to market their products and find a margin of profit after paying for packing and freighting and other charges. They evidently suffer from lack of co-operation in the past, but strenuous endeavours are being made to work together better. Apples are the chief crop at present, and most of the shipments are made to Prairie points, many hundreds of cars being shipped. The consequence is that, with other shipping centres doing the same thing, the Prairie market becomes flooded with apples and a fall in price ensues. If the Prairie crops have been a failure or if the price has been excessively low, as was the case this year, the farmer has little money for British Columbia fruit; at least he will not buy sufficient to lay in a stock to last through the winter, taking the risk of getting it frozen. What is urgently needed is the building of Prairie storage facilities controlled by the fruit-growers themselves, from which the fruit may be gradually released. This will no doubt come in due course; a few seasons such as this of 1922 will do a great deal to cause every fruit-grower to see the urgent necessity of combining in organizations and protecting their interests and the future of the industry.

Stock.—A fair amount of stock-raising is also carried on and the cream shipped to Nelson or Revelstoke, but for this purpose a 10-acre block is not large enough to grow the feed required, with the result that feed has to be bought at prices too high to allow of much, if any, profit.

Most of the land at present settled on at Arrow Park originally belonged to a land company, which had its holdings surveyed into 10- and 12-acre blocks and sold them at $100 per acre. Clearing has cost from $125 to $150 per acre, and many have not more than 4 or 5 acres cleared, with the consequence that their ground is too small to make enough to live on, and the ranchers have to take work in the surrounding camps, sawmills, road-work, etc. The 60-acre blocks I surveyed will enable the settlers to have a better chance of making a living. On the good flat land there will be room for orchards of considerable size, for roots and vegetables, and still leave a good many acres for growing hay, with 30 acres on the foot-hills which may be used for grazing.

The Future.—There are many thousands of acres in the Mosquito Creek Valley, north of Arrow Park, at present held under timber licence, which should, when the timber has been removed, afford space and opportunity for a large and prosperous community. There is con-

siderable water flowing in small streams and brooks, and I believe this district has a bright future before it.

Timber.—Logging operations in the district have been in the past and are yet being carried on successfully and with considerable profit to the operators and benefit to the settlers.

Blister-rust Disease.—Over an area approximating 100 acres the blister rust appears to have got into the white pines which are dead or dying, whilst other types, such as fir and tamarack, are doing well. There is considerable white pine in the Arrow Lakes country, and if it is to be saved efforts must be made to combat this disease. I understand there are several large areas of white pine similarly attacked, one being in close proximity to Nakusp.

Business.—West Arrow Park town consists of two stores on Front Street, above the wharf, a post-office, hotel, and school, and at East Arrow Park, across the Columbia River, there is also a post-office, store, school, and in addition a church and a hospital and resident nurse, and there are several other settlements of similar size on the banks of this river.

Wharf.—The wharf at West Arrow Park is causing dissatisfaction among the residents, and apparently with some cause. It is steep and quite narrow, so that no team with wagon can turn round, and they consequently have to be backed down; then if there is any load at all they have difficulty in stopping in time, and on more than one occasion team and wagon have gone over into the river. Also the river here is swift and makes difficult landing for the boats. The residents have been agitating for a new wharf in a better location, or at least for the present one to be widened, and one or other certainly seems to be needed if the district is to go ahead.

Transportation.—There is transportation by the C.P.R. boats plying on the Arrow Lakes, making the round trip up and down in two days, connecting with the Arrowhead-Revelstoke Railway line and with West Robson, on the Kettle Valley Railway from Vancouver to Nelson, and thence by way of the Kootenay Lake boat with the Crow's Nest Pass Railway and the Prairies. In addition, there is a road from Nakusp along the east shore, which passes through East Arrow Park at 14 miles, Burton at 20 miles, and continues for another 15 miles along the shore.

Climate.—The climate is about the average for the Kootenays, except that here for about a month or six weeks in the fall there is considerable fog in the mornings, usually dispersing about 11 a.m. The winters are not excessively cold, but there is a good deal of snow, which first settles towards the end of November and will not have entirely melted off until the end of April, but the temperatures will not fall much, or often, below zero. Summer temperatures will rise up into the nineties, but seldom over 100, and the evenings are always cool and blankets needed throughout the summer nights. Rain falls at intervals throughout the summer.

Game.—There are more coyotes here than in the Kootenays generally, but they are not in excessive numbers. Black bear are sometimes seen in the settlement, also deer, and back in the hills there is fair hunting and shooting.

Fish.—Fishing in the smaller lakes and in the creeks is good, but in the Columbia River itself is not so very good, although occasionally a good-sized salmon is caught.

Slocan Lake.

From Arrow Park my next work took us to Rosebery and the northern end of the Slocan Lake, where we made a shore traverse along the railway-grade, connecting certain surveys north of Rosebery with the surveys at the north end of the lake and up the Bonanza Creek Valley, tying in two isolated surveys on the way, and making a triangulation tie to a block of isolated surveys on the west side across the lake.

General Description.—Slocan Lake is a small lake about 25 miles long and rather over 1 mile wide, surrounded by steep high mountains, with a number of towns on the west shore, these being busy or quiet, according to the mining situation. These towns from the north are Rosebery, New Denver, Silverton, and Slocan City. There is a steamboat service on the lake three times per week, although formerly daily, and Slocan City is connected by a branch railway-line with the Kettle Valley line. Rosebery and New Denver are on the Nakusp-Kaslo line, running through the heart of the Slocan mining country.

Fish and Game.—The Slocan Lake waters are clear and fishing is quite good. Hunting and shooting is also good, though the proximity to the mines, whilst affording ready access by trails to the uplands, necessarily means that the game keeps farther away.

Land and Timber.—Along the northerly end of the lake there is no unalienated land fit for farming purposes. On the eastern shores devastating forest fires have removed all merchantable

timber. On the west shore there is more timber, but the steep bluffs and precipitous slopes make logging operations unprofitable.

Climate.—The Slocan Lake climate is typical of the Kootenays. Heavy snowfalls and long but not extremely cold winters are the rule, with zero weather rarely experienced for more than a day or so at the time. The lake does not freeze over.

Mining.—For more than thirty years the Slocan country has been known for its rich mineral-deposits, and by this time the whole area for miles has been Crown-granted or already held under annual assessment-work by free miners. Most of the producing mines have passed that stage where they can be profitably operated under company management, so that a large part of the shipments are by leasers; a noted exception is that of the Silversmith, formerly the Slocan Star, at Sandon. Many of the leasers make very good money. The Slocan ores are generally silver-lead-zinc, and a few known as dry ores; that is, the ores contain silver not associated with the sulphides of the base metals—lead and zinc. Included in the list of noted mines are the Payne, Noble Five, Ruth, Sovereign, Rosebery-Surprise, and many others.

ARGENTA AND LOWER DUNCAN RIVER.

From Rosebery I took the C.P.R. train to Kaslo and took the regular Tuesday night boat to Argenta, at the north end of the Kootenay Lake. We stayed in Argenta that night and next morning moved to a rancher's house 2 miles up the valley, in close proximity to the piece of land we surveyed, which was bounded on the north, east, and south by previously surveyed lots, and on the west by the Lower Duncan, which is here a river of considerable size, having drained both the Duncan River country, Duncan Lake, and the Lardeau Creek, Trout Lake, and Lardeau River countries.

Land.—There is a large area of land here, lying in the valley at the north end of the lake, about 2 miles wide. Originally brought down by glacial action, there is now a vast accumulation of boulders and wash, covered by varying thicknesses of river-silt, brought down by the Duncan and Lardeau. Near the present end of the lake the silt is of great depth, but at a distance of 2 or 3 miles back large areas have no silt whatever and bare wash is exposed. At a point nearly opposite Cooper Creek, where the river divides, it is cutting away the east bank very rapidly, and fears are expressed that with the high waters of this coming spring, or the near future, the cutting will have entirely washed away the bank and exposed a deep slough, through which the waters will then rush, tearing away a considerable area of land, at present fit for cultivation and which is largely being used for pasture purposes. I looked into this, and without taking any specific measurements could see that there certainly was some danger of this happening.

About 5 miles in a straight line from the head of the lake is the junction of the Lardeau and the Duncan, and from here the two valleys are narrower. At 9 miles in a straight line is the south end of the Duncan or Howser Lake, 9 miles long. For 16 miles north of this lake are many thousands of acres of flat land, submerged in the summer-time, but which, if provision were made to prevent flooding, would be capable of supporting a large ranching community.

Game.—The flats are a favourite ground for grouse and duck shooting; deer are also sometimes seen. The country both to the east and to the west is very wild and little frequented, and big game is numerous. Cougar are sometimes seen on the flat and their tracks higher up in the snow are frequently seen. Black, brown, silver-tip, and grizzly bear, caribou, and goat, are often met with by hunters.

Roads and Trails.—From Argenta, where there is a post-office and school, there is a trail—now little used and consequently in a very bad state of repair—up Hamill Creek over the pass summit, called Earl Grey Pass, at an elevation of about 7,500 feet; thence down Toby Creek to Windermere, in the East Kootenay Valley. At the head of Earl Grey Pass are some very high peaks and precipitous country, Earl Grey Peak itself being well over 10,000 feet. A wagon-road extends northerly to Duncan Lake, with a branch road crossing the Duncan River by a splendid bridge of composite steel and timber construction, up past the west side of the lower end of Duncan Lake; thence over a low divide to Howser Station, on the Canadian Pacific Railway line between Lardeau and Gerrard. Other than this last there is no bridge over the Duncan River, and access to Lardeau, where there is a store, hotel, and post-office, must be by boat. The chief settlement at Argenta is situated on the bench and is connected with the wharf by a good wagon-road half a mile long. There is also a good trail running for 3 miles down the east shore of the lake to a rancher's house.

Transportation.—The C.P.R. boat from Nelson and Kaslo calls at Argenta once a week at midnight on Tuesdays, and also at Lardeau, where in addition another call is made on Saturdays, and from where the train runs up to Gerrard, on Trout Lake, and returns the same day.

Climate.—Curiously, the Argenta Flats enjoy a milder climate than is usual in the West Kootenays; cattle and horses are able to winter out with just slight feeding; and whilst other parts may be several feet deep in snow, this area is sometimes almost free. The elevation of the flats is 1,765 feet above sea-level.

PROCTER, ETC.

From Argenta we again used the weekly midnight boat, and, passing Kaslo, landed at Procter, at the head of the outlet or West Arm of Kootenay Lake. Here I ran some miles of traversing on the north shore from Balfour to Queens Bay, located a number of old survey corners, and made triangulation ties across to the Pilot Bay and Procter side, where I also ran a traverse tie to a Dominion Government astronomical pier situated south of the C.P.R. track.

This is part of the widest section of the Kootenay Lake, although the water for a mile outside Procter and Balfour is comparatively shallow, though so clear that at depths estimated to be 50 feet one could see the bottom.

Business.—At Procter there are three stores, a school, church, post-office, and a hotel. Procter is the centre of a ranching community extending for 4 or 5 miles along both shores of the arm in a westerly direction. All land suitable for ranching has been alienated from the Crown.

Transportation.—C.P.R. boats from Nelson to Kootenay Landing and from Kaslo to Nelson make the return trip daily, calling at Procter each way. In cold and long winters the West Arm becomes frozen and impassable for these passenger-boats. Nelson passengers are then transported between Nelson and Procter by train. Heavy freight between Nelson and Kootenay Landing, Kaslo and Lardeau, consisting mostly of ore, coal, and coke, lumber, poles, and ties, and handled at the Procter slips all the year round, and as there is a good deal of freight at this point the switching-yards are quite busy.

Sanatorium.—At Balfour there is a large sanatorium, built by the Canadian Pacific Railway as a hotel, but now closed. The probability is that at a future date this might again be opened as a tourist hotel, as the situation is very fine.

Fish and Game.—Fishing is popular, but the hunting and shooting does not appear to be so good as on some parts of the lake-shores. Kootenay Landing and Duck Lake, at the south end of the main lake, is very popular for duck-shooting.

This completed the work allotted to me for this season and the party was then disbanded.

I have, etc.,

H. D. DAWSON, B.C.L.S.

CHEAKAMUS VALLEY, NEW WESTMINSTER DISTRICT.

BY W. G. MCELHANNEY.

VANCOUVER, B.C., August 7th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on the subdivision of logged-off lands in the vicinity of the Cheakamus and Cheekye Rivers, about 10 miles north of Squamish, at the head of Howe Sound:—

This land at one time produced a heavy stand of fir, cedar, and hemlock, which was logged off about ten years ago. A severe fire or a series of fires followed over part of this land, burning off most of the debris, but this has now grown up with alder, vine-maple, young hemlock, jack-pine, and fir. A good road from the head of Howe Sound to the Upper Squamish passes through the centre of this tract, as well as the Pacific Great Eastern Railway, so that the land is favourably situated for transportation. This land is higher than the general run of land in the Squamish Valley, which suffered so severely from the disastrous floods of 1921, and consequently attention has been directed to the possibilities of the higher-lying lands. Although

this land lies only on an average of about 100 feet above tide-water, yet the most of it is entirely free from any danger of flooding. This tract appears to have been either an old bed of the Cheekye River or of glacial origin. The Cheekye is a very tumultuous mountain stream which at one time may have flowed down along the mountain lying to the east of this tract and down towards Brackendale, gradually eating its way north till it joined with the Cheakamus in its present position. The nature of the soil would either indicate this, or that a great glacial deposit had been made over this whole territory from the high mountains to the east.

The soil is very stony, with large boulders mixed with gravel and silt. In places these boulders are bunched together with very little deposit of silt. These boulders are now on or near the surface and give the indication of very stony ground. The timber in these spots has been mostly a hard fir of only medium size, and is being reforested with jack-pine, hemlock, balsam, and fir. In other places boulders are not so thickly congregated and silt and gravel predominate. These spots, with the decayed vegetation from the forest-growth, are quite productive. It is unfortunate, however, that the severe forest fires that have burned over the area to the east of the Squamish Road have burned off a great deal of this vegetable matter. In spite of this, there is in places a thick growth of vine-maple, alder, huckleberry, fireweed—in fact, all the plant-life common to the Coast that grows over logged-off areas. A fairly good idea of the nature of the soil is obtained from turned-up roots of trees from cuts along the Pacific Great Eastern Railway. In places there will be a mass of boulders and gravel and immediately adjoining several feet in depth of good loam.

The whole tract surveyed is very dry. There is no running water over this portion, but water can be readily obtained from the Cheekye River. During logging operations water was obtained from this source by means of a wooden flume. This flume ran to two different places in this area, and its position would indicate that the whole area could be served with water from the Cheekye River. I am satisfied also that water could be obtained from the small creek that drains Alice Lake for the same purpose. Along the position of the old flume, where water has dripped or overflowed, the plant-life is much more luxuriant. This season has been very dry and the ground appeared to be absolutely without moisture. The ground is very permeable and could absorb a great quantity of water. Irrigation would almost seem to be necessary to ensure crops, but this would be expensive for a small tract, and the best solution would be to have a large enough plant to irrigate the whole tract. As far as a supply of domestic water is concerned, I have very little data to judge from. North of the Cheekye River, on Lot 1817, a well has been sunk to a depth of 60 feet and a good all-the-year-around supply of water obtained. At Brackendale, I understand, water has been obtained very near the surface. Over most of this area I think one would have to go to considerable depth to obtain water unless in that portion near the Cheakamus River.

This land should be suitable for fruit or vegetables if water could be obtained on it. It would be ideal for chicken-ranching. On the ranch in Lot 1817 above referred to good results have been obtained with fruit, vegetables, and hay without irrigation, but conversation with the owner indicated that with irrigation splendid results could have been obtained.

It was decided to subdivide this land into approximately 10-acre plots, as small acreage seemed to be most in demand. The land slopes gradually to the north and west in the north half and to the south and west in the south half. The whole plot is intersected with old skid-roads and railway-grades. There is no difficulty about getting grades for roads and construction will not be costly. Grades will run from 2 to 5 per cent., except at the bank to the west of the Pacific Great Eastern Railway, where some cutting will have to be done to make a satisfactory grade.

There is some very good land to the west of the Pacific Great Eastern Railway. This is flat, with a very heavy growth of vine-maple in the northern portion and with young hemlock and vine-maple in the southern part. That in the northern portion is mostly silt, very easily cut up with water, but very productive. With a very severe flood it is subject to overflow, but only on rare occasions. Land near the Cheakamus is being washed away rapidly. Evidently a great deal of damage was done last year.

Portions of this land can be easily cleared. Fire has burned off all the rubbish left after logging operations and the new growth has not attained much size. Other portions over which fire has not travelled will be difficult to clear on account of the old debris, as well as the thick new brush now growing up. Cost of clearing will vary from $20 to $300 per acre. There is

a small patch of virgin timber of about 6 or 7 acres, containing about 75,000 feet of hemlock and cedar, lying to the east of the Squamish Road. To the west of the road there are a few patches of standing timber, mostly of small size and scattered, so that logging would scarcely be warranted.

The only industry in the vicinity at the present time is the logging operation of the Cheakamus Logging Company. This has been started recently and gives employment to about fifty men and is likely to continue for some years. Lying to the east of the tract surveyed there is a large quantity of timber on the Cheakamus, Cheekye, and Mamquam Rivers, and the removal of this timber will provide a great deal of work for some years.

Climatic conditions are practically the same as those prevailing along the Coast in this vicinity.

There is a railway-station within a hundred feet of this property; a school within 2 miles; stores and post-office within 1 mile.

I have, etc.,
W. G. McElhanney, B.C.L.S.

NEW WESTMINSTER DISTRICT.

By M. W. Hewett.

Vancouver, B.C., September 18th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report of the surveys made by me during the past summer in New Westminster and Sayward Districts:—

I left Vancouver by gasolene-launch on June 8th and made camp in North-west Bay, 4 miles west of Seechelt.

Working from here, I re-ran the outlines of Lot 1310, Group 1, N.W.D. On this survey, C. Pringle, one of my axemen, met with an accident which necessitated the amputation of his leg below the knee.

On completion of this work I made a survey of the expired timber licence covering Lot 2193, Group 1, N.W.D., cutting it into three lots, and further subdividing the southerly one of these, which fronts on the water, into nine blocks of varying sizes, with frontages on the Government Road to Seechelt.

All these lots are very rocky in character, but contain some land that can be brought under cultivation. Blocks 3 to 9 of the subdivided lot, being least rocky in character and having frontages either on North-west Bay or the Strait of Georgia, should make desirable home-sites.

Leaving North-west Bay, I proceeded to the mouth of Jervis Inlet, where I made camp on the extreme north end of Seechelt Peninsula. Here I cut the expired timber licences covering Lots 2727 and 2729, Group 1, N.W.D., into fourteen new lots, ten of which have frontages on the water. These lots also are very rocky and broken in character, but are intersected by low draws or valleys of fair land. There seems to be considerable inquiry for the small lots on the water-front as home-sites for fishermen.

From here I also sent my assistant, H. A. Youdall, B.C.L.S., through the Skookumchuck to examine Lot 3743, Group 1, N.W.D., with a view to determining whether the point shown on Mr. Idsardi's plan of survey was a peninsula or, as reported, an island. His report was most unequivocally to the effect that it is not an island.

I then went up Jervis Inlet to the mouth of Britain River, where I made ties between Slayathlum Indian Reserve and Lots 1903 and 2217, Group 1, N.W.D., surveying en route four lots on ground either previously vacant or covered by the expired Timber Licences 37342 and 44769. These lots consist partly of alluvial soil in the river-bottom and partly of the steep adjoining hillsides.

As I reported to you in my letter of August 8th, I found a uniform low variation over the whole area covered by this survey. Frequent readings of the needle determined this as being from 22½° to 23° east. I have checked this by a reference to the notes of the late Mr. Laverock's traverse of this shore made by him in 1917.

Leaving Jervis Inlet, we moved up to Squirrel Cove, on Cortes Island, where I cut Lot 864, Sayward District, into eight new lots, with approximate areas of 40 acres each. This piece of ground was the best fitted for agriculture of any surveyed this season, being for the greater part little broken, with fair soil and easily cleared.

On completion of this work we went into Malaspina Inlet, where we made a tie between Lot 4200, Group 1, N.W.D., and Timber Licence 11846P and from there to Horace Point, on Redonda Island, where we made a survey of a 20-acre home-site on ground formerly covered by Timber Licence 2786.

From here we returned to Jervis Inlet, where I made additional ties in Britain River and stored my rowboats for the winter, returning to Vancouver on September 13th.

Weather throughout the season was good, but very hot and smoky. Water was scarce on most of the ground surveyed.

I have, etc.,
M. W. HEWETT, B.C.L.S.

RANGE 1, COAST AND SAYWARD DISTRICTS.

BY JOHN DAVIDSON.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to report on surveys carried out under your instructions in Range 1, Coast and Sayward Districts.

JACKSON BAY, RANGE 1, COAST DISTRICT.

A closed survey was made from the head of Jackson Bay along the south boundary of Lot 36 and the east boundary of Lot 659 to Read Bay, and the shore-line was traversed from there to Jackson Bay. This survey defined the overlap of Lot 659 on Lot 36 and located an error in the survey of Lot 1720, which was then resurveyed.

Jackson Bay is a deep indentation running north-westerly from Sunderland Channel and terminates in a long mud-flat, which is exposed for about 20 chains at low water. There are a few pre-emptions along the shores of the bay, with gardens and clearings. A very good crop of vegetables and small fruits was grown here this season.

From the head of the bay a wide flat extends in a northerly direction to Glendale Cove, a distance of approximately 10 miles, and varies in width from 2 to 4 miles. This flat when logged may prove to be a valuable agricultural tract.

A trail has been blazed by the Forestry Branch from Jackson Bay through this flat to Glendale Cove. There is a post-office and general store in Jackson Bay and it is reached by a weekly steamboat service from Vancouver. At Read Bay extensive logging operations are being carried out and several miles of logging-railway operated.

GLENDALE COVE, KNIGHT INLET, RANGE 1, COAST DISTRICT.

Here a survey was made to ascertain the true position of S.T.L. 1428P and 1429P in relation to Lot 360 and to each other. Glendale Cove is a narrow bay running southerly from Knight Inlet. The east shore is high, rough, and rocky and slopes up very steeply from the water. On it a wharf has been built up on piles to accommodate a salmon-cannery. The west shore is low and less steep.

The cove ends in a low grass-covered flat, which is flooded at high water and broken up by many sloughs and river-channels. This flat, which belongs to an Indian Reserve and used by them in the fishing season, is the only agricultural land bordering on the cove.

MENZIES BAY, DISCOVERY PASSAGE, SAYWARD DISTRICT.

Menzies Bay is a wide shallow bay on Vancouver Island at the southern end of Seymour Narrows. A logging-railway has been extended along the northern shore and a float set on deep water to enable steamers to call at any stage of the tide. At present two logging companies are operating over this road. The bay is the outlet of several small streams which drain a large

area of hilly country covered with a good growth of merchantable timber. This country, though low, is so broken up by small rock ridges that the area of arable land is small.

Lot 673 was subdivided into Lots 1191, 1192, 1193, and 1194, and these lots lie from 1 to 2 miles west from the beach. This area had been fire-swept just before the survey was commenced and the fire was still smouldering and blazing up in places. During the time of the survey it spread towards Menzies Bay until even the driftwood on the beach was burnt up. Our camp at the water's edge was guarded by fire-trenches, and each evening after the day's work the survey party was kept busy carrying water and renewing the defences. Uultimately the only green spot left was in the vicinity of the camp, and it became alive with grouse, pigeons, and other birds, with their young. Many deer took to the sea near here and swam across Seymour Narrows to Quadra Island. The land surveyed was found to be less suited for agricultural purposes than was anticipated. A detailed report on each portion surveyed is attached to the field-notes.

Von Donop Creek, Cortes Island, Sayward District.

The resurvey of Lot 746 was completed. This lot lies on the eastern shore of a shallow lagoon opening off Von Donop Creek. The lagoon is under cultivation as an oyster-bed. The numerous oysters seen do not appear to have grown much since my last visit here two years ago.

Bute Inlet.

A triangulation survey was made of Bute Inlet. On the tide-flat at the head of the inlet a base-line was laid out, 109 chains in length, and levelled stakes 1 chain apart were driven to support the chain. The flat is built up of gravel, fine sand, roots, and logs, and is divided by numerous channels of a deep, swift glacial stream flowing in from the north-east.

From the base-line a triangulation system was carried down the inlet, joining on to the last season's triangulation at the southerly end of Stuart Island; through Arran Rapids to join on to the triangulation survey of the Yuculta Rapids; and from there down the west side of Stuart Island, connecting the Yuculta triangulation to the Stuart Island base. A further check on the work was made by surveying a new base-line at Orford Bay, half-way down the inlet. On both sides of the inlet existing surveys were searched for and tied on to. The shore-line was sketched between stations and stadia traverses run in places where necessary to obtain greater accuracy in detail.

As many mountain-peaks as possible were trisected, but smoke haze and mist prevented a complete record of the peaks from being obtained. The triangulation stations were permanently marked as in last year's work.

On the south side of the Southgate River the east peak of Mount Rodney (7,883 feet) was climbed and a cairn erected to enable Mr. Bishop, B.C.L.S., to connect his triangulation survey through the Coast Range on to the Bute Inlet system, which in turn is connected to the Dominion Geodetic Survey. Near the head of Bute Inlet a white-painted post 12 inches square was found set in a rock mound and marked "U.S. Coast Survey, 1881."

Bute Inlet is, roughly, 42 miles long and 2 miles wide. Throughout, its whole length it is bounded on both sides by steep rugged mountains from 4,000 to 8,000 feet in height, of the typical Coast granitic formation. In many places the mountains descend precipitously into the sea.

The principal rivers flowing into the inlet are Homathko, Southgate, and Orford. The Homathko rises in the Central Plateau near the Chilcotin country, flows through a break in the Coast Range, and continues down the Homathko Valley, where it is fed by many small streams before emptying into the sea at the north-west corner of the inlet. The Homathko Valley appears to be a continuation of Bute Inlet, filled up with glacial drift and debris brought down by the river. Immediately at the head of the inlet the land is low-lying, swampy, and covered by a low growth of scrub spruce, with some willows and alder. The mouth of the river is full of gravel and sand bars, with roots and logs.

Under favourable conditions small gas-boats can travel up-stream for 2 or 3 miles, but the shifting sand-bars, the muddied and swift waters make navigation hazardous. Up-stream the banks are well defined and from 3 to 5 feet high and the soil is of good quality.

The valley extends for some 20 miles to Waddington Canyon and is from 2 to 4 miles wide. When logged off it may prove to be of agricultural value. Logging has been done here at various times and a new camp was started there late in the year.

The possibility of a railway route up the Homathko and through the Coast Range is dealt with in "Report on Surveys and Preliminary Operations of the C.P.R.," by Sandford Fleming, 1874 and 1877; and also in "Reports in Reference to Location and Western Terminal Harbour," 1878.

The Southgate River is a much smaller stream than the Homathko and is from 100 to 150 feet wide. It is a swift stream full of fine grey silt and its mouth is full of bars. It is only navigable by canoes. The valley near the mouth is a gravelly flat about a mile wide and covered by a dense growth of brush. It is of little value for agricultural purposes. A logging-railway was built some years ago up the valley to take out the timber logged off the first few miles. The rails have been taken up and relaid up the Orford River Valley, where logging operations are being actively carried on.

The Orford (formerly the Salmon River) flows through a narrow valley with steep flanking mountains and empties into the sea at Orford Bay. For the first 2 miles from the sea the valley is a fertile flat with deep soil and is about a mile in width. From here on the valley narrows rapidly, taking on the typical V shape, with gravelly flats in the bottom covered with alder and the lower slopes of the steep mountains well timbered with good fir and cedar.

On the west side of the inlet the Bear River is the largest of a number of small streams draining short, steep V-shaped valleys. These valleys are from 1 to 5 miles long and their lower slopes carry a good growth of merchantable timber, principally fir, cedar, and hemlock.

At the mouth of the streams there is usually a short stretch of shingle beach and occasionally a small area of tillable soil. The remainder of the coast-line on both sides of the inlet is rugged rocky mountain-side with frequent precipitous cliffs. Anchorage and shelter for boats is hard to find; only Fawn Bluff and Orford Bay giving shelter on the east side from the north wind.

In the winter months the prevailing wind is from the north, and it comes sweeping out of the Homathko Valley as if out of a funnel, and raises a sea which occasionally prevents the ordinary gas-boat traffic up the inlet for two weeks at a time.

AGRICULTURE.

The Homathko Valley offers the only large tract of level land tributary to Bute Inlet. This when cleared may be developed into farming land, but the lower areas are subject to flooding in summer, and the winter climate is severe for the Coast District. The Southgate Valley as far as examined is of little agricultural value, and the good land at Orford Bay is covered by an Indian Reserve.

Occasional patches of arable land from 1 to 5 acres in extent are found throughout the remainder of the inlet; few of these will ever be cultivated, as there is little shelter for boats to be had.

TIMBER.

The timber in this district is above the average in quality, the cedar being particularly good, but it covers only a small part of the area. Of the 2,600 square miles of the drainage-basin, 2,300 square miles are above merchantable-timber line and 50 square miles of the remainder is barren.

The only important logging is being done up the Orford River, where 6 miles of logging-railway is being operated. The remainder of the logging, except for a small camp at Fawn Bluff and one up the Homathko River, is being carried on by hand-loggers.

FISHING.

The salmon were more plentiful than last season. The Indians put up salmon for their own use only, as owing to the anticipated small run no buyers came up. The nearest operating cannery was at Quathiaski Cove.

MINING.

No prospecting was done this season. A report on this district is found in the Geological Survey Summary Report for 1907.

GAME AND FUR.

Quite a number of mountain-goat were seen during the summer down on the shore; wolves were frequently heard on the bars at the mouth of the Southgate River, which may account for the absence of deer, none having been seen all summer.

Above timber-line ground-hogs and rock-rabbits were frequently seen. Grouse were scarce, although the weather was favourable during hatching season. Ducks seemed to be as plentiful as in former years in spite of the numerous hunting-parties.

Marten, mink, ermine, otter, wolves, and both black and grizzly bear are in sufficient numbers to make trapping profitable in the larger valleys.

Many tourist parties were seen during the summer, and those met with were enthusiastic about the Coast Mountain scenery and the trout-fishing had in the feeders to the main streams.

Climate.

The rainfall varies from 70 to 100 inches. July and August are as a rule dry and clear. The remainder of the year is more or less cloudy and unsettled, except in winter, when the north wind brings clear cold days. The snow lies about 3 feet deep in the valley flats and the temperature is usually below zero for some time each winter.

Accessibility.

The Union Steamship Company furnishes a bi-weekly steamer service from Vancouver to Churchhouse and Bruce's Landing, at the mouth of Bute Inlet, and to Orford Bay, half-way up the inlet. At all these places there is a post-office and general store.

Stuart Island.

Stuart Island lies across the entrance of Bute Inlet and rises to a height of 880 feet in a rocky ridge. Only a small area along the shore can be cultivated, and the greater part of this has been made into homes by fishermen engaged in catching cod.

On the west and north sides are the Yuculta and Arran Rapids, which are only navigable for a short time around slack water. The Yuculta is the route most favoured by tug-boats with logs in tow from the north; the Arran is scarcely used except by local fishermen.

The rapids, while being a danger to navigation, form a favourite feeding-ground for codfish, and several men are engaged here in supplying cod to the logging camps, the surplus being shipped to Vancouver.

Nodales Channel.

The Dominion Geodetic Survey station on Mount Tucker was tied in to the Nodales Channel triangulation survey and an intersection made with the Valdes station on Mount Discovery. It was found impractical, owing to the rounded nature of the summit of Mount Tucker and to its heavy growth of timber, to make a tie to the Yuculta triangulation system.

I have, etc.,

John Davidson, B.C.L.S.

QUEEN CHARLOTTE ISLANDS.

By J. M. Rolston.

Vancouver, B.C., November 30th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report on surveys made this summer. The principal part of the work was on Queen Charlotte Islands, and consisted of groups of islands at the entrances to Masset and Skidegate Inlets, also several pre-emptions on the east coast between the above inlets. This territory has been reported on in detail many times, so a detailed report is unnecessary.

At the northern end of Queen Charlotte Islands, tributary to the village of Masset, on Masset Inlet, the country is very flat and in many places open muskeg. On the north-east coast at Rose Spit there is a small settlement consisting of five or six families, who have good land and go in for cattle-raising, as good feed all the year round is to be had on the sandspits along the eastern coast. The village of Masset is not so prosperous since the war, due to the closing of the Sitka-spruce export. This was a thriving industry during the latter years of the Great War, as the

Queen Charlotte Island spruce proved the best spruce for aeroplane uses, and in consequence the settlers, shopkeepers, etc., were ensured plenty of work and trade.

There is a large mill at Buckley Bay, some 20 miles from Masset, which it is reported will be operating on a very large scale next season and will give work to a large number of men. This company claims to have a thirty-year cut of spruce.

At Skidegate Inlet, which separates Graham and Moresby Islands, there is a large cannery belonging to the Maritime Fisheries. This cannery employs a large number of men. It is reported they are going into the manufacture of fertilizer and oils on a large scale.

At the entrance to Skidegate Inlet there is a long strip of good agricultural land, called "Sandspit," which supports some twenty families. The farms here were well cultivated and it was evident the settlers were making a success of mixed farming. They complained of not having any cold storage on the steamers, and in consequence they could not ship meat, eggs, etc., to Rupert, which was their logical market.

Rumour states that a large mill was to be installed at Skidegate to cut the miles of timber limits which stretch from Skidegate south to Cumshewa. The Indian village at Skidegate is a revelation in Indian villages; water is laid on and the village presents a very picturesque appearance, and many very novel Indian curios can be obtained.

At Cumshewa Inlet the nature of the country changes to mountainous, rolling hills, timber-covered along the deep gorges, which stretch in all directions. At the west end of the inlet the Kelly Logging Company has several camps and was busily engaged in making up Davis rafts to ship to the pulp-mills on the Mainland. Cumshewa Head, which we surveyed, is a barren, rocky headland, jutting out and interrupting all the south-east gales, the bays being full of wreckage.

The climate while on Queen Charlotte Islands was exceptionally fine, no rain falling for two months and no bush fires to speak of.

The interior of these islands is hard to get to as there are very few trails, and in consequence very little prospecting has been done. Several good claims have been staked in the vicinity of Skidegate, copper mostly, but it is understood that coal may be developed in large quantities.

PORCHER ISLAND.

Three pre-emptions were surveyed on Porcher Island, at Jap Inlet, Oora Bay, and Kitkatla Inlet. The island is almost round, with high hills in the centre, and valleys running into the bays; there is a lot of vacant land, consisting of swampy open muskeg, which, if drained, would make good land. A ready market exists at Rupert for any produce grown. The settlers met with were mostly fishermen in the summer-time and farmers in the winter, which hardly afforded them an opportunity of testing the farming possibilities of the island. Game was very plentiful, deer being very tame, also plenty of geese on Kitkatla Inlet.

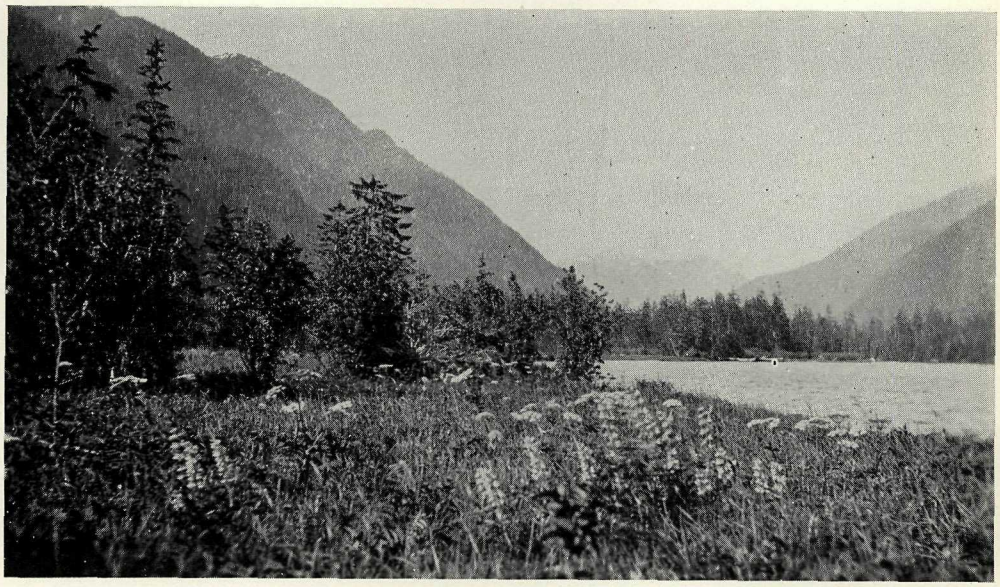
Mineral consisting of copper, high grade, has been found near Jap Inlet, but no amount of development has been done as yet.

SMITH ISLAND.

On Smith Island one pre-emption was surveyed at Osland, an Icelandic fisherman settlement. This island is the centre of the canning industry, large canneries being situated along the channel between Smith Island and the Mainland. The fishermen have small holdings for gardens and go in for goats and sheep. The island is a high mountain sloping to the sea on all sides, and there is very little agricultural land or timber.

I have, etc.,

J. M. ROLSTON, B.C.L.S.



Grass flats at mouth of Kilbella River. Kilbella Valley in background.

Indian dead-house, Kimsquit, Dean Channel.

KILBELLA VALLEY, RANGE 2, COAST DISTRICT.

By A. S. G. Musgrave.

Victoria, B.C., November 20th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit my report covering work carried out under your instructions in Ranges 2 and 3, Coast District, during the past season.

The first part of my season was occupied by the subdivision of the logged-off lands in the Kilbella Valley, Rivers Inlet; I then adjusted an old survey at the head of Smith Inlet, and finally covered some 2,000-odd miles by gasolene-launch, setting the new type of permanent Coast triangulation pins up the various inlets from Burke Channel northerly to Milbank Sound.

Kilbella Valley Subdivision.

Owing to a confusion of names the Dominion Geographic Board in 1919 changed the name of the old Kildala River and Bay in Rivers Inlet to Kilbella River and Kilbella Bay; this avoids all confusion with the present Kildala River and Kildala Arm at the head of Douglas Channel.

The Kilbella River joins the Chuckwalla River some 100 yards before they jointly flow into Kilbella Bay, situated about 4 miles from the head of Rivers Inlet. The Kilbella is approximately 30 miles long and flows in a general direction of south-south-west until 8 miles from the mouth, whence it flows practically due south. Its volume is partly glacial, but it is fed and gathers considerable volume from numerous small creeks flowing mainly from the mountains on its easterly flank; the water is cold in midsummer, but is not milky white and contains a very small amount of sediment. The average width from a point 5 miles up-stream to the mouth is 250 feet and the average midchannel depth in July is about 10 feet. The current at low tide was just sufficient to hold an ordinary Evinrude on a round-bottomed boat with six men aboard; oars had to be resorted to at intervals. At all high tides the river is affected to a point 5 miles up-stream and a full 23-foot tide affects it considerably farther. No falls are encountered for at least 24 miles from the mouth.

For the first mile from the mouth the valley is about 1½ miles wide and consists of rich grass flats and alluvial silt; these flats are subject to flooding at 23-foot tides when the river is running at all full. Above these flats for three-quarters of a mile the timber has been partly logged off; it is, however, only a few feet higher than the grass flats, and is therefore subject to flooding at extreme high tides in conjunction with the fall freshets.

Owing to the above I took as the southerly boundary of the subdivision the northerly boundary of "I.R. 2, Kildala"; this line lies 1¾ miles from the mouth.

Practically the whole area subdivided has been logged off by the Pacific Mills Company, Limited, of Ocean Falls, for pulp purposes.

The valley is flanked on either side by mountains averaging 3,000 feet in height; this unfortunately has the effect of shutting out sunlight to the extent that in midsummer the valley only receives direct sunlight from 7 a.m. to 5 p.m. For this reason the winter snows, when they fall to any extent, remain on the ground longer than normal.

I have prepared a general map of the whole delta which shows various sloughs and high-tide channels; one of these channels cuts off a considerable round to the Kildala Packing Company's wharf; this channel can be used by gas-boats of about 4- or 5-foot draught at 17-foot tides and upwards.

The southerly group of lots lie in the broad part of the valley between the main Kilbella and Chuckwalla Rivers; the valley here is about 1½ miles wide. From here northerly the subdivision extends into the main Kilbella Valley, which has an average width of half a mile.

The area subdivided, while not above *all* possible flooding, is considerably higher than the grass flats at the mouth. I consider that the flooding in extreme years will be more or less confined to old well-defined slough-beds, but a very unusual year may see these overflow. For this reason it would be advisable for any settlers unfamiliar with the valley to carefully chose the highest possible point for their houses; in the case of ten of the seventeen lots they can build on the side-hill above all possible flooding if they wish, and in the case of the remaining seven lots points can be selected in each case quite immune from any floods.

ACCESS.

The subdivision is so arranged that all lots front on waterways; access by gas or row boat is possible at all stages of the tide in all seasons of the year to Lots 1278 and 1286; at high tide in all seasons to all other lots except Lots 1281, 1282, and 1283, which are bounded by the Chuckwalla and Egan's Slough. These later lots can easily be reached by a trail through Lot 1280; this trail could be made fit for all traffic at a trifling cost, as the grade is naturally perfect.

The Chuckwalla River flows with considerably greater velocity than the Kilbella; hence it is not normally navigable beyond the gravel-bar at Lot 1280.

Egan's Slough is at present only navigable at high tide to the middle of the north boundary of Lot 1284; beyond this point, on the Chuckwalla side, there are very considerable log-jams which would entail much work cleaning out.

The longest water run from any lot to the Kildala Packing Company wharf is 5 miles; the Union Steamship boats call there weekly during the summer and fortnightly during the balance of the year. A road connecting this wharf with the subdivision would entail about 2½ miles of grading along a rocky side-hill, but the water access is so sheltered that I do not consider this would be necessary.

WATER AND RAINFALL.

As all lots front on main waterways ample domestic fresh water is available; it is very cold, but does not contain sediment to any extent. One well was sunk some years ago by the loggers in Lot 1284, water being struck at about 9 feet; the loggers state that any wells sunk south of this point were brackish.

The annual rainfall, compiled from records kept over the period 1895 to 1906 at Findlay, Durham & Brodie's cannery, some 5 miles away, is as follows:—

	Inches.		Inches.
January	12.26	September	10.51
February	10.56	October	12.99
March	7.33	November	16.36
April	8.48	December	16.46
May	5.04	Average	112.55
June	4.34	Minimum annual fall	96.14
July	3.41	Maximum annual fall	134.58
August	4.80		

LAND-CLEARING.

The logged-off area is studded with large spruce and hemlock stumps to 5 or 6 feet in diameter in places; these would entail heavy clearing cost, but very many alder and cottonwood areas exist which should amply repay clearing.

SOIL.

An analysis of two typical samples of soil show that nitrogen and potash content is quite satisfactory, also that the lime content is good. It is just possible that on portions of the land, to get the best results, it may be necessary to introduce some form of phosphate; seaweed would supply this, I understand, so if it is required it is not far distant.

A soil authority has given his opinion on these samples as follows: " . . . the soil should be capable of producing high yields of our ordinary farm crops . . . the lack of sunlight and the abundance of rain will limit the variety of crops . . . the potato is also a crop which should do comparatively well."

The entire valley, with the exception of the land at the very bases of the mountains, is river-silt for a depth of 10 or more feet; it contains chiefly sand and organic matter. The soil at the base of the mountains is stony, but very rich black loam.

MARKETS.

The market for agricultural products in a small way is as good as any inlet on the northern Coast owing to there being in Rivers Inlet some ten active operating canneries, a sawmill, a hospital, and many logging camps. A very conservative estimate of the consumption of the

above from April 1st to the end of August annually, compiled by a cannery manager in the inlet, is as follows: 25 cases of eggs per week; 2 beeves or the equivalent per week; 30 to 40 tons of potatoes per season; fresh vegetables and small fruits in considerable quantities. All these commodities are at present brought weekly from Vancouver per Union Steamship boat with no cold-storage facilities.

The whole question hinges on whether a settlement in this valley could give a *constant* supply of the above, as failing this they could count on no market for their produce; in this connection I may say that in the course of conversation with the authorities at Ocean Falls this year I found that Bella Coola produce found a very poor market there owing to this very reason of inconsistency.

As regards cattle-raising, winter feed would be required from October to February in all probability; this could be readily obtained by experienced men rafting up the rich grass off the delta during the summer, and in addition the cultivation of clover, oats, peas, and vetches. An experiment in stock-raising a few years ago in a somewhat similar valley at the head of Smith Inlet proved a failure owing to the fact that Interior cattle were imported and the sudden change to the Coast conditions proved disastrous; in addition, it is a well-known veterinary fact this this exceptionally rich delta-grass is injurious to stock which has not become gradually accustomed to it. For these and many other reasons care should be exercised when sinking capital in stock under such conditions.

SETTLERS.

The most ideal settlers for this area would undoubtedly be married fishermen; the sole industry practically of this inlet is fishing; hence it would be unwise to be so optimistic as to picture a settlement making a purely agricultural living here, but, coupled with fishing, any settler should make a comfortable living and own a home-site close to his season's work. I may say that while carrying out the survey many fishermen made inquiries from me as to the date when it would be available for purchase.

GAME.

Marten and fisher are the chief trapping-game; one trapper a few winters back trapped twenty marten right on the subdivision. Deer are fairly plentiful, and bears, mostly reputed to be grizzly, make a happy hunting-ground of the valley.

No trout or other fish were seen in the rivers; this is probably due to the fact that it is not a salmon-spawning area, there being no storage-lakes at the source; the Owikeno River and Lake, some 5 miles away at the head of the Inlet, being the main salmon-spawning area for the inlet.

GENERAL.

Farther up the Kilbella River than the subdivision extends there are, I understand, some excellent stands of spruce and hemlock, but the sharp "S" bends on the river make it difficult to get the lumber out; in this connection a glance at the plan will show what a considerable straightening of the river would be entailed by cutting or blasting a new channel from Station E 32 to W 17; the question of increased velocity and consequent greater erosion would need to be gone into more thoroughly. These sharp bends are a continual trap for snags, making the navigation of the river risky at certain periods of the year.

NEKITE RIVER, SMITH INLET.

On completion of the Kilbella Valley Subdivision I reduced my party and chartered a 38-foot gasolene-launch for the balance of my work along the Coast. I first proceeded to the Nekite River, at the head of Smith Inlet, to adjust an old survey of Lot 1202. The pre-emptor here has done very considerable work in reclaiming a large area of meadow tidal flats by dyking. This river-valley lies some 25 miles from Margaret Bay Cannery, Smith Inlet, the nearest point of call of the Union Steamship boats; owing to this comparative isolation and the lack of markets in Smith Inlet it is questionable whether the pre-emptor will receive adequate return for the undoubted hard work he has expended on it.

The soil and general conditions of this pre-emption are very similar to the Kilbella Valley, described in the first part of this report.

PERMANENT MONUMENTING OF COAST TRIANGULATION.

In pursuance of your Department's recent policy of perpetuating, by means of the new regulation iron pin, the triangulation stations on the main headlands of the inlets along the Coast, I proceeded to the following inlets triangulated by Messrs. Wright, Underhill, and Smith, B.C.L.S., a few years back: Burke Channel, North Bentinck Arm, Labouchere Channel, Dean Channel, Cascade Inlet, Johnson Channel, Return Channel, Roscoe Inlet, Ellerslie Channel, and Milbank Sound. In all, I established seventy-eight headlands by means of setting the regulation iron pin with wedge in drill-holes and erecting very firm tripods and building cairns of rocks.

I have, etc.,

ARTHUR S. G. MUSGRAVE, B.C.L.S.

WEST COAST, VANCOUVER ISLAND.

BY A. W. HARVEY.

VICTORIA, B.C., December 1st, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—In accordance with your instructions I have completed the work detailed, with the exception of the subdivision of Catala Island, Espinoza Inlet, and the tie to T.L. 888, Clayoquot District, this latter not having been commenced when I received your telegram to close down operations for the season.

I commenced the work near Clayoquot by making a triangulation of Tofino Inlet and adjoining waters, and also made the necessary ties on Kennedy Lake. I found that T.L. 4608, situated on Windy Arm, Fortune Channel, was not surveyed in accordance with the plan. In this vicinity the country is very rocky and precipitous, the only land of any value for agricultural purposes being occupied by Indian reserves.

I next proceeded to Herbert Arm, Clayoquot Sound, and made the necessary connection between the surveys there. The shores of this inlet are very steep and rocky, the only good land being Lot 1110. Herbert Arm does not appear to conform closely with the map.

I next completed the surveys in Hesquiat Harbour. The land on the west side of this harbour, which is surveyed into townships, is good and generally low-lying and level, but the lots surveyed by me to the north are poor and rough, covered with a dense growth of salal and heavily timbered with spruce, hemlock, and cedar; this timber, however, is not of very good quality. There are patches of good land, but these lots are situated on the foot-hills of a range of hills about 2,000 feet high.

From Hesquiat we moved to the north end of Nootka Island and triangulated Nuchatlitz Inlet. I also completed the surveys in that vicinity which were not completed last season. I did not subdivide Lot 26, Catala Island, as there was more important work to be done and the time was getting short.

I next moved to the south end of Nootka Island and retraced the east boundaries of T.L. 1059P and 1064P; these surveys were very roughly made and are considerably off in azimuth chainage. I also surveyed P.R. 1009 in this vicinity.

I then proceeded to the Conuma River, Tlupana Arm, and surveyed P.R. 1127 and 1128. The valley of this river is narrow, averaging about 15 chains in width, and the sides are very precipitous. The land in the river-bottom is very good; the timber is poor, with the exception of some good fir on the lower slopes. About 4 miles up the river is a narrow box canyon and the country here becomes very rough and broken. I was informed later that there is about 1,000 acres of excellent land about a mile above this canyon, but did not see it. In the neighbourhood of Nootka Island most of the land suitable for agriculture has been already surveyed. I was told, however, by G. Newton, postmaster at Centre Island, that there are some good pieces of land in Zeballos, Espinoza, and Port Eliza Inlets, in the vicinity of which few surveys have been made. After leaving Nootka I surveyed P.R. No. 1755 in Bawden Bay. This is a very rough and rocky piece of land, with a few patches of meadow and a little good land.

I next proceeded to Alberni and connected Section 17, Barclay District, to the W.W.W. group of mineral claims by a traverse about 10 miles in length and tied in the adjoining surveys.

I also connected this traverse with the triangulation of part of Alberni Canal made last season. I accomplished this by running a traverse down the Canadian National Railway grade and tied in all existing surveys.

The last work done consisted of a triangulation of Nahmint Bay and a traverse from Lot 77N to T.L. 1003, Clayoquot District; the last-named lot is situated on the top of a very steep mountain about 2,500 feet in height, and this was a difficult and slow piece of work, as the clouds very seldom cleared from the mountain, even during fine weather.

I have, etc.,
A. W. HARVEY, B.C.L.S.

COAST TRIANGULATION, RANGE 3, COAST DISTRICT.

BY J. T. UNDERHILL.

VANCOUVER, B.C., November 27th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report upon my season's work in Range 3, Coast District:—

The work done this summer consisted of various stretches of Coast triangulation, together with three small lot surveys. The triangulation covered Ellerslie Lake, the upper end of Ellerslie Channel, a small portion of Roscoe Inlet, Moss Passage, Milbank Sound, Schooner Passage, Laredo Sound, Laredo Channel, Laredo Inlet, Deer Passage, and the easterly half of Lama Passage. One pre-emption at the junction of Johnson Channel and Gunboat Passage was surveyed, as also Outer Island, lying to the south-west of Price Island, and Idol Point, the last two being beacon-sites surveyed for the Department of Marine and Fisheries. Besides the above, a tie was run from Ellerslie Lake to Roscoe Inlet.

Again this season, as well as defining the shore-line, an endeavour was made to tie in, either by tangential shots, stadia, sketch, or minor triangulation, every island, islet, rock, reef, and lagoon in the waters covered. In all, 446 stations were occupied and 110 monuments placed. Three geodetic secondary stations were also tied in. These stations were purposely set at or near sea-level by the Geodetic Survey, in order that the Coast triangulation might conveniently be tied to them, and should be of great value as control points.

ELLERSLIE LAKE, ETC.

This body of water, roughly in the shape of a St. Andrew's cross, and approximately 75 feet above sea-level, lies among the mountain ranges separating Roscoe Inlet and Ellerslie Channel. The larger arm or main body of the lake, lying in a general north-easterly direction, is bordered by steep snow-capped mountains, which become extremely rough at its upper end. The other bar of the cross made by the South and North Arms of the lake are generally less rugged, particularly the North Arm. As a whole the shores are well timbered, especially the North and South Arms. Logging on a moderate scale was in progress in the South Arm this summer and will doubtless be carried on in the North Arm at some future date. The timber consists of hemlock, spruce, and cedar. The shores of the main lake carry good commercial timber only in the valleys of the larger creeks, but are not of very great area.

At its lower end beautiful falls provide an outlet to the lake, the water falling into a tidal lagoon some three-quarters of a mile in length. This lagoon connects by a narrow passage with Ellerslie Bay. The entrance to the lagoon can only be entered at high-water slack owing to the occurrence of tidal rapids. Ellerslie Lagoon and Bay are well timbered and have been already extensively logged.

The agricultural possibilities of Ellerslie Lake, Lagoon, and Bay are negligible. Only in the North Arm of Ellerslie Lake does any extent of comparatively level land occur—at its head and on its westerly shore about its middle length. Owing, however, to its inaccessibility and all too short season, it is extremely improbable that it will ever be used for that purpose. During the winter the lake, lagoon, and generally the bay freeze up.

Near the southern extremity of the South Arm a low narrow valley runs easterly to Roscoe Inlet, distant about 1½ miles. A tie traverse was run through same to connect with Roscoe Inlet and some 4 miles of the latter body of water triangulated to provide a tie to Indian Reserve No. 3. Roscoe Inlet from this point to its head is bordered by high rocky mountains sparsely timbered and in many places falling precipitously to the water. The valley through which the tie traverse was run is well timbered with small, poor-quality cedar, yellow cedar, hemlock, spruce, and pine up to 16 inches in diameter. Underfoot the ground is soggy, consisting of a shallow depth of muskeg and gravel caught in depressions of the underlying rock. The divide itself is only some 350 feet in height.

ELLERSLIE CHANNEL.

At the head of Ellerslie Channel a narrow bay or offshoot runs approximately 1½ miles in a northerly direction. This body of water was triangulated and the streams flowing from Ingram and West Lakes tied in, as also Lot 337. The offshoot before mentioned is well timbered on its western shore with hemlock, cedar, and spruce. Its easterly shore is mainly rock bluffs except near its head. In this vicinity the bordering mountains have a more gentle slope and are moderately well timbered. The discharge of the streams flowing from Ingram and West Lakes were measured, but owing to abnormally dry weather the values obtained are certain to be below their normal volume. Ingram Lake is apparently backed by a fairly extensive watershed, as it is the lowest of a chain of lakes extending back some little way into the mountains. The lake itself is only a quarter of a mile from Ellerslie Channel and is approximately 70 feet above sea-level. The stream flowing from same is roughly 40 feet wide, with a bed very much broken by large boulders, and finally plunges over a 30-foot fall to salt water.

West Lake was not actually visited owing to its distance inland making a traverse tie too costly for the scope of my work. However, the stream flowing from it was examined for some half a mile back from the shore. In its lower reaches it is roughly 40 feet wide and badly broken by boulders. Here the stream is fast flowing and split in places by fangs of rock. About half a mile from its mouth the bed is freer of boulders, more sandy and gravelly, and the flow sluggish, promising a level flat valley for some further distance.

MOSS PASSAGE.

This body of water, lying between Dowager and Lady Islands, connects Milbank Sound with Mathieson Channel. It is a little over 4 miles in length and varies in width from 7 to 30 chains. The tides in this passage are quite strong, and at its narrowest part, which occurs about its middle length, vary in velocity from 3 to 5 knots. During the ebb tide, when a westerly wind is blowing, small tide-rips occur at this point and at its junction with Milbank Sound. It is free from reefs except at its eastern end. The reef here is covered only during the higher stages of the tide and lies slightly north of centre channel, being connected at low tide with Dowager Island. It is easily avoided by favouring the Lady Island shore. On turning into Mathieson Channel do not turn too quickly, as there is a small reef in this channel lying about 6 chains off-shore, close to its junction with Moss Passage. Both these reefs are marked by kelp during the summer.

The Lady Island shore of Moss Passage is rocky and low-lying. It is well timbered with red and yellow cedar and scattered hemlock and spruce, ranging in size to 2 feet in diameter. The timber is poor in quality, being stunted, knotty, and wind-swept, and of little value for lumber purposes.

The soil appears to be mainly of a gravelly nature, varying from 6 inches to 6 feet in depth, and in the depressions inclined to be swampy. Two pre-emptions have been taken up on this shore and considerable clearing done in both. Neither of them was occupied during the time I was in that vicinity, and from all appearances had not been occupied this spring.

The Dowager Island shore is similar to that of Lady Island, but more rough and broken at its western end. Here it is slightly exposed to the surf from Milbank Sound, which has broken up the shore and washed the nearer vegetation. Owing to the lack of running water, agricultural developments in this area are liable to suffer during dry summers.

MILBANK SOUND.

My work in Milbank Sound consisted of a triangulation of that portion lying north of a line joining Day Point to White Rocks. This section is very well charted, and any one desiring information regarding the general lie of the shore, together with the position of reefs, rocks, etc., cannot do better than study the chart.

Milbank Sound is well known for its rough water. Being exposed to the open Pacific, it is seldom free from ground swell, and during south-east or south-west blows is dirty for small craft. The stage of the tide materially affects the roughness of the sea. During the ebb, when the water is running out of Finlayson and Seaforth Channels, a very much shorter or choppier sea is experienced. This moderates with the change of tide. Behind Aldwich Point and Sandstone Reef temporary shelter may be had in fair weather, but neither is safe anchorage in any sort of a blow.

As regards the shores, the west or Price Island shore is low-lying and rocky, being deeply indented at its southern end. Day Point, shown at the extreme south end of Price Island, is in reality on one of a number of islands separated from Price Island by narrow and shallow channels. The timber on Price Island is poor in quality, being scrubby and badly wind-swept. No ground suitable for agricultural purposes was noticed, the land adjoining the water being composed of rock-outcroppings, with muskeg and gravel in the depressions.

The shores of Lady and Dowager Islands bound this portion of Milbank Sound on the east. These islands are very irregular and are fronted by numerous small islands, rocks, and reefs as shown on the chart. Their timber and soil have already been described in dealing with Moss Passage.

To the north the sound is bordered by the shores of Swindle Island, which are steep and rocky, with the exception of a short stretch of sandy beach lying behind Sandstone Reef. This beautiful beach is covered by Lots 1171 and 1172. Back of this beach there appears to be a fair stand of cedar, hemlock, and spruce, but no timber of any consequence is to be had along the rest of the shore. Back some distance from the shore the lower slopes of the hills on Swindle Island appear to be well timbered with fair timber. No suitable agricultural land occurs in this vicinity, rock-outcroppings being too prevalent in the area adjoining the water.

SCHOONER PASSAGE.

Schooner Passage is a narrow tortuous channel separating Price and Swindle Islands and joins Laredo Sound to Milbank Sound. At two points the channel narrows down to about 4 chains in width, and at the more westerly narrows goes dry at extreme low water. Several reefs occur throughout its length, more particularly in its western half. At its junction with Laredo Sound it is blocked by small islands, islets, rocks, and reefs extending some distance off-shore. This end of Schooner Passage is also very much indented by small bays and inlets. Most of the reefs are easily avoided in passing through this passage, but care should be taken to avoid a small reef in midchannel approximately 15 chains westerly of the western narrows. While in this area this summer a small halibut-boat had the misfortune to run on this reef, luckily with no damage. About 3 miles from the easterly end of Schooner Passage a tidal lagoon, known as Salt Lake, runs into the Swindle Island shore. The mouth of this lagoon is badly blocked by reefs, and owing to the occurrence of tidal rapids the lagoon can only be entered or left at slack water. The lagoon itself is of no great area and is broken up by islands. The tides in the narrows are moderately strong and meet in the bay between them.

The shores of Schooner Passage are well timbered throughout, but in the main the timber is of poor quality, being small, stunted, and wind-swept. Only in the vicinity of the Salt Lake does an extent of good timber occur, and this area has already been partially logged. Cedar, yellow cedar, hemlock, spruce, and scattered pine constitute the timber. The land bordering this body of water is more free from rock-outcroppings than is generally the case on the Coast, and in places a fair depth of soil was noticed, particularly on the Price Island shore. Inaccessibility and lack of handy markets preclude the use of this land for agricultural purposes for some time to come.

LAREDO SOUND AND CHANNEL.

Laredo Sound and Laredo Channel lie between Aristazable Island on the west, and Princess Royal, Swindle, and Price Islands on the east.

Laredo Sound proper was scarcely touched by my work, most of it lying south of my triangulation. As far as seen, it appears to be open in the centre, but obstructed by reef and rocks as both shores are approached. Laredo Channel is fairly free of reefs, and those of danger to navigation are shown on the chart. Laredo Bay, lying just north of the junction of Meyer's Pass with Laredo Channel, has several bad reefs and rocks, and care should be taken in crossing this bay when entering Laredo Inlet. All rocks and reefs seen in this area were tied in. On the Princess Royal side of the channel there are several small inlets and lagoons, all of which were investigated. This water area can be very rough at times, the wind sweeping down from the north end of the channel kicking up a very nasty sea in the vicinity of Surge Narrows. With a south-east blow the surf strikes in as far as the mouth of Laredo Inlet.

The Aristazable Island shore is steep and rocky, except for a short stretch at its northern end. Much of the interior of this island is barren and burnt over, and only in the creek-valleys does any timber of any consequence occur. Poor-quality cedar, yellow cedar, hemlock, and spruce compose the stands, the latter tree being best as to size and quality. One or two pre-emptions have been taken up on this shore, but apparently abandoned. While there are a few places that give promise of being fair land, their distance from any settlement and climate are much against them.

The easterly shore of Laredo Channel is very broken, bays, inlets, or lagoons running off every few miles. In general it is steep and rocky and well timbered with poor-quality cedar, yellow cedar, spruce, and hemlock. Several barren burnt-over areas, however, can be noticed from the water. No land suitable for agriculture was seen, but it is possible that some of the flatter portions may be required for sites for fishing purposes.

LAREDO INLET.

Laredo Inlet, some 20-odd miles in length, lies in a general northerly direction and extends well into the interior of Princess Royal Island. It varies in width from three-quarters of a mile to a little over 1½ miles. Its mouth is blocked by two islands, thus making three entrances to the inlet. The easterly and middle entrances are used by local launches, that to the west being very narrow and strewn with reefs. In the inlet itself only three dangerous reefs were noticed. Two of them lie well out in the channel off the mouth of Mellis Inlet, and the third lies off the north end of the island at the head.

On the west side two offshoots, Mellis Inlet and the Bay of Plenty, run off. They are both narrow and about 2 miles in length. The tides are regular in flow, but owing to the inlet's entrances being choked their velocity here is noticeable.

The shores are generally well timbered with fair-quality spruce, cedar, yellow cedar, and hemlock. The better stands have already been taken up, and in one case fairly well logged. Hand-logging has also been carried on along both shores. No land suitable for agriculture was seen, the hills sloping fairly steeply to the water throughout its entire length.

DEER PASSAGE.

Deer Passage lies between Cunningham and Chatfield Islands and connects Seaforth Channel with Return Passage. It is an invaluable waterway for small boats, as it affords a short connection to either Ellerslie Channel, Sister's or Roscoe Inlets. Hand-loggers or others working in these channels use it on their way to Bella Bella, which is the closest port to them and their source of supplies. It is approximately 8 miles in length and of very variable width, narrowing down to some 5 chains in width at its narrowest part, which occurs close to its northern end. At this point it is nearly blocked by two rocks. Throughout its length are a number of small islands and rocks, but few reefs. Only in its northern end do they obstruct the channel, but are readily avoided if care is taken.

Both shores are well timbered, more particularly the east, but the timber as a whole is of poor quality, being small and heavily limbed. Spruce, cedar, and hemlock predominate.

The Chatfield Island shore is lower lying and not so steep as Cunningham Island, but both are rocky and rock-outcroppings occur throughout the land adjoining the water. Other than for timber purposes the land would appear to be of little use.

Lama Passage.

My work in this channel consisted of the triangulation of that portion lying between Camp Island and Pointer Island lights. This section has already been accurately charted, and therefore any one desiring information as to lie of the shores, rocks, etc., cannot do better than consult the chart.

The south shore is low-lying and well timbered and is mostly taken up by pre-emptions. The north shore is rocky and steep. It is generally well timbered with poor-quality spruce, cedar, and hemlock. With the exception of a small area close to Camp Island light, it is doubtful if any of this land will be required for settlement purposes.

Lot 1311.

This lot is a pre-emption close to Charlie Point, on the west side of Johnson Channel. It lies over the valley of a small creek, with sides falling moderately steeply to the creek-bed. It is moderately well timbered throughout with spruce, cedar, yellow cedar, and hemlock of small size. Most of the land is gravelly, with here and there patches of richer soil, and in depression is swampy inclined to muskeg.

Lot 1312.

This lot, being Outer Island, is situated off the south-west coast of Price Island and was surveyed as a beacon-site for the Department of Marine and Fisheries. It is covered with a growth of spruce, hemlock, and cedar and in part with dense undergrowth. The shore-line is steep and rocky and on it and the adjacent rocks numerous sea-lions live. The timber is valueless, being heavily limbed and wind-swept. No area of arable land other than small patches was noticed.

Lot 1313.

This lot, being Idol Point beacon-site, consists of the small peninsula, on which the light of that name stands. It is situated on the northerly end of Dufferin Island, opposite the mouth of Ellerslie Channel. It is well timbered and is rocky throughout.

Climate.

The area of the Coast covered this season is well known for its bad climate. This summer, however, was a pleasant exception and was one of the driest every experienced. Very little rain fell during the latter part of May or in June, July, or August, but the weather was beginning to break in early September. There is a considerable difference in climate between the inner channels and those stretches of water lying immediately adjacent to the ocean. The rain and snowfall is very much less close to the Pacific than it is in the inner channels.

The prevailing winds of summer are westerly blows, but often their apparent direction is otherwise, due to the lower winds following the deviating channels between the mountain ranges. The wind usually commences to blow about 8 a.m., being at its maximum about 4 p.m., and dying away at sundown.

Game.

Practically all the islands surrounding the waters triangulated are plentifully stocked with Coast deer. As a general rule, the farther west the island lies the more thickly the deer are. This is partly due to these islands being less hunted over and to the absence of wolves, which seem to be on the larger inner islands only. Last winter seems to have been particularly hard on deer in the vicinity of Ellerslie Channel and Lake. A considerable number of carcasses were seen in this vicinity, and I presume the heavy snow covering their food, and the wolves, are accountable for same.

A few wolves were seen on Princess Royal Island, and from accounts of those in the vicinity there are quite a number of wolves on the island. The hand-loggers in Ellerslie Lake also reported a fair number in that vicinity.

Bear are also numerous on Princess Royal Island and a white (Kermode's) bear was seen by the party. Tracks of bear were plentiful in Roscoe Inlet and on the divide between Roscoe and Ellerslie Lake.

A few grouse were seen in Deer Passage, but this bird does not appear to be plentiful anywhere in this section of the Coast. Plover, snipe, and gulls were breeding in great numbers

on the more exposed rocks, particularly in Laredo Sound. A few geese breed in the vicinity of Laredo Inlet, but give one the impression that they are mere stragglers who may or may not be there another season. No edible ducks breed in this area at all.

Few of the smaller fur-bearing animals were seen, mink being the commonest.

Trout of several varieties can be caught in any of the streams, the fishing in Ellerslie Lake and Ingram Lake and its outlet being particularly good.

Fish common to British Columbia waters can be caught throughout this area, but are most plentiful close to the open ocean. A fair number of whales, blackfish, sea-lions, and seals were also seen.

I have, etc.,
JAMES T. UNDERHILL, B.C.L.S.

COAST TRIANGULATION, RANGES 3 AND 4, COAST DISTRICT.

BY A. E. WRIGHT.

PRINCE RUPERT, B.C., December 3rd, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on my season's work on the northern Coast of British Columbia:—

The waters triangulated this year consist of Estevan Sound and the unnamed sound between the south end of Estevan Sound and the entrance to Surf Inlet; North Surf Inlet and several unnamed islands about the entrance to North Surf Inlet; Union Pass from the north end of Squally Channel to Grenville Channel; four lakes on Pitt Island emptying into Union Pass; Red Bluff Lake, on Pitt Island, emptying into Grenville Channel; Coghlan Anchorage, Kiltuish and Kiskosh Inlets off Douglas Channel, Drum Lummon Lagoon, Jesse or Fountain Lake, Verney Passage, and the passages between Loretta Island and Hawkesbury and Maitland Islands. Lighthouse-sites were also surveyed on South Surf Island and near Camp Point at the south end of Grenville Channel.

Several stations of the Hydrographic Survey were connected to in the vicinity of Surf Inlet and at the south end of Estevan Sound, and stations of the Geodetic Survey on the summits of Estevan and Hawkesbury Islands and on the Pitt Island shore of Otter Channel were also tied.

North Surf Inlet bears northerly into Princess Royal Island from the entrance of Surf Inlet. It is about 6 miles long and from a quarter to a half mile wide, with some fair timber near the head. There are several small islands north of the entrance to Surf Inlet. The largest of these were traversed. They are mostly of lime formation and have some fair cedar and spruce.

Estevan Sound is the southerly continuation of Nepean Sound. It varies in width from 3 miles at its north end to 6 miles at its south and is 15 miles long. The southern end is rather shallow, partially obstructed by North and South Watcher Islands and by numerous drying rocks. Estevan Sound is not recommended by the Admiralty, but a good channel exists three-quarters of a mile east of South Watcher Island; thence northerly, keeping to the centre of the channel.

Campania Island is about 4 miles wide and 17 miles long. The rock formation is a white granite and its mountains rise to a height of about 2,000 feet. The western slopes are very abrupt, descending to a level of 200 feet above the sea, with a level stretch of bare rock half a mile wide to Estevan Sound. The west shore of Campania Island is badly cut up by inlets and bays with innumerable small islands.

Estevan Island, or rather the Estevan Islands, lying between Estevan Sound and Hecate Strait, are about 4 miles wide and 18 miles long. They are best divided into North, South, and East Estevan Islands, but there are also a great number of small islands off these. The summit of North Estevan Island, on which the Geodetic Survey has placed a station, rises to a height of about 1,100 feet, but the greater portion of all the islands are low but rough and rocky, with not much merchantable timber.

Union Pass is the northerly continuation of Squally Channel, separating Pitt Island from Farrant Island and terminating in a narrow neck of water 2 chains in width at its junction with

Grenville Channel. It is narrow and tortuous, though widening out in places to 30 chains. The tides attain a velocity of 6 knots at springs and there is a depth of at least 10 feet throughout the channel.

A chain of lakes extend north-westerly into Pitt Island, from about half-way through Union Pass, for a distance of 7 miles, passing to the westward of Red Bluff Lake.

Red Bluff Lake extends 7 miles westerly into Pitt Island from a point 5 miles south of Lowe Inlet on Grenville Channel. Its eastern extremity is only 100 yards from Grenville Channel and its mean elevation 110 feet above sea-level. From the mountains south of Red Bluff Lake many other lakes can be seen.

Coghlan Anchorage with Stewart Narrows separates Promise Island from the Mainland. It is about 10 chains wide at its narrowest part, widening out to half a mile at its south end, and is 4 miles long. There is an abandoned saltery about half-way through Stewart Narrows on the Mainland side.

Douglas Channel is the southern continuation of Kitsumgallum and Lakelse Valleys. It extends southerly from Kitimat to Wright Sound, a distance of about 54 miles, varying in width from 2 to 3 miles. Its east shores are Hawkesbury and Maitland Islands and its west shores the Mainland peninsula between it and Grenville Channel. The mountains bounding it are about 4,000 feet in height, with perpetual snow on the upper slopes facing north. Extending into the Mainland from the west shores of Douglas Channel are many inlets and lakes. The shores are for the most part steep and bare of timber. At the mouths of the larger creeks, however, and on certain of the gentler slopes, some fine spruce and balsam may be seen.

Kiskosh Inlet is about 6 miles north of Hartley Bay. It averages about half a mile in width and extends north-westerly for about 6 miles. A flat, well-timbered valley extends back for half a mile from the head, terminating in steep mountains.

Kitkiata Inlet is 14 miles north of Hartley Bay and was triangulated and reported on by J. T. Underhill, B.C.L.S., in 1920.

Fourteen miles north-east of Kitkiata Inlet is the Drum Lummon Mine in course of development. Drum Lummon Lagoon has an entrance 5 chains wide, through which the tide runs very strongly. It is impossible to navigate excepting for two hours at slack, which occurs two hours after high and low tides in Douglas Channel. The lagoon is from a quarter to three-quarters of a mile wide and about 7 miles long. There is a large stream on the south-west shore with a drop of over 1,000 feet in three-quarters of a mile, where considerable power could be developed should it be needed at the Drum Lummon Mine. There is also a fair quantity of spruce and balsam of good quality on the slopes of the mountains near the head and on the flats at the head of the inlet.

About 2 miles north of Drum Lummon Bay is an indentation called Dawson Arm. About 1½ miles in this indentation divides into two inlets. Miskatlah Inlet extends north for 4 miles and was triangulated in 1920 by J. T. Underhill, B.C.L.S., and Kiltuish Inlet, the westerly arm, extends north-westerly for 6 miles, terminating in a flat timbered valley, fronted by mud-flats through which flows a large creek navigable at high tide for 3 miles.

Six miles north-east of Dawson Arm, Jesse or Fountain Lake falls directly into Douglas Channel from a height of 18 feet. Jesse Lake is about 30 chains wide and 6 miles long, with a flat timbered valley at the head. A large creek navigable for some distance flows into the head of the lake.

The eastern shores of Douglas Channel consist of Hawkesbury and Maitland Islands, separated by Sue Channel, which is divided near its eastern end by Loretta Island. The shores of the passage to the south of Loretta Island are well timbered, but those of the passage to the west are bare and rocky. Both Hawkesbury and Maitland Islands are very rugged, the former rising to a height of about 4,000 feet, with depressions between the mountains filled by small lakes.

We tied in to a monument of the Geodetic Survey on the summit of Hawkesbury Island at an elevation of about 4,000 feet. South-east of Hawkesbury Island and separating it from Gribble Island lies Verney Passage, 14 miles long and averaging a mile in width. Its shores are very precipitous, with practically no timber. The Gribble Island shores are particularly steep, with deep depressions between the mountains, in every case containing a lake. While these lakes are from 300 to 700 feet in elevation and close to the channel, their value from a power standpoint is counteracted by the fact that they drop sheer into the channel, with no flat ground available for power-stations.

INDUSTRIES.

Fishing.—The nearest cannery to the district covered by this report is at Lowe Inlet, on Grenville Channel, where salmon from all the seaward channels from the south end of Laredo Channel to well up Principe Channel are taken. Salmon caught in the waters east of Douglas Channel—i.e., Gardner Canal, etc.—are generally taken to Butedale Cannery on Fraser Reach. No gill-nets are used, most of the salmon being caught off the mouth of the creeks by purse and drag seines. By far the greater portion of these fishermen are Indians, though there are a few white men and Japanese. The fish are called for regularly by a launch or tug-boat.

Spring salmon and a large proportion of cohoes are caught by trolling from gas-boats, but these are the only species of salmon which will take a bait. The seine fisheries at the smaller rivers are becoming depleted just as quickly as the more-talked-of gill-net fisheries at the large rivers, such as the Skeena and the Nass, and will soon disappear altogether if vigorous steps are not taken to preserve them.

Logging.—There are no sawmills in the district under report and logging is carried on altogether by hand-loggers. These men, either singly or by two's and three's, secure licences to cut timber along a fixed distance of shore-line. They are not permitted to use heavy machinery, and as their means of removal are limited to such tools as screw-jacks, peevies, etc., they only take timber that can be dropped close to the water on a side-hill. It is usually necessary to bark them and wait until the rain has made them slippery enough to slide easily into the water. The hand-logger usually has a gas-boat and a log float on which is built a comfortable cabin, and the sheltered nature of most of the waterways makes it possible for him to tie his home conveniently to his work. Practically all logs from this district are taken either to Swanson Bay or Ocean Falls. The most-sought-after logs are spruce, as it has been impossible to sell cedar lately. A considerable amount of hemlock and some balsam are also cut.

As the choice timber near the salt water becomes exhausted it will become necessary to use the scrubby growth of the side-hills, of which there is an almost unlimited supply.

Mining.—This district is on the western fringe of the Coast Range and was formerly considered to consist almost wholly of a white granodiorite. A great portion, however, is composed of much older rocks, mainly granitic schists, but containing also bands of pure and impure limestone and other metamorphosed sedimentary rocks.

Outside the Belmont Surf Inlet mines operating on Princess Royal Island, the only operating mine is that at Drum Lummon Bay on Douglas Channel. This is still in the development stage, though indications are very promising. When visited in August the wharf was nearing completion and preparations being made to install a larger compressor and construct a tramway.

The values are in copper ores which are in a pegmatite dyke, but there is also a considerable value in free gold, and some of the picked samples are spectacular. Many other prospects exist, especially near the operating mines, and in the Gardner Canal District but little work has been done on most of them.

Agriculture.—It is unlikely that farming will ever develop to the extent of being called an industry. The patches of suitable land are too isolated and require too much preparation to be handled economically. It is likely, however, that pieces of land will be taken up, either singly or in small groups, by fishermen and loggers who only need small holdings and who will derive the major part of their income from pursuits other than agriculture. Excellent vegetables are had from such small gardens as do exist.

On Aristazable Island, on the north and south ends of Banks Island, and on portions of Estevan and Porcher Islands are areas that will eventually be taken up in this way.

CLIMATE.

The climate in the district under report is mild, with no extremes of heat and cold. On the outer islands the temperature never falls to within 15° of zero and never rises above 80° above. At Kitimat, which may be taken as the extreme, it frequently falls below 10° below zero and probably reaches 90° above in the summer.

The rainfall varies from 80 inches near Hecate Strait to 280 inches in the midst of the island mountains, and the snowfall varies in the same way, there being practically none on the outer islands. At Kitimat the climate partakes more of the characteristics of the interior, as while the snowfall is fairly heavy, the rainfall is not so severe as farther down the channel.

Game.

Deer are found on all the islands, but become very scarce as the head of Douglas Channel is reached. They are very numerous on the outer islands. Goats are found on the Mainland and on Pitt Island, but none of the other islands. Black bear are seen on the inner islands and on the Mainland, but I have never seen any tracks on the outer islands. Wolves are quite numerous, both on the islands and on the Mainland.

Geese and ducks are quite numerous in the fall and winter, especially on the inlets off Douglas Channel.

In the area under report the only post-office is that at Hartley Bay, where the Union Steamship Company supplies weekly service.

Next to Kitimat this is the largest Indian settlement in the district and has a Government wharf. While there is no post-office at Lowe Inlet, mail can be got if addressed care of the cannery. There is also a good store at Lowe Inlet, where practically all sorts of supplies can be obtained.

I have, etc.,
A. E. Wright, B.C.L.S.

CONTROL SURVEY, RANGE 4, COAST DISTRICT.

By F. C. Swannell.

Victoria, B.C., January 17th, 1923.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—The work of the season, as planned, was to extend the main triangulation of 1920–21 north-easterly so as to connect with R. P. Bishop's station on Mount Fulton, thus giving a direct tie from the Coast triangulations up Dean Channel and Gardner Inlet across to the line run along the 54th parallel in the vicinity of Babine Lake. It was also proposed to establish a main station near Natalkuz Lake and tie this by traverse or triangulation to the surveys on Tatelkuz Lake, already tied to the line on the 53rd parallel. As the end of the line run west along the 53rd parallel had in 1920 and 1921 been carried across to the Coast triangulation, it was hoped to connect the 53rd and 54th parallels with a closed circuit east of the Coast Range, and in addition check the triangulation across the Coast Range.

The Geological Survey, under S. C. McLean, having in 1920 measured a base at Ootsa Lake Post-office, I was further instructed to carry my own triagulation down to this as a check. Most unfortunately, however, the road-gang, in altering the location of the Ootsa-Francois Road, had destroyed the monument at one end of Mr. McLean's base, thus ruining a careful bit of work. Had a few angles not been read from this point the previous season, no check at all could have been obtained.

I regret to state it was impossible to complete above programme by a rigid triangulation to Mount Fulton. The main stations, 30 to 40 miles apart, should have been read early in the summer, but for three months smoke from forest fires made it absolutely impossible to see distant points. In the fall we were hampered by low-lying clouds and fresh snow on the mountain stations. Although seriously hampered by smoke, I ran a chain of minor triangles down Ootsa, Intata, Natalkuz, Chelaslie, and Euchu Lakes, tying in several isolated surveys, connecting up with the large block of surveyed land along Tetachuck Lake and the surveys at Tatelkuz Lake. Topography was taken along this belt and a reconnaissance of a very rugged mountain area at the headwaters of the Kitlope River made.

I shall now report in detail on the country area by area, finishing with some remarks on the results of the main triangulation.

Ootsa River and Intata Lake.

Leaving the easterly end of Ootsa Lake, the river which drains the basins of Ootsa, Whitesail, Troitsa (Blue), and Tahtsa Lake is 160 yards wide, splitting into several channels running swiftly between small islands and bars. Half a mile down is a deep lake expansion a mile in

length. The river leaves this in two channels, the smaller one to the right leading off as a narrow bay. The main river runs to the left, is deep, and practically dead water. The two channels unite 2½ miles below Ootsa Lake, flowing swiftly over a gravel bottom, and 300 yards farther there is a quarter of a mile of shallow rapids, 300 yards of swift good water, and then another rapid caused by a reef of bed-rock extending clear across the river. At low water there is only one deep narrow break in this reef not far out from a low rocky point jutting out from the right bank. At high water these two rapids are completely drowned out. In the fall, however, care must be taken to run both on the right-hand side. The remaining mile and a quarter to Intata Lake is good water, although fairly swift.

INTATA LAKE.

This lake is 10¼ miles long, very narrow, and forms a flattened "S" lying south-east in general direction. It is much longer and narrower than shown on existing maps. There is very little beach, except at the spits of the long narrow peninsulas, which at several places contract the lake to a quarter of a mile in width. Much of the lake is very shallow, being silted up with mud to within a foot or so of low-water level. There is no agricultural land along the right or southerly side, the country, densely wooded with jack-pine, rising steadily to a flattened ridge about 600 feet above the lake, which near the lower end of the lake abruptly rises in a densely wooded flat, table-topped hill, a landmark from both Ootsa and Natalkuz Lakes. The country to the east of the lake is also useless agriculturally, broken hills jutting out into the lake as promontories.

Five miles down one lot has been surveyed, which takes in almost the whole of the only good piece of land adjacent to the lake. There is a fairly heavy stand of spruce and pine in the hills at the head of the lake, but much of this was ruined this year by a fire started through criminal carelessness on Ootsa River.

NATALKUZ LAKE.

The river link between Intata and Natalkuz Lakes is only a mile long, is swift, much cut up by islands, but even at low water there are no rapids. By taking the left-hand channel throughout, its navigation is safe and easy at any stage of the water for canoes and small boats.

After the depressing effect produced by the worthless jack-pine country around Intata Lake it is a pleasure to pronounce Natalkuz one of the prettiest lakes in the Northern Interior —an effect largely produced by the long vista down the main arm, almost the whole 12 miles of which, to the Nechako River, is flanked on the left by an almost unbroken escarpment, the steep grassy slopes of which are broken at rare intervals by small streams draining the plateau and hill country behind, whose waters have built out alluvial fans into the lake.

Everywhere there are wide beaches of gravel and sand, and instead of the muddy bottom of Intata Lake the shallows at the heal of Natalkuz Lake have a sand bottom. The lake is Y-shaped; the long arm runs south-east 12 miles to the Nechako River, is straight, and gradually increases in width to 1¼ miles just above the peninsula between the two arms of the lake. The West Arm runs due west 5 miles from the Nechako River to Euchu River, which drains the four large lakes to the west.

Unfortunately there is very little good land around this lake. At the head of the main arm east of the river there is some meadow and bottom land. The fans of alluvial land below the escarpment are very small, never over 20 acres. The plateau behind runs back for miles in places, but its lowest elevation is 3,000 feet and most of it is jack-pine country with a few scattered meadows.

At the outlet and down the Nechako River 630 acres of bench land has been surveyed, but the soil is inferior, being sandy and gravelly. The land between the arms is hilly. South of the lake for some 4 miles back is undulating jack-pine country, again worthless except for a few small meadows.

NECHAKO RIVER AND CANYON.

The Nechako River flows from the south-east end of Natalkuz Lake as a beautiful clear stream flowing smoothly over gravel bottom and averaging 125 yards in width. Running almost east for 5 miles, it then swings in a general direction north-east to the Great Bend 23 miles down-stream. Here it turns sharply back on itself, running west and even south-west for 7

miles, and then plunging abruptly north into the Grand Canyon, shortly below the entry from the west of Lucas Creek. As far down as this point the river is smooth-flowing but swift. The surrounding country is mostly jack-pine bench lands quite unfit for agriculture. There is very little burn. Occasional small areas of bottom land covered with poplar, cottonwood, and willow occur in the river-loops, but in all it would be hard to obtain more than half a dozen quarter-sections. The most marked topographic feature of this upper river is the line of sharply crested moraine ridges flanking the right bank of the river for the first 3 miles and terminating in a glacial lake, into one end of which the river has cut. The same occurs again some miles farther down, the lakes in both cases being evidently much older than the river.

The Grand Canyon is 7 miles long, the lower 3 miles being a narrow box canyon cut down sheer 300 feet. Above the water is not continuously bad, but the gorge is deep, and shorter box canyons and bad chutes are frequent, particularly at the head of the canyon.

Down the lower 3 miles nothing living can go. There is one wild cascade of 60-foot drop, and below this the river races madly in a narrow cleft, at places not 50 feet in width and often immensely deep. A rise of 3 feet in the level of the broad river above the canyon would pile the water 30 feet higher in this chasm.

We noted one right-handed bend where the whole impact of the raging current has cut a cave 100 feet long and 60 feet deep into the cliff, the water swirling in boiling eddies under the overhanging cliff. No salmon pass this canyon, needless to say. Half a mile above the stream draining Cheslatta and Murray Lakes the gorge abruptly ends, and except for four short but rather bad rapids the river is a broad smooth-flowing stream down to Fort Fraser. The total drop in the 7 miles of canyon must be at least 325 feet.

Euchu and Chelaslie Lakes.

The west end of the shorter arm of Natalkuz Lake is linked to Euchu Lake by less than a mile of river and river expansion. There is only one short riffle. Indeed, Euchu and Natalkuz were anciently one lake, the western arm of which, now Euchu Lake, being cut off and dammed back by alluvial deposits from Entiako River, which here enters from the south. Euchu Lake (altitude 2,600 feet) is 12 miles long, its general direction a little south of west. Its greatest width is a mile. Three miles from the west and on the north side a narrow river-like channel a mile long leads into Chelaslie Lake, running 5 miles to the north-west.

Chelaslie is really on an arm of Natalkuz Lake, the connecting-link being absolutely dead water. The east shore of Chelaslie is flanked by a high grassy escarpment which carries around at a height of about 300 feet down Euchu Lake. There is good grazing on the slopes. The country behind is jack-pine-covered plateau.

At the head of Chelaslie is a belt of bottom land, partly open swamp meadow, part densely overgrown with willow. There is no land along the western shore of Chelaslie, which runs up into the thickly wooded hills. At the foot of the lake east of the outlet is 100 acres of excellent bottom land carrying a stand of cottonwood and poplar. This is mostly included in Lot 338.

The only good land noted along the north shore of Euchu Lake was some 20 acres on a point some 6 miles up the lake and a swamp meadow 7 miles up. To the south is a worthless broken jack-pine country, with a little good land and meadow on a bay near the mouth of Tetachuck River. This river, emptying into the west end of Euchu, is 4 miles long. A mile up, a few hundred yards above the Bella Coola Trail crossing, navigation is stopped by falls 25 feet high. The remainder of the river to Tetachuck Lake (altitude 2,200 feet) is a continuous boulder-strewn rapid with two small cascades. We had to portage our canoe three times, the longest carry being a quarter of a mile around and above the falls. The remaining rapids we dragged the canoe up "light."

Chedakuz Creek.

The trail from the head of the Nechako River to Tatelkuz Lake for the first 5 miles follows the crests of open moraine ridges, the whole surrounding country being covered with glacial drift, with numerous small lakes in the folds and hollows. At 5 miles out the trail dips down to Chedakuz Creek, a stream 30 feet wide and 1 foot deep emptying into the Nechako 4 miles below Natalkuz Lake. The creek lies in a trough 200 feet below the level of the plateau. Its course is tortuous and betrays much evidence of old beaver-work, resulting in many meadows; the strip of bottom land is in places 20 to 30 chains wide, but is not continuous. A thousand

acres in all could be selected along 10 miles of the valley, but never more than 80 acres in any one spot. The plateau on either side of a general level of 3,000 to 3,200 feet, is quite useless, being typical worthless jack-pine country.

PASSES TO HEADWATERS OF KIMSQUIT AND KITLOPE RIVERS.

In the report for 1920 Garde Pass from Eutsuk Lake down Smaby Creek to the Kimsquit River was described; this year Surel and Lindquist Passes were examined and the surrounding mountains mapped.

Surel Pass (Altitude 3,960 Feet).

Surel Lake (altitude 2,980 feet) is entirely within the main Coast Range. It is 3 miles long and drains into Eutsuk Lake by three-quarters of a mile of torrent, ending in a 90-foot fall close to Eutsuk Lake. Into its south-west corner a large glacier creek enters; going straight south down this for 3½ miles through large swamp meadows the head of the valley is abruptly reached; three large cascades, falling sheer from the glacier-capped mountain wall to the left, joining forces to form the creek. The rise up to this point has been only 200 feet. Turning sharply west up a small feeder the summit (3,960 feet) is reached, 5 miles from Surel Lake. The descent is now down an alpine valley dropping south 2 miles and at an altitude of 3,200 feet merging into the valley of Chatsquot Creek, which latter creek heads in the huge glaciers of Smaby Mountain. A mile and a half below the junction, at an altitude of 3,000 feet, the Chatsquot drops into a gorge, falling 1,800 feet in 1½ miles into the wide Kimsquit Valley. This point is at an altitude of 1,200 feet, 34 miles from Dean Channel and 11 miles from Surel Lake.

Lindquist Pass (Altitude 3,150 Feet.)

Lindquist Lake (2,915 feet), 2 miles south of the western end of Whitesail Lake, into which it drains, runs west for 3 miles. From the west end of the lake a little over a mile, crossing the divide at an altitude of 3,150 feet, brings one to a creek in an alpine valley running south for 3 miles; then at about an altitude of 3,000 feet swinging more westerly into a gorge; finally, 6 miles from the summit emptying into Ear Lake (1,170 feet). This lake, 2½ miles in length, drains directly into Gamsby or Tenaiko River, a main tributary of the Kitlope River, although the lake itself is in the Kimsquit Valley and is only separated from Chatsquot Creek by a few hundred yards. The outlet of Ear Lake is 40 miles from Gardner Inlet and 38 miles from Dean Channel.

Regarding the descent from the summit to Ear Lake, Heretzky, who examined the pass nearly fifty years ago, states: "The waters of the North-east Fork of the Kitlope reach Beaver (Ear) Lake after a precipitous descent through a rugged canyon, above which the mountains rise to towering heights. From Lake Tochquonyalla (Lindquist) to the lower valley of the Tsatsquot a road could be carried only along the rugged slopes at a high elevation and with excessively steep gradients."

MAIN TRIANGULATION.

While not proposing to go into technical details, a few remarks as to the way in which the separately worked-up triangulations of Eutsuk, Whitesail, Tahtsa, and Ootsa Lakes fitted into one main scheme may be of interest.

The 1920–21 work fixed three points commanding the plateau east of the Coast Range; these points, marked by large cairns, are: Rhine Crag (altitude 6,312 feet), at the east end of Tahtsa Lake; Mount Wells, south of the west end of Ootsa Lake; and Mount Swannell, in the Fawnie Range south of Natalkus Lake. By erecting cairns on Nadina and Uncha Mountains we bridged the gap to Mount Fulton. Three main bases and three check-bases were used. The Eutsuk triangulation extended by a base measured by the Geological Survey gave a value of 63,000.3 feet for the distance Arete Peak — △ 23 Whitesail Lake. Expanding my Whitesail base westward, I obtained a value 63,000.0; the mean of the two results was taken and expanded to the large triangle Chikamin Peak–Rhine Crag–Mount Wells (Stony Mountain), whose shortest side is 24 miles. Working down to the Tahtsa Lake triangulation, we got a value of 36,590 feet for the distance between Rhine Crag and Huckleberry Mountain. The Tahtsa Lake base gave 36,591 as the value of this distance. These agreements are satisfactory, especially as owing to the mountainous country the main bases were far too short.

The distance Rhine Crag–Mount Wells as obtained by the Whitesail–Eutsuk triangulation is 179,611 feet. The Ootsa Lake triangulation, based on the Geological Survey base at Ootsa Lake Post-office, gives 179,615 feet. This is an error of 4 feet in 34 miles. The mountain bases were much shorter, but the triangulation extension better.

MEANS OF ACCESS.

Intata, Natalkuz, and Euchu Lakes are readily accessible by water from the settlement along Ootsa Lake. Chelaslie Lake may be also reached by the Bella Coola Trail, which crosses at the foot of Ootsa Lake, striking into the head of Chelaslie Lake and following down the left-hand shore to Chelaslie Crossing at the foot of the lake. The only land route to Natalkuz, the Upper Nechako, and Chedakuz Creek from Ootsa Lake is a circuitous one by Indian trail from the east end of Cheslatta Lake.

CLIMATE.

The summer of 1922 was abnormally dry, there being hardly a heavy shower in three months. In normal years the climate and rainfall of the lake region south of Ootsa Lake is much that of the Northern Interior Plateau in general. This year was remarkable in that there was an entire absence of summer frost, probably on account of the dense blanket of smoke from the forest fires by which we were surrounded. Twenty-five miles up Eutsuk Lake the rainfall would be double that normally experienced a few miles to the east. The snowfall is four times as much, we were informed. The rainfall rapidly becomes greater as one works westward into the main Coast Range, until it is very heavy at the heads of the Kitlope and Kimsquit, and the forest-growth here is typically coastal.

GAME.

Deer were common along Natalkuz Lake and were frequently seen along the shore. They were more numerous still down the Upper Nechako, where they have not been hunted. In one afternoon, going down-stream, we encountered seven—one too tame to run away although the canoe passed within 80 feet. During the season thirty-two were seen along the shore, casually, during the process of the survey. Moose are moving into the country rapidly. Only four black bear were seen and two grizzly in Surel Pass. Goat in the mountains were scarce and kept very high, and we saw no caribou at all.

I have, etc.,
F. C. SWANNELL, B.C.L.S.

CONTROL SURVEY, CHILKO LAKE, RANGE 1, COAST, AND LILLOOET DISTRICTS.

BY R. P. BISHOP.

December 31st, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to report on a triangulation and topographical survey carried out this year in the neighbourhood of Chilko Lake, Tazeko (Whitewater) Lakes, and the Southgate River.

With the exception of an expedition to Whitewater, all the work was reached by back-pack trips from the shores of Chilko Lake, which was navigated by a dug-out canoe fitted with an Evinrude. A three-months supply of food and gasolene was cached at the commencement of the season on the north shore of Franklyn Arm, a necessary preliminary in this part of the country, where communication is extremely uncertain owing to flooded rivers, gales on the lake, and absence of settled inhabitants.

Chilko Lake is best reached by way of the Chilcotin Road from Williams Lake, on the Pacific Great Eastern. A telephone from Williams Lake to Bella Coola affords communication to all points on the road, and, by means of its peculiar broadcasting effects, provides the inhabitants with a means of innocent amusement which owes its chief attraction to its touches of local colour.

From the road the shortest way to the Nemaia Valley, near the centre of the lake, is by trail from Hanceville, where Norman Lee's store forms a convenient starting-point for a pack-train. As high water on the Whitewater River renders this route extremely uncertain during the summer months, I decided, somewhat fortunately as it turned out, to go in by way of the north end of Chilko Lake. We heard later that the canoe at the Whitewater crossing which I used in 1912 had disappeared, and that nowadays the Nemaia Valley Indians, who naturally know the ropes pretty well, avoid this trail during the summer months and come out by way of Chilko River. I believe that the Whitewater is high during June and July and that it rises and falls at intervals for some time later.

We motored from Williams Lake to Mr. Stewart's store at Redstone, loaded up in Mr. Robertson's wagon, and left the main road some 6 miles farther on, a little to the east of the Redstone Indian Reserve. Here a rough track runs a little to the west of south, crossing the 124th meridian 7 miles south of the 52nd parallel and ending at Chilko River a little above the mouth of Brittany Creek. The southern part of this track has been cut out recently and is very rough. The surrounding country has been reported on in the report of the survey of the 124th meridian, dated 1912. Generally speaking, it is a gently undulating gravelly plateau, covered by scattered pine which are being continually burnt over, and carrying here and there a few scattered meadows.

Even in June the country was very dry and the lakes nearly empty, so that I had some difficulty in recognizing the lake just to the east of the 7-Mile post (south) on the meridian-line, although this was very accurately sketched at the time of the survey.

At Chilko River we struck the trail which runs along the north bank. Here the wagon left us, and, very fortunately, two Indian pack-trains happened along that very evening, so that we had little difficulty in getting up to the lake, each outfit making a couple of trips. Travelling light with one's own pack-train, the best way is to follow the trail all the way up the Chilko River, leaving the main road at Newton's, or at Stewart's store.

We contemplated the possibility of having to build a boat at the lake, but at length had the good fortune to secure a good-sized canoe which took the engine on its side. Getting the outfit down the lake took some time, as the winds delayed us a good deal and twice swamped the canoe. These winds, which are liable to spring up suddenly and at times blow with great violence, usually commence at noon and die down late at night, but occasionally continue to blow and so maroon the traveller for some days. At Franklyn Arm we left our supplies in a cache belonging to Mr. Ducharne.

Beside the canoe we used, the Indians have one other canoe, a very small one, and Mr. Ducharne, of Brittany Creek, has a third. There are, I believe, no other craft of any kind. One can never depend on getting any of these canoes, as the owners may be away from the lake for weeks at a time. Anybody wishing to spend much time in prospecting around the lake would do well to take in a boat in pieces over the snow.

The Indians spend most of their time on horseback, so that the lake is practically deserted and one may not meet a soul for months. It presents a great contrast to Babine, where everybody travels by water and generally with the aid of gasolene.

MAIN PHYSICAL CHARACTERISTICS.

The outstanding feature of this part of the world is, of course, the Coast Range batholith, composed mainly of granite rocks. Inside the range lies the Northern Interior Plateau, here about 4,000 feet above sea-level, mostly covered by glacial drift or volcanic rocks of the Tertiary period. Between the plateau and the main range, which bears roughly north-west and south-east, are foot-hills and detached mountain-masses, some of which are almost as high as the peaks of the main range.

Three parallel lake systems, Tatlayoco, Chilko, and Tazeko, or Whitewater, lying due north and south, lie partly in the mountains and partly in the foot-hills. Low passes running east and west connect Chilko Lake to the south end of Tatlayoko and to the Tazeko Narrows. The "Coast contact," the inner edge of the granites, described by geologists as a zone of probable mineralization, passes close to the southern ends of these lakes. If this zone, which has so far been very little prospected, proves rich in mineral wealth, its system of lakes and connecting passes may eventually prove of great use in developing a system of transport.

Tatlayoko, the westerly lake, is drained by the Homathko River, which breaks through the mountain range on its way to the head of Bute Inlet. This valley has several times been suggested as suitable for a route to the Coast, and a description and profile of the location-lines can be found in the reports of the old Canadian Pacific Railway surveys. The other lakes drain in the opposite direction, inland, by way of the Chilko and Tazeko Rivers, tributaries of the Chilcotin. The Coast Range generally consists of peaks from 8,000 to 9,000 feet high, surmounted here and there by a few which run to 10,600 feet. The peculiar sameness in height, which has been commented on in several reports of the Geological Survey of Canada, is particularly noticeable from the peaks west of Franklyn Arm. Deep valleys exist, but these hide behind the hills and are difficult to pick up even when one knows their whereabouts.

Mineral Wealth.

Although detailed investigation is not within the scope of this report, the subject cannot be altogether avoided in any general account of the natural resources of the country. The only detailed geological survey in the neighbourhood is the Tazeko map area, which is described in the report of the Geological Survey of Canada for 1920 by the late J. D. MacKenzie, who makes special reference to the deposits of limonite-iron ore, to which so much attention has been paid of late years. These deposits are also described in the Report of the British Columbia Department of Mines for 1919 by W. Brewer and, in greater detail, by F. J. Crossland in 1920. A reference to the recent developments in the Tazeko District is made elsewhere in this report. A few miles to the south-east is the Bridge River map area, which is fully described in the Geological Survey Memoir No. 130, issued in 1922. The surrounding district, which is a centre of mining activity, has on several occasions been visited and reported on by geologists. Mr. Bateman, who commenced the detailed survey of this map area in 1912, also made a rapid trip through the Tazeko country to the Nemaia Valley, from which he canoed towards the south end of Chilko Lake. His description is given in the Report of the Geological Survey for 1912. I believe that, apart from this, the lake has not been reported on by any geologist.

Tatlayoko Lake, to the west, was described by G. M. Dawson about the time of the early Canadian Pacific Railway survey and in 1910 by William Fleet Robertson, Provincial Mineralogist, who gives an account of the properties of the Tatlayoko Gold Mining Company's holdings in the report of the British Columbia Bureau of Mines for 1910.

Mr. Robertson discusses the probability of mineralization along the line of the "Coast contact" throughout the Province in general, and, speaking of Tatlayoko Lake, says: "As to the geology of the district, the granite and other plutonic rocks forming the Coast Range Mountains extend eastward as far as Tatlayoko Lake; on the east side of this lake are the sedimentary rocks of the Interior, and along this contact there is a strong probability that productive mineral deposits occur, particularly where the dykes from the main Coast upheaval have struck off into the sedimentaries." He advises the prospector for the present to give more particular attention to gold ores, which may be treated on the ground.

Mr. MacKenzie, in his report on the Tazeko country, says: "The recognition and mapping of this contact was one of the most important results of the season's work, and its significance is this: Wherever the plutonic rocks are intrusive the general geologic conditions are favourable for mineralization to have taken place; but where the granitic mass is covered by the overlap of volcanic flows there is no geologic reason for anticipating mineral-deposits along the contact."

The lines of contact between the three main classes of rock—the granites, the Interior sedimentaries, and the Tertiary volcanics—appear very clearly in the hills around Chilko Lake. I did not go very far into the country between the end of Franklyn Arm and Tatlayoko Lake, but, from the appearance of the mountains there, think it highly probable that the inner contact of the granites is not overlain by the volcanics, and that, consequently, this may be a favourable area for prospecting.

About a mile beyond the end of Franklyn Arm Messrs. Ducharne and Boulanger have built cabins and have done a good deal of work on their claims, which carry values in copper and molybdenite.

An outlying dyke of granite appears on the summit of Mount Nemaia, some miles away from the main body, and the strata of the surrounding rocks here have been tipped until they are almost vertical. Another likely-looking spot for prospecting is in a canyon about 4 miles west of the south end of Chilko Lake, where there is a certain amount of iron pyrites.

VEGETATION.

The general aspect of the pine-covered plateau and of the foot-hills is described elsewhere. According to Indian report, fir was at one time much more plentiful throughout the country than at present. There are, however, still considerable bodies of it around Chilko Lake, although fires have destroyed a great deal in the last ten years. The trees, being somewhat scattered, have in many places a beautiful park-like appearance, but are heavily branched and would not make very good lumber.

Next to pine and fir, the most plentiful trees are spruce and balsam and, around timber-line, the sugar-pine. At the south end of the lake we saw several large white pine, a few hemlock, and one solitary red cedar about 8 feet high. There are a few yellow cedar in different parts of the lake and plenty of pencil cedar and juniper.

The vegetation at the south end of the lake begins to show a few signs of nearness to the Coast, but full development of Coast vegetation is reached with surprising suddeness 8 miles farther on, in the valley of the Southgate, where cedar, fir, and pine grow to great size, accompanied by yew, salmon-berry, and an abundance of devil's-club, or "bad stick," as the Indians call it. The other extreme, typical of the Interior, commences in the Nemaia Valley, where there is a good deal of bunch-grass, wild sunflower, and other vegetation typical of a dry climate. Black, red, and mountain huckleberry are plentiful on most of the hills, and on the "potato mountains" the Indians spend some time every year laying in a supply of the wild potato.

GAME.

Mountain-goat are fairly common and now form the most reliable supply of meat for the hunter. There are no sheep on the west shore of Chilko Lake, but a few to the south of the Nemaia Valley and towards the Whitewater Lakes.

Mule-deer are pretty evenly distributed, but are far less common than formerly. The Indians report meeting down the Southgate a "Tenas deer," which is, I suppose, the Coast blacktail.

We are told to expect many black bear and the usual ferocious grizzly, but we saw very few tracks of either kind and only once got a glimpse of a black bear. Much to my astonishment, I heard that several moose had been seen in the country in the last two years; one of these beasts appeared at Franklyn Arm last year. On the mountains ground-hog (marmot) are quite plentiful and are killed by the Indians for their meat and skins.

As a general rule game is far less plentiful than ten years ago, the scarcity of deer being particularly marked. Some blame the Indians for this; others, the cougar. I believe that within the last few years attempts have been made to boom this part as a big-game country, and that two or three parties from the East were induced by local guides to come and try their luck, with very disappointing results. Careful preservation might lead to a better state of affairs. Some of the Nemaia Indians seem at length to realize that they will be the losers in the long run if everything is exterminated, and for a time gave up shooting the sheep on the hills to the south of their valley.

Blue grouse, willow-grouse, and fool-hen are fairly plentiful in the Interior, but we saw nothing of the kind in the denser vegetation of the Southgate. I saw some prairie-chicken in the Nemaia in 1912, but none this year, although I was told that there were some near Tsunia Lake. Ptarmigan seem to occur on all the hills.

We caught no fish in Chilko Lake, as we always had to travel too quickly to make trolling worth while. The Indians catch a good many cookanee fish in Conni Lake, and, I believe, net trout in Brittany Creek.

SCENERY.

One tends to become somewhat case-hardened in this Province to magnificent scenery, and, when describing it, to lapse into banal conventionalities which arouse in the mind of the reader an uneasy suspicion that he has heard it all before.

Here, however, the landscape, while typical of the usual grandeur of British Columbia, has certain characteristic features of its own, interesting both from a mountaineering as well as from a picturesque point of view.

A great lake, nearly 4,000 feet above the sea, cuts into the heart of a mighty range; its southern half being closely surrounded by masses of peaks, several of which are over 10,000

feet in height. The result is a relief of about 6,000 feet, not so great as in the adjacent valley of the Southgate, where it is half as much again, but, on the other hand, free to a great extent from such abominations as devil's-club, hardhack, and other impediments due to dense vegetation. The alpinist in search of fields or peaks to conquer without a long preliminary scramble through the bush will do well to consider the merits of Chilko Lake.

There is a great variety of peaks to suit all tastes, the jagged granite of the Coast batholith and the castellated peaks of the Tertiary volcanics affording scope enough for the most ardent alpinist, while the weathered Cretaceous rocks of the "red mountains" enable those of quieter tastes to get well up and enjoy the view without too much unpleasantness.

The variety in the colours of the different classes of rocks, the low-lying glaciers, and the wonderful blue of the lake, the dark green of the "Christmas trees," and, late in the year, the yellow and orange of poplar, willow, and cottonwood, combine to make up a remarkable picture.

From the highest peaks to the west of the lake the Coast Range presents an extraordinary but somewhat monotonous panorama, the peaks being too numerous and too closely packed to afford much variety, although here and there deep and mysterious valleys lend interest from a geographic point of view. On the east side of the lake there is much more variety, and perhaps the best view of all is from Mount Tatlow, which has been appropriately described as an outlying buttress of the range. On the one hand are glimpses of Chilko and the Tazeko Lakes amidst the peaks, and, on the other, a vista of the Chilcotin plains and many other parts of the Northern Interior Plateau, the hills of which seem to crop up almost indefinitely in the distance, although the surface becomes "hull down" after a hundred miles or so. Anahim Peak, the Itcha, Ilgachuz, and Tsitsutl Mountains show up clearly from the summit, but are soon lost to view as one descends the slopes. A view of the sunrise from Mount Tatlow is well worth the climb, as from the upper slopes the eastern plains appear bathed in light, while the pall of darkness still hangs over the western world.

From a practical point of view this district at the present time presents many disadvantages to visitors. The delays to which one may be subjected on the lake on account of its stormy nature, and the crankiness of the local craft, the uncertainty of getting the use of these craft, and the general inaccessibility during the summer months on account of the height of the White-water River, are great drawbacks to those who want to make the best of a short holiday; but with plenty of time and money these can, of course, be overcome. An interesting account of a summer's trip by Malcolm Goddard is given in the journal of the Alpine Club of Canada for 1912. During the course of the season's work we visited several of the cairns erected by Mr. Goddard and triangulated on to others from a distance.

Indians.

Ten families of Indians have their headquarters in the valley, but lead a semi-nomadic existence during the greater part of the year. Like all the Chilcotins, they are born horsemen and do not like going where they cannot ride; consequently they seldom use the lake and avoid the "back-pack" country to its south and west. Some twenty years ago they used to make trips down the Southgate in order to visit the Coast or to catch salmon which ascend as far as the forks. I believe that of late years none of the Indians have gone in this direction, possibly because the settlement at the head of Bute Inlet no longer exists.

After a few years' residence in one place they have a tendency to move on, possibly being influenced by the condition of the range and of the hay meadows. At present the main village of the band is near the south boundary of Lot 305, but there are several old village-sites in the valley.

The Nemaias go in largely for horses, and two members are said to own between them several hundred of these beasts. The result is that the valley is getting overstocked and some of the inhabitants here have moved to Brittany Creek, while another proposes to go to the Elkin Valley. At present the extent of the Indians' holding is not clearly defined and a good deal of uncertainty exists on the subject. The settlement of this question, which has been pending for some years and is now on the verge of completion, will make things much more satisfactory both for the white men and the Indians. There seems to be a tendency, especially on the part of the younger men, to raise cattle instead of horses; although this may be the result of the rapid diminution of the game of the district which has taken place in recent years, it is, at any rate, a most hopeful sign for the future and as such deserves encouragement.

In the early summer the village is generally deserted, as nearly everybody takes to the hills to gather wild potato or hunt meat for consumption during the haying season. They generally use mowing-machines, but do little in the way of raising either "tame" or irrigated hay and depend on the wild swamp meadows for their supply. They raise a few carrots and turnips however, and some years ago had a few acres under ditch. After the hay season a good many take to the hills to hunt the marmot, which is used both for "ground-hog robes" and for meat. In the winter comes the trapping season.

SETTLEMENT.

There are at present no white settlers in Nemaia Valley or near Chilko Lake, but Mr. Ducharne and Mr. Boulanger, who own pre-emptions on Brittany Creek, have cabins at their mineral claims a mile from the end of Franklyn Arm, as well as on their trap-lines in the same neighbourhood.

Mr. Anger, a returned soldier, also of Brittany Creek, who was running a good-sized bunch of cattle there, was drowned last year while fording the Chilko River. Mr. Atkinson is settled at the mouth of Brittany Creek and three of the Nemaia Valley Indians are settling in this neighbourhood.

Mr. Skinner is located north of Choelquoit (Eagle) Lake, and there are, I believe, a few white men at the north end of Tatlayoko Lake. The district is undoubtedly capable of carrying a larger population, as it is well suited for stock-raising; settlement will, however, be very scattered even when the district is fully developed. The delay in the apportioning of the Indian reserves and the difficulty of crossing the Chilko and Whitewater Rivers during the summer floods have kept progress back during recent years, and at present the price of beef gives poor inducement to anybody to go in for stock-raising.

STOCK-RAISING AND AGRICULTURE.

The whole of the district under report is too high for anything in the way of mixed farming, but the hardier kinds of vegetables are grown. Potatoes will not stand the frost in summer. Horses, however, can rustle for themselves all winter in the meadows and cattle require comparatively little feed.

This region affords an interesting contrast to the agricultural districts of the Northern Interior, as both localities have great advantages and great drawbacks.

In the mixed-farming country of the north, potatoes and oats mature without much trouble, but the wild swamp-hay rapidly deteriorates in winter, so that animals have to be fed for half the year. In the north in 1920 the price quoted for wintering horses was $25, but unless arrangements were made in the summer there would be no hay available and the animals would starve.

As one goes south the wild hay stands the frost "better and better," and in the neighbourhood of Chilko Lake animals feed out all winter despite the altitude.

I wish to make it quite clear that I am not trying to "knock" either country, but, by comparison, to show that the high and somewhat desolate plateau to the south, which has at times been adversely reported on, has its own peculiar advantages. I will now describe it in detail.

The country adjoining the 124th meridian was reported on by the writer in 1912. Several of the meadows cruised during that survey have been taken up by the pre-emptors already mentioned. Mr. Ducharne thinks that a good deal of "tame hay" could be grown away from the meadows by utilizing the water of Brittany Creek, a stream which draws its waters from the melting of the snows. I believe that irrigation was practised by the late Mr. Robertson in the Nemaia Valley, where the streams also have the immense advantage of being glacier-fed, and, in consequence, high at the time of year when they are of greatest advantage to the farmer.

Potato Mountain, Tullin, and other hills around the north end of Chilko may be roughly described as the foot-hills of the Coast Range. In many places where the soil conditions are favourable these support luxuriant vegetation near the timber-line, which occurs between 5,500 and 6,000 feet above sea-level. Where granite and hard volcanic rocks occur the vegetation is less prolific.

North-east of the foot-hills the country is a comparatively level plain, broken by a few hills, and generally surfaced by glacial drift sprinkled here and there by boulders of lava and recent

volcanic rocks. This plateau is, for the greater part, more thickly wooded than the settled parts of Chilcotin, is often burnt over, and in parts presents a somewhat desolate appearance. There is a good deal of open bunch-grass on the surveyed land to the north of Choelquoit Lake and lesser patches along the Chilko River and in the Nemaia Valley. Timber-grass is plentiful and wild hay meadows are scattered here and there over the area. These vary greatly, some being rocky and barren and other carrying good hay. The surveyed lands in the Nemaia Valley are partly meadow and partly bunch-grass side-hill, the latter having been rather heavily grazed in recent years by the horses of the Indians.

Access.

A rough wagon-road runs from Hanceville to the Whitewater River. In the winter the Indians sleigh as far as Nemaia Valley, but during the summer floods the Whitewater presents a bad obstacle. Even pack-trains have given up using this route since the canoe at the crossing has disappeared. The late Mr. Robertson commenced a bridge over the river some little way below the ford, but this was swept away. The Brittany Creek settlers are rather keen on having a bridge over the Whitewater near its junction with the Chilko. I have not seen this route and can say nothing about it. I should, however, imagine that if a bridge could be built near the site selected by Mr. Robertson it would be sufficiently central for all purposes. From this point a road to Hanceville or to Big Creek would afford a far shorter route to the railway, and would, furthermore, be useful in opening up the Whitewater Lakes country. At present during flood-time inhabitants of both Brittany Creek and Nemaia Valley have to swim their horses across the Chilko in the slack water near the lake. From this point the Nemaia Valley Trail strikes east to the north end of Tsunia and thence along its north-west shore to Chilko Lake. An old trail which went through a pass in the hills to Conni Lake is now, I believe, covered with windfall and out of commission.

During moderate water the Chilko can be crossed by two or three fords between the lake and the mouth of Brittany Creek. A trail follows the north bank of the river as far as the Chilcotin Road. A rough wagon-road has been recently constructed from the main Chilcotin Road, east of Redstone Indian Reserve, to a point on the Chilko River a little to the south of Brittany Creek.

Tazeko.

In August we made a trip to the East Branch of the Tazeko or Whitewater River in order to tie in some mineral claims and the surveys made by the Geological Survey of Canada in the vicinity of the iron-ore deposits there. This region was fully reported on by the late J. D. MacKenzie in the report of that Survey for 1920. Since Mr. MacKenzie's visit to the district there has been a good deal of excitement over a claim staked by Mr. Taylor, of Lillooet. We turned up one Sunday morning at Mr. Taylor's place in the midst of what at first glance appeared to be either a prayer-meeting or an intensely interesting poker-game, but proved to be a few of the neighbours watching Mr. Taylor wash out a pan of gold. The result quite justified their marked attention. The gold is found in a soft, disintegrated rock and does not appear to be at all water-worn. Mr. Taylor had a 28-foot arrastra, but found that by using it he was losing a good deal of the gold, which is on this claim somewhat difficult to separate. The claim had been bonded the year before to Mr. Tretheway, of Hanceville, who sent a diamond-drill to the Whitewater Lakes, but did not do any further work. I hear that it has been bonded again to an outfit who are working there this winter. I do not know how much development-work has been done on this claim. The whole of the available land in the neighbourhood seemed to have been blanketed by wholesale stakings, so that many fortune-seekers coming in could find no ground on which to locate. Several outfits, however, were doing genuine work, the most noteworthy being Messrs. Prosser and Davidson, of Lillooet, who were driving a tunnel on their claim, which adjoins Mr. Taylor's on the east.

The best way to reach this part of the world during the summer is from the Lillooet direction by way of the Bridge River Wagon-road and then by pack-train. Shalath, on the Pacific Great Eastern, is the nearest point on a railway. The passes on the Bridge River Divide are, however, open for a few months only in summer, and at other times one must go in by way of the Tazeko Lakes, which are reached from Big Creek or Hanceville. The trail runs to the west of the northerly Tazeko Lake and east of the southerly one, keeping a mile or two back from the shore in each case. Mr. M. Taylor and Mr. Swanson, of Lillooet, are running a motor-boat on

the lake, which they brought in this spring over the snow and put together there. She is a powerful, well-built craft, but was not very much used this year. A boat of this type would in my opinion, be immensely valuable in opening up Chilko Lake, the south end of which lies in a country impassable for trails and only to be opened up by water transport.

Some of the prospectors we met at Tazeko were thinking of following up the Coast contact towards Chilko Lake. There are several valleys running in this direction which can be traversed by pack-train—the Westwater, the Yohetta, and another valley on the north, all parallel to the Nemaia Valley. We returned to Nemaia Valley by way of the Yohetta Valley, which lies west of the Whitewater Narrows, and strikes Chilko Lake opposite Franklyn Arm, the trail swinging north a mile or two before reaching the shore of the lake and running over some broken country towards Nemaia. Through the Yohetta Valley the trail is good, with the exception of one soft spot. We saw some bands of horses here which I was told belonged to the Stone Rancherie Indians. There is a certain amount of bunch-grass on the slopes of the eastern end of the valley, but the western part being thickly wooded indicates the transition from the Interior climate to that of the Coast.

THE SOUTHGATE.

On the 26th we started on a trip down the Southgate River, partly in order to find out something about the country and partly in order to better the connection with a cairn located by John Davidson, B.C.L.S., on Mount Rodney at the head of Bute Inlet.

Cairns had already been placed on Mount Good Hope and Mount Chilko, both of which, as far as one could judge through the smoke, would secure a good command of the valley of the Southgate and probably make the desired connection. As we had rigged these stations in July, we had not "searched" for the cairn on Mount Rodney which was to be erected in August, so I considered it advisable to climb one of the mountains some way down the river in order to identify Mr. Davidson's cairn and, in addition, obtain a well-conditioned triangulation.

As some interesting information was obtained from this trip, I will describe it in detail. From Franklyn Arm there is a fair trail for some miles up 9-Mile Creek as far as the summit of the pass. Beyond the pass is the head of one of the branches of the Southgate. Some 3 miles farther, just below the timber-line, Mr. Boulanger has a very cosy trapping cabin, which proved a welcome refuge during the dirty weather we several times experienced in that neighbourhood. The snow here must be very deep in winter, to judge from the height above ground at which some of the trees had been cut off. Opposite the cabin is a valley coming in from the east, through which flows another and larger branch of the Southgate. I believe that a trail once led up this valley, past the south of Mount Meriam, to a point on the shore of Chilko Lake about 6 miles from its south end. Leaving one man at the cabin to relay up supplies for subsequent work on the high peaks, I proceeded down the valley with Mr. Durham. The time of the year seemed suitable, as the Nemaia Valley Indians had told us to put off the trip till late in August in order to avoid high water in the side-streams. Furthermore, the camp augur, from an inspection of the new moon, had foretold fine weather for a fortnight at least, so we set out with great expectations of it, which, however, were not entirely fulfilled, as the mountains here apparently consider it their duty to halt anything in the way of moisture which the westerly winds may have forgotten to leave on the west coast of Vancouver Island.

The first few miles down-stream we found very bushy, and in only a few places could we follow the old Indian trail or the one built by Mr. Franklyn, for both were completely overgrown. I have not been able to find out much about Mr. Franklyn's trail beyond the fact that he is popularly reported to have started from Bute Inlet with sixteen horses and to have arrived in the Interior with one only. Considering the nature of the country, he may be said to have done pretty well. The weather still being hot, the river was in full flood from the melting of the glaciers, sweeping granite boulders down its bed with a most impressive crash and roar. The side-streams, which were comparatively low, would probably have been impassable when swollen by the melting of loose snow in the early summer.

On the evening of the third day from Franklyn Arm we found our way barred by a large river, also in full flood, coming in from the east. As this carried more water than the branch we had been following, and afterwards proved to be longer, I will refer to it as the main Southgate River. The junction, which I will refer to as the forks, is in the uppermost of Mr. Green's timber-limit surveys. The trail crosses the northerly branch by a Siwash bridge about

a quarter of a mile above the forks, then follows the north bank of the river to Bute Inlet. I believe that this part of it is in pretty fair shape.

We spent a day or two trying to bridge the main river without any luck, several 4-foot trees going down-stream like matchwood, until heavy rain in the valley and snow on the peaks put mountain-work out of the question, and caused us to turn our attention to the valley instead.

Water-power.—As the altitude of the forks was only a few hundred feet above sea-level, I decided to explore the main branch of the river with a view to ascertaining whether it passed sufficiently close to Chilko to enable the great storage capacity of that lake to be used for the generation of water-power. For some 8 or 9 miles up-stream the barometer showed the altitude of the river to be all that could be desired; but here we had to guess roughly at our distance from the lake, as our position could only be obtained by dead reckoning, the great depth of the valley precluding all view of the neighbouring peaks. The only plan seemed to be to tie the valley direct with the south end of Chilko Lake, so, the weather still being broken, we beat a retreat to Franklyn Arm, where we employed a well-earned rest in the urgent business of "make and mend clothes."

The second trip, made direct from the south end of Chilko Lake, showed the main branch of the Southgate River to be about 9 miles from the lake and 3,500 feet below it. Owing to the length of tunnel necessary to make use of this head of water, any scheme to develop it may lie outside the realm of practical politics for the present, but it will in all probability be used eventually.

The industrial development of this Coast will depend more and more on water-power, especially as recent authoritative reports on the subject show that electrical smelting of iron ores is economically possible on this Coast, provided that a sufficiently large supply of cheap power can be obtained. It seems within the bounds of possibility that, even as England attained industrial supremacy on the Atlantic by reason of her deposits of coal and iron, this country may rise to a similar position on the Pacific by reason of her supply of "l'houille blanche." Reports on exploratory surveys are often referred to after even half a century, so it will not be out of place for me to give details regarding this source of power, even if it is not likely to be developed for some time.

In order to obtain an approximate estimate of the power available, it would probably be necessary to take periodical measurements of the flow of Chilko River, as calculations derived from the size of the watershed of the lake might not be of much use on account of the great variation in rainfall in different parts of the area. The Chilko River, which is largely glacier-fed, starts rising in the latter part of June and remains in full flood during July, August, and part of September. The lake, which is very deep, especially at the south end, is undoubtedly of sufficient size to regulate the flow of all available water throughout the year.

As regards the way "out," two routes present themselves, the more obvious being down the Southgate to the head of Bute Inlet, some 30 miles away. In the other direction, to the south-east, we have to consider the possibility of a pass through the Coast range of mountains, through a tract of country which appears to be absolutely unknown and unexplored.

From Mount Chilko, at the south end of the lake, one has a few glimpses of the valley of the Southgate, coming in from the east and south; a mysterious valley this, with its giant fir and cedar, wandering at a low level amid the 10,000-foot peaks into the heart of the range, unmapped and unknown, and yet within 120 miles of Vancouver. From my observations in the field I got the impression that there might be a pass through the range at the head of the Southgate; and on my return to Victoria I hunted through all sources for any information about this part of the country, but could find nothing of recent date.

Commander Mayne's Narrative.—Mr. Nation, of the Mines Department, suggested a search through "B.C. and Vancouver Island," written in 1862 by Commander Mayne, one of the early hydrographers of this Coast, who in 1860 was commissioned to inquire into the question of a route to Cariboo from the Coast inlets. During the days of the gold-rush he went up the Pacific Great Eastern route as far as the Bridge River, which he describes in some detail, and also made numerous side-trips, always packing along his chronometer and sextant.

In his book he continually refers to an Indian report that the Bridge, the North Fork of the Lillooet, the Squamish, the Klahoose (Toba), and other rivers have their source in a mountain basin, "containing four or five small lakes, in which rise all the large rivers watering this part of the country."

From the configuration of the country it seems very likely that the Southgate is one of the "other rivers" referred to. In another part of the book he refers to a route which he thinks leads from the head of Bute Inlet to Lake Anderson. It seems quite possible that this route was up the Southgate River and down the Lillooet or the Bridge, as Lieutenant Mayne got his information from Anderson Lake Indians, who every year came to the Coast to fish, visiting Howe Sound, Jervis, Toba, and Bute Inlets. The Indian story of a pass through the mountains here is confirmed by Mr. Downie, who went a little way up the Toba in 1859 while searching for a route for a road to the Interior, and strongly recommended examination of the route leading up this river to the headwaters of the Bridge. Apparently both of these routes would have to pass through the mountain basin which Commander Mayne describes so frequently.

TRIANGULATION.

The triangulation is expanded from a base in the Nemaia Valley and connects the south end of the survey of the 124th meridian, which terminates here, with the upper end of Chilko Lake and with the Tazeko Lakes on the east and the Southgate River on the south-west. The district is in general very mountainous, so that the work, being of a control nature, required stations on the highest peaks in the country. These were marked by cairns from 5 to 10 feet high which should be visible up to about 40 miles in good weather. The system affords good control for detail mapping purposes and is now capable of rapid expansion in either direction, particularly along the inner edge of the Coast Range, where a series of intervisible points can be easily picked, partly on the mountains and partly on the low hills of the Northern Interior Plateau. Owing to the presence of low-lying clouds on the higher peaks late in the season, the angle-reading work on Mounts Chilko and Good Hope could not be completed, but, as the triangulation scheme here consists of a series of quadrilaterals and polygons, satisfactory checks can be obtained on the results of the calculations, which are close enough for all present purposes. Adjustment by least squares, however, is better postponed until all angles are read.

A search was made from Mount Chilko for a cairn placed on Mount Rodney by John Davidson during his survey of Bute Inlet, and angles were read on to an object which agreed with Mr. Davidson's description of the station. The "Rodney" cairn was not erected when we climbed Mount Good Hope, but I think there is no doubt about its visibility from this point. Certain identification can only be obtained by reading the angle between Chilko and Good Hope at Mr. Davidson's cairn, and, as it is close to salt water where transport is comparatively easy, I would suggest that it be read with a large micrometer theodolite. Being somewhat acute, this angle requires somewhat careful measurement, but a better-conditioned set of triangles could be obtained, if necessary, by erecting an intermediate station half-way down the Southgate.

This tie is of considerable importance, as it will afford a means of obtaining a very close approximation to the true positions of a great number of the surveys in the Interior which are connected, directly or indirectly, with the survey of the 124th meridian. Mr. Davidson's work, being tied to the geodetic net on the Coast, will be based on "North American datum," and the geographic position of his points will accordingly be free from the bugbear known as "local attraction of gravity," which exercises such a disturbing influence on astronomical determinations of position in this part of the world.

Angles at all stations were read by a 5-inch Berger transit cut to twenty seconds; eight repetitions being taken to each angle and the horizon closed wherever possible. On the mountains the instrument was read without the tripod, being screwed to the wooden board which secures it in its box when travelling. The correction required to each angle on closing the horizon varied from one to three seconds.

A base-line 2½ miles long was measured in the Nemaia Valley, where satisfactory expansion was obtained on the neighbouring hills. Measurements were taken with a heavy steel band, 1 chain long, graduated at the end to hundredths of a link. Stakes were driven every chain by a large mallet, their relative height obtained by a line of levels for calculating the slope reduction. The exact points were marked by needles, which were taken out after each chainage and placed in again the next time.

Hills had to be climbed when opportunity offered and the base postponed till October. The rapid change of temperature when the sun rose at this time of the year proved to be somewhat of a nuisance and necessitated very frequent readings of the thermometer.

Chilko, Tazeko, and a few lesser lakes were mapped by depression angles and a certain number of photographs taken by a 5 by 4-inch film camera fitted wtih a ray-screen are being used experimentally to contour certain parts of the map.

I have, etc.,
R. P. Bishop, B.C.L.S.

CLEARWATER VALLEY, KAMLOOPS DISTRICT.

By W. S. Drewry.

Victoria, B.C., February 10th, 1923.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—Under your instructions to make surveys in the Clearwater Valley with the purpose of obtaining general information and connecting scattered surveys, thus permitting the construction of a framework upon which a proper map of the important and little-known region could be constructed, the following report is submitted:—

Clearwater River is the principal tributary of the North Thompson, which it joins some 60 miles north of Kamloops. Some years ago surveys were made on the east side of Clearwater northerly to Murtle River, east of Mahood Lake. In 1921 a survey was carried from the Kamloops and Lillooet boundary-line by way of Mahood Lake, connecting with the above-mentioned surveys. A triangulation survey of Quesnel Lake had also been made, fixing points of reference along its shores. It was intended to connect these three groups by traverses through the valley, triangulation of Clearwater and Hobson Lakes, and a short traverse of about 6 miles across a low divide to Quesnel Lake, incidentally tying in the various land and timber limit surveys which had been made at various times.

After careful study of information obtained as to various routes into this out-of-the-way part of the country, it was decided to go by way of 150-Mile House, Canim Lake, and an old Indian hunting-trail leading from its foot northerly and easterly to Clearwater Lake near its outlet; the route being chosen because it appeared to offer the shortest and most secure line of communication over which men and supplies could be moved. Another factor influencing the choice was the desirability of reaching the lake as quickly as possible, so that triangulation of the lakes might be performed in the summer season during fine weather.

On reaching Canim Lake it was found that fires were running on all sides, in one place sweeping across trail opened by us. The trail followed from Canim Lake goes northerly to Hot Fish Lake; thence easterly across Deception Creek to its tributary, Spanish Creek; and then northerly and easterly to Clearwater Lake; in all, a distance by trail of about 45 miles, much of it over high mountains, the summit being crossed in old snow 6,080 feet above sea. It had been intended to make a track survey of the route, but dense smoke made this impossible.

On reaching Clearwater Lake a small raft was constructed, with the aid of which preliminary examination was made to find a place where the base could be measured from which to expand the triangulation. Considerable search was necessary before suitable timber was found with which to build a larger raft to carry camp and supplies, and construct a framework to fit the canvas boat-skin which had been brought in to expedite triangulation-work. Signal-setting was soon commenced and was carried on during raft- and boat-building operations, but was hampered by smoke settling in the valley and finally becoming so dense that triangulation-work was precluded about the end of July. During this period some 17 miles of trail passable for horses was constructed from the foot of Clearwater Lake to its head, so that camp and supplies could be moved with horses from that point to Hobson Lake, some 6 miles distant.

On August 4th we moved camp and supplies to the head of Clearwater Lake by raft and commenced traverse and trail work to Hobson Lake. In about three days a heavy downpour of rain came and cleared away the smoke, so parties were at once dispatched by boat and raft and the lake triangulation completed expeditiously before smoke again filled the valley.

A trail having been constructed to the foot of Hobson Lake, camp was moved to that point. The boat was taken apart, carried through, reassembled in a few hours, and rafts constructed in three days with which to undertake the triangulation of Hobson Lake. The weather had

been quite broken for several days and the air clear, but as soon as it ceased raining smoke filled the valley quickly, apparently coming from two large fires, one on the East Arm of Quesnel Lake and the other on the northerly end of Hobson Lake.

The season was now so far advanced that it became apparent the full scheme of work contemplated could not be carried out if there were any interruptions, and smoke conditions indicated that such would occur.

Groups of timber-limit surveys extend from the foot of Hobson Lake on one side or the other to Quesnel Lake; so it was decided to connect these groups, determine by astronomic observation the magnetic declination used in these surveys, and thus permit their proper orientation, confining errors to those incidental to such surveys. The traverse between Hobson and Clearwater Lakes was completed.

Having done this, the party moved to the foot of Clearwater Lake and commenced a traverse which eventually connected with the Mahood survey of 1921, thus completing the contemplated programme except in its northerly part, where timber-limit surveys are used instead of more accurate traverse and triangulation work.

The mountain trail by which the party went in was impassable owing to deep snow by October 1st, so we went out by way of Mahood Lake, having transported our canvas boat from Clearwater to Mahood Lake, some 15 miles.

As there is no trail along Mahood Lake, the horses were taken over a mountain about 5 miles to Candle Creek; then in the water along the lake-shore about 9 miles to the head of Mahood Lake, from which place there is a good trail and road to 100-Mile House on the Cariboo Road.

METHOD OF SURVEY.

All triangulation stations were marked by cedar posts planted generally in cairns and referenced by bearing trees where available. Traverse stations about a mile apart were similarly marked, intervening stations being indicated by hubs only without bearing trees. Linear measurements were made with a 5-chain tape read to the nearest tenth of a link. In base measurements the tape was read to hundredths of a link. Angular measurements were made with a 5-inch Berger transit reading to 30 seconds, readily estimated to half that amount. Each angle was read four times and the mean taken. Angles of the traverse were invariably read clockwise, so that no error as to the manner of deflection could arise.

The triangulation net consists mostly of quadrilaterals with diagonals observed to permit easy angular adjustment, no side equation being used. On the whole the work is thought to be of considerable accuracy.

DESCRIPTION OF COUNTRY.

From Mahood Lake north the Clearwater Valley is rather narrow, with deep bays or high benches running back in places. Its surface is rough, being broken by lava-knolls in the southerly part, gradually giving place to ridges of mica-schist until Clearwater Lake is reached. Here the mountain-slopes come down more or less sharply to the lake; those on the west side being mica-schist, as are also those on the east side until, towards the head of the lake, quartzite takes the place of schist, and rises in the great mass of Pilpil Mountain of the Indians, extending easterly along the south shore of Azure Lake.

Along Hobson Lake the mountain-slopes generally come steeply to the water, although in some places high benches extend back from the lake before abrupt mountain-slopes are reached. Time did not permit the examination of lands back from the shore, excepting those about the foot of the lake.

Apparently there are only a few hundred acres of agricultural land in Clearwater Valley north of Murtle River, and this is in scattered parcels, so that no important agricultural development may be anticipated.

TIMBER RESOURCES.

Between Mahood Lake and Murtle River on the south and Clearwater Lake to the north are considerable areas carrying fine stands of cedar and some spruce. The larger part of this tract has been burned over, and a growth of fir, poplar, birch, and some jack-pine has replaced the cedar with which most of this country was clothed at one period.

About the foot of Clearwater Lake on the west side there is a tract some 6 miles long by 10 miles wide carrying a tremendous stand of cedar and considerable hemlock on the lower slopes,

with spruce and balsam above. Unfortunately a great deal of the cedar appears to be over-matured and is probably depreciating in value, at the same time injuring the younger growth. Midway up the lake on its east side there are a few square miles of fine cedar.

On both sides of the lake old fires have devastated some of the country, but reforesting is well under way on by far the greater part, while the process is only beginning on some of the more recently burned-over lands.

About the head of Clearwater Lake, northerly to Hobson Lake, there is a fine belt of timber from 2 to 3 miles wide, consisting of cedar, hemlock, and spruce, with some fir.

Along the west shore of Hobson Lake for a distance of about 8 miles from its foot there is a good stand of cedar and hemlock extending back from the lake rather more than a mile. On the east the stand of timber appeared to be principally hemlock of fair size.

Higher up on the slopes surrounding all the above-mentioned tracts of timber fit for the saw is a dense growth of spruce and balsam, while intervening stretches on the lower levels contain large quantities of poplar, fir, birch, and occasionally some pine, a large proportion of all of which, except the latter, is suitable to pulp-making.

This Clearwater basin is estimated at some 1,200 square miles in area, about a quarter of which is thought to contain timber fit for saw or pulp. The great Bridge Creek basin is not considered in the above, although tributary to it.

Water Resources.

Hobson Lake, about 20 miles long and 1 mile wide, occupies the northerly portion of the great trough and discharges through about 6 miles of river into Clearwater Lake, the difference in elevation of the two lakes being about 700 feet, as indicated by aneroid barometer.

About 1½ miles above Clearwater, Azure Lake, some 16 miles long, discharges through a short run of stream into Clearwater River. Although the current is rather swift, it is possible to take a boat from Clearwater to Azure Lake. Above this junction Clearwater River is a succession of very swift water, rapids, and falls for about 4½ miles, and on examination may be found to offer opportunity for a considerable power-development.

Clearwater Lake is about 15 miles long, with an extreme breadth of about 1½ miles. The water of the lake tumbles out with a fall of about 8 feet, below which is very swift water and heavy rapids.

Some 2 miles north-east of Mahood Lake, Murtle River joins the Clearwater from the east, coming from Murtle Lake, which is of considerable size and might be used as a great storage-basin, from which the stream-flow could be kept up in low-water periods. There are three falls on Murtle River, the lower one, having a sheer drop of over 400 feet, being about a mile from the junction with Clearwater River. The fall of Bridge Creek from Mahood Lake, which is an ideal storage-basin, to the Clearwater is rather more than 250 feet in 3 miles.

The difference in elevation of Canim and Mahood Lakes is about 500 feet, most of this fall on Bridge Creek connecting them occurring within some 3 miles. Back of this is the large storage capacity of Canim, Horse, and Bridge Lakes. It will thus be seen that there are great opportunities for the generation of hydro-electric power within a short radius.

General.

The juxtaposition of large quantities of both saw and pulp timber with great power possibilities would seem to indicate that the whole area should be carefully examined with development of these latent resources in view. Such industrial development would require large capital, because the building of about 40 miles of light railway to Murtle River, and its extension for logging purpose as required, would be necessary, as well as the construction of power plants, saw and pulp mills, etc. The great area from which timber-supplies could be drawn would, however, seem to make the matter worthy of more detailed examination.

The scenic beauty of Clearwater, Hobson, and Azure Lakes is very great, high glacier-bearing mountains with fields of perpetual snow being visible from many points.

Fish and Game.

Clearwater Lake affords excellent sport with the rod, the fish being rainbow trout of large size, a number of those taken weighing over 3 lb. each. Mule-deer are plentiful and may be shot

whenever wanted, while black bear seem to be quite numerous. About Hobson and Azure Lakes there are many small bands of caribou, both along the lakes and in the mountains, where goats also may be found. No moose were seen, but tracks were observed at various points.

The country is difficult of access, but is well worth going into, if for sport only.

I have, etc.,

W. S. DREWRY, B.C.L.S.

PHOTO-TOPOGRAPHICAL SURVEYS, NICOLA VALLEY, KAMLOOPS DIVISION OF YALE DISTRICT.

BY R. D. MCCAW.

VICTORIA, B.C., December 15th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I beg herewith to report upon the photo-topographical surveys carried on by me under your instructions during the past season. Your letter of instructions, dated June 23rd, requested that I continue the surveys in the Nicola Valley, the area to be covered being bounded on the north by the Dominion Government Railway Belt and on the south and east by work already done. Westerly I was to continue as far as time and appropriation would permit. The actual area done is bounded on the north, south, and east by the aforesaid limits, and on the west extends to the west side of the valley of Moore Creek, a tributary flowing into the north end of Nicola Lake. The surface measures approximately 375 square miles, being less than the average season's work, occasioned by loss of time through smoke from forest fires. With this season's work the upper part of the Nicola River watershed above Nicola Lake is complete, with the exception of some small areas tributary to Moore and Quilchena Creeks. In addition, that part of the Salmon River Valley south of the Railway Belt is done, having been included in this year's area.

SEASON'S OPERATIONS.

I organized my field party about July 1st, starting out from Merritt as in the previous season's work in the Nicola Valley, and commenced work on the ground in the vicinity of Salmon Lake, a feature tributary to the Salmon River and about 3 miles north of Chaperon Lake. For transport a light Ford truck was used all season and pack-horses when necessary, arrangements having been made to hire these when needed. The party consisted of myself, an assistant surveyor, a cook, and three or four men as occasion required. I might state here that when we arrived in the Nicola Valley a thick pall of smoke from forest fires covered the entire country, and for the ensuing six weeks the condition was so bad that we were able to do but little photographic work. The selection of triangulation stations was also a problem, as there are but few days that visibility extended more than a few miles, and apart from main stations used previously, we were unable to select new stations that we were sure would be satisfactory. In this regard we were rather fortunate, as all new stations chosen gave the intervisibility desired.

On July 8th I went over to the Pennask Lake country to complete information needed to finish the previous season's work. I was engaged upon this for several days. During my absence my assistant, L. A. Austen-Leigh, B.C.L.S., carried on from main camp. Upon my return the Hamilton Mountain Station was revisited and the signal there was improved. Several camera stations were occupied prior to July 14th, although conditions were poor. From that date until August 11 there were but a couple of days when camera-work was possible. During the smoky periods paced traverses were done in the flat and rolling areas adjacent to Salmon Lake. These had to be done in any event on account of the nature of the country. One long base traverse was measured by tape. Elevations were taken with an aneroid, a stationary aneroid in camp being used for comparison. Traverses were connected with the land surveys where these existed, or left to be tied by triangulation or by photographic intersections. During July we moved up the Salmon River to do the high country adjoining the Okanagan watershed, but, with the exception of placing some signals and running a little traverse, could do nothing.

On August 10th all the traverses in the locality thought necessary were done, and as smoke conditions were no better, camp was moved to the Nicola River at the mouth of Lauder Creek. It was the intention to continue traverses in this locality. However, rain set in and cleared the atmosphere to such an extent that photographic work was permitted. For the balance of August there was no delay from smoky conditions, as rain fell at intervals and the atmosphere was kept comparatively clear. During this period stations were occupied in the vicinity of Lauder Creek, Nicola and Stump Lakes, and Moore Creek. One new main station was erected on an open summit just south of the Railway Belt and north-west of Stump Lake. It was found afterwards that this station and the Tahaetkun Mountain Station of 1920 were intervisible, although at the time it was very uncertain. One main triangulation station of 1921 was reoccupied and an auxiliary signal left to suit the present year's work.

On September 4th we moved back to Salmon Lake to endeavour to get done the photographic work there which we were unable to do earlier. We were engaged there until September 29th, and during the intervening period covered all of the high country to the east, up the Salmon River and its tributaries. Very little time was lost and two days' rain was the only cause. Tahaetkun Mountain was occupied on September 15th and readings taken to all the other main stations used this year. Another station occupied at the beginning of the season as a camera station was reoccupied as a main station. This is located on the south limit of the Railway Belt near the quarter post on the south boundary of Section 19, Township 16, Range 15.

From a base camp located at the Donahoe Mines at Stump Lake on September 30th the balance of the season's work was done. Heavy rain caused us two days' delay early in the month, but this was more than offset by the fine, clear weather following. Other camera stations were occupied in the vicinity and some traverse run. The remaining main triangulation stations were occupied—namely, Hamilton Mountain and Stump Lake—and the area was finished on October 14th. The party was then paid off and the camp outfit stored for the winter.

GENERAL.

The atmospheric conditions for a large part of the summer were very bad and could be but little worse for work of this nature, and had there not been a great deal of traverse-work needed, the loss of time would have been much greater than it was. It is difficult to estimate the actual loss of time, as, besides the days we could not work, a number of stations had to be occupied a second time and moves duplicated. However, for a season such as it was, the area covered is good.

Following is a summary of stations, etc., done this year:—

Main triangulation stations	5
Photographic stations	86
Separate camera stations	170
Land ties	14
Miles paced and other traverse, about	175

Regarding the country covered this year, it may be stated that it is a grazing area. Much is open grass land and in the timbered areas there is usually a good growth of grass and weeds, except in the high altitudes and in parts where windfalls are thick. East of the Shallow Valley, containing Chaperon, Index, Rush, and Salmon Lakes, the country rises in broken ridges to the Okanagan Summit. In parts these ridges are very precipitous and along the boundary of the Railway Belt some sheer rock walls are encountered falling to the north. There is a considerable open area in the vicinity of the lakes mentioned and much is under hay cultivation. The open area ceases up the Salmon River and its tributaries and jack-pine and fir cover the slopes. The north-west slope of the Tahaetkun Mountain ridge is an old burn and in parts is still destitute of timber-growth. Weeds and grass grow on this in profusion, affording good summer grazing. East of the headwaters of Red Canyon Creek (Nash Creek) there are some open hills with a good growth of grass. Most of the summit between the Okanagan and Salmon Rivers is densely timbered and is of no grazing value. Several small lakes and meadows exist.

To the west of Salmon Lake and south of the Railway Belt the country takes the form of a rolling plateau, with drainage usually in a southerly direction. The highest part is under 5,000 feet in altitude and the watercourses are of very low grade. Swamps are numerous and there are some meadows and small lakes. The higher elevations are thickly timbered with jack-pine

and patches of fir. To the south an open area extends to the Nicola River and Douglas Lake. The latter is good grass range and in the timber there is usually a good growth of grass and weeds.

On the west side the plateau falls in open slopes to the Nicola-Stump Lake Valley. A low narrow ridge, part open and part timber, separates this valley from that of Moore Creek. In both these valleys there is considerable cultivation, hay being the chief growth. West of Moore Creek the country rises in solid timber growth.

Other survey reports have made mention of the roads in the district, so it is hardly necessary to state much in that regard. The main Merritt-Kamloops Road traverses the Nicola-Stump Lake Valley and the Douglas Lake Road follows the Nicola River and Douglas Lake to the Douglas Lake Cattle Company's ranch. From here a good road continues northerly to Chaperon Lake and beyond to the Salmon River Valley, following this latter to Grande Prairie. A portion of this road has been relocated and built during the past year, giving an easier gradient down into the Salmon River Canyon of the Railway Belt. Farm roads extend all over the open areas and it is easy to get to one point from another. A fair road extends up Moore Creek from the main road at Nicola Lake to the 101 Ranch and connects across the ridge with the main road again at Stump Lake. Parts of this road are very steep. There are several pack-trails worthy of mention. One known as Freeman's Trail has been cut out wide and extends from Fraser Creek easterly to the road going from Chaperon Lake to Grande Prairie. This trail gives a short route from the Stump Lake country to Grande Prairie. A fair trail extends up the Salmon River to Bouleau Lake. Another trail joins this some 3 miles west of the lake, coming over from Ingram Creeks and connecting with Grande Prairie.

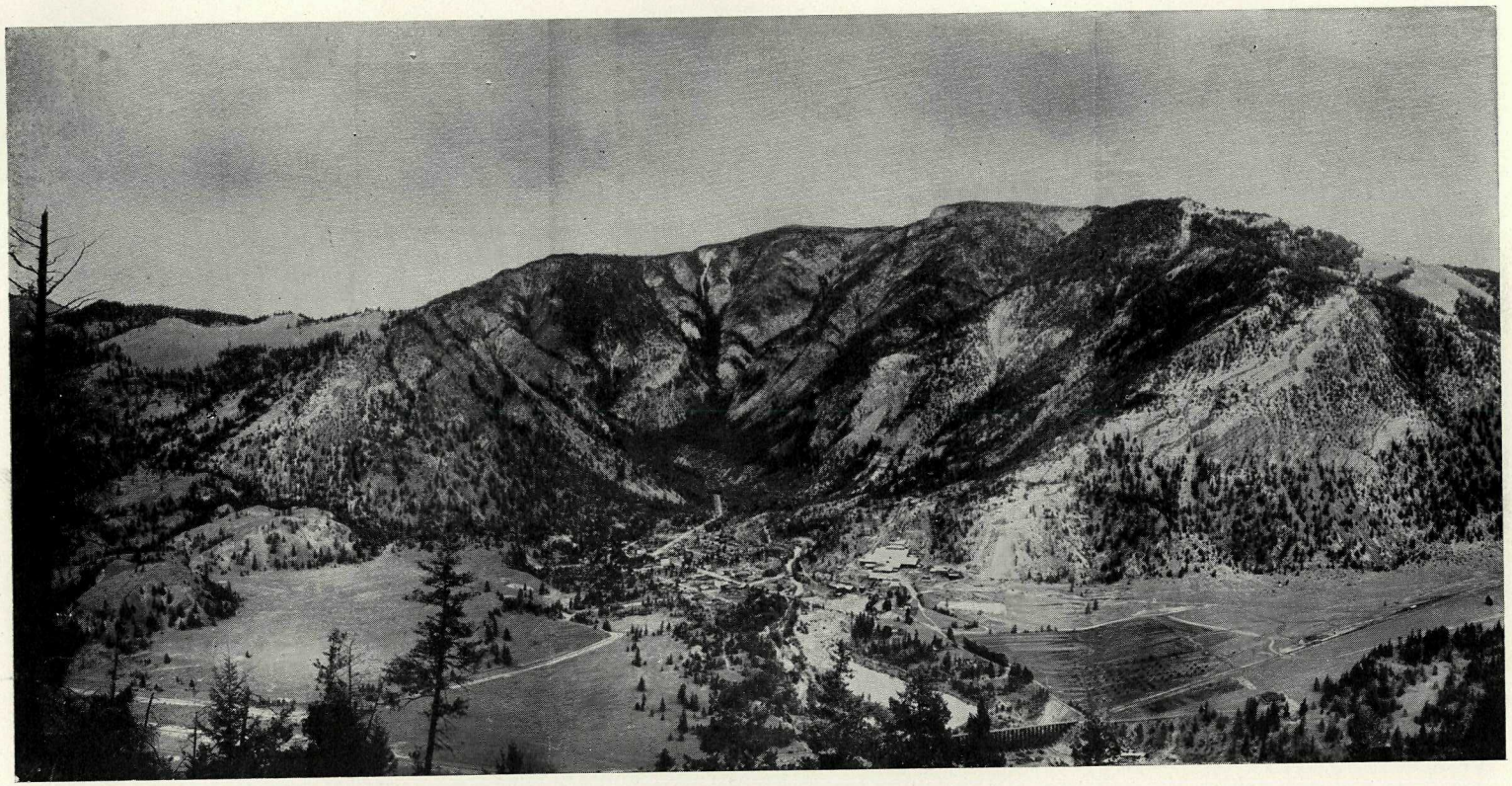
The grasshopper pest was very bad in the Nicola Valley again this year and grass and grain suffered greatly. Feed for stock was very scarce and became a serious problem for the stockmen in the locality.

In the vicinity of Stump Lake there has been considerable mining activity in the past, the Donahoe Mines and the Mary Reynolds Mine being the chief locations. Both of these produced silver-lead ore in varying quantities. At present both are closed down. Some new placer-gold work was being done in the Nicola River above Douglas Lake this summer, but the result is not very certain.

The game in the area is similar to that reported on last year. East of Salmon Lake deer are plentiful; west of this there seems to be but few. An odd grizzly is said to exist and there are a few black bear. Grouse seem to be numerous and prairie-chicken were seen in large flocks in the open country. Ducks and geese are very numerous. Salmon Lake is well stocked with trout and large catches have been made. In the open country many coyotes were seen.

The map-work is well under way and as usual three sheets will be submitted—namely, a topographical, triangulation, and timber-grazing sheet. Some photographs will be submitted later.

I have, etc.,
R. D. McCAW, B.C.L.S.



Similkameen Valley at Hedley.

PHOTO-TOPOGRAPHICAL SURVEYS, SIMILKAMEEN VALLEY, KAMLOOPS, AND SIMILKAMEEN DIVISIONS OF YALE DISTRICT.

BY G. J. JACKSON.

VICTORIA, B.C., December 12th, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on the photo-topographic survey made by me during the past summer:—

The area covered was in the Kamloops and Similkameen Districts and consisted of the valley of the Similkameen River from the mouth of the Ashnola River up to 5-Mile Creek, including the watershed area of all the creeks flowing into it from the north and of Paul Creek and Sterling Creek from the south. On the south-east it connects with my work of the season of 1920 and on the north-west with that of 1921, and to the north with that done by Mr. McCaw in previous years while doing the Okanagan watershed.

SEASON'S OPERATIONS.

The party was organized at Princeton on June 14th and immediately moved down to Hedley. Our first camp was near the Nickel Plate Mine, about 4,000 feet above Hedley. The Hedley Gold Mining Company kindly took all our equipment up on its tram-line. Here we occupied several stations; then moved eastward, covering the headwaters of Cold, Shoemaker, 15-Mile, 16-Mile, and 18-Mile Creeks by July 1st.

The atmosphere during this two weeks was very smoky, necessitating more stations than usual, as long views could not be taken. Even so, the pictures are not good but can be used. On July 1st the smoke closed in very thickly and from then until August 10th was very dense. Although attempts to occupy stations were made on the clearest days, it proved very unsatisfactory, and finally we gave it up and devoted our time to making compass traverses of the various branches of 20-Mile Creek and the creeks to the westward as far as 5-Mile Creek, and in cutting the necessary trails so that we might be able to run over the country quickly, once the smoke cleared enough to make it possible to occupy stations.

On August 10th it started to rain hard and continued for five days. This put out most of the fires in the vicinity and cleared the atmosphere, so that we were only troubled by smoke on a few occasions during the remainder of the season.

After the rain we immediately started back over the area, occupying the necessary stations. The trails we had already cut enabled us to get over this quickly, and on September 7th we completed the country north of the Similkameen River and moved down to Hedley.

We now worked down the river, occupying sufficient stations to cover the valley from Hedley to the Ashnola River. We then worked up Paul Creek and over into Sterling Creek, and down it to the Similkameen River again. Then we worked up the river to 5-Mile Creek, where we connected with last season's work. The party was then disbanded on October 13th.

The triangulation system for the season was controlled by stations of the Geological Survey of Canada, supplemented by new ones of our own, made in previous years.

During the season 63 dozen views were taken and the following stations occupied:—

Main triangulation stations	4
Main photographic stations	103
Separate camera stations	104

In addition to these, a considerable number of ties were made to land and mineral claim surveys and 77 miles of compass traverse run. About 17 miles of new horse-trail was cut and about 20 miles of old had to be cleared of windfalls to be made passable.

GENERAL.

The Similkameen Valley is served by the Great Northern Railway, which operates between the International Boundary and Princeton, where it connects with the Kettle Valley Railway.

The main Provincial Highway runs through Princeton, Hedley, and Keremeos, and is a good motor-road. There is a wagon-road up 20-Mile Creek to Hedley Lake and the Okanagan Divide, where it is joined by another from the Nickel Plate Mine, and runs down Keremeos

Creek to the Keremeos–Penticton Road. This road was used to bring machinery and supplies to the Nickel Plate Mine before the tram from Hedley to the mine was constructed, but it has now fallen practically into disuse and the bridges are either rotted out entirely or are in very bad condition. Otherwise the roads could be made passable with very little work if they were ever needed again.

There is also a pack-trail up the main 20-Mile Creek as far as the Similkameen-Kamloops boundary-line, where it joins a trail running east and west along the boundary, east as far as the divide, and west to the Similkameen River at 5-Mile Creek, with a branch down to the river at Bromley Creek. On the south side of the river there are trails up Paul and Sterling Creeks, also a wagon-road for about a mile up Sterling Creek.

The only country suitable for agriculture is the bottom land and the lower benches of the Similkameen Valley and a little up Sterling Creek. The land in the Similkameen, where water can be put on it, is good for fruit and general farming. However, Indian reserves occupy a very large part of the land in this section and it is not cultivated as well as it might be. The valley is narrow, only from one-half to one mile wide, with very steep sides, which soon reach an altitude of 3,000 feet or more above the river. At Hedley the river is about 1,700 feet above sea-level.

Up Paul Creek and on the divide between it and Sterling Creek there is quite an area of open bunch-grass hills, suitable for cattle-grazing, and which is at present occupied by all the cattle it can stand. However, up both creeks there are considerable areas of timber grazing that are not used.

On the north side of the Similkameen, starting at the east end of the area, there are Cold, Shoemaker, 15-Mile, 16-Mile, and 18-Mile Creeks; these are all short and run from the divide in deep valleys draining comparatively small areas. On all these creeks there are patches of good grazing right back to the divide and we observed cattle on all of them.

Then comes 20-Mile or Hedley Creek, which flows into the Similkameen at Hedley. This drains a large area. The first 4 miles from the mouth flows in a very deep, narrow canyon; then it forks, one branch flowing in from the west and north and the other from the north. The latter, about 9 miles from the mouth, branches into several streams. There seems to be very little grazing on any of these branches. Along the upper few miles of most of them there are wet meadows formed by beaver, which are covered for the most part with low willows. The country is, to a great extent, a mass of fallen timber, with a thick growth of black pine; hardly any grass grows and it is inaccessible for stock. On the divide near Pearson Mountain, and again near Brent Mountain, there is good grazing around and above the timber-line, especially on the Okanagan side. In former years both these ranges were used for sheep-grazing, but this season they appeared to be unoccupied.

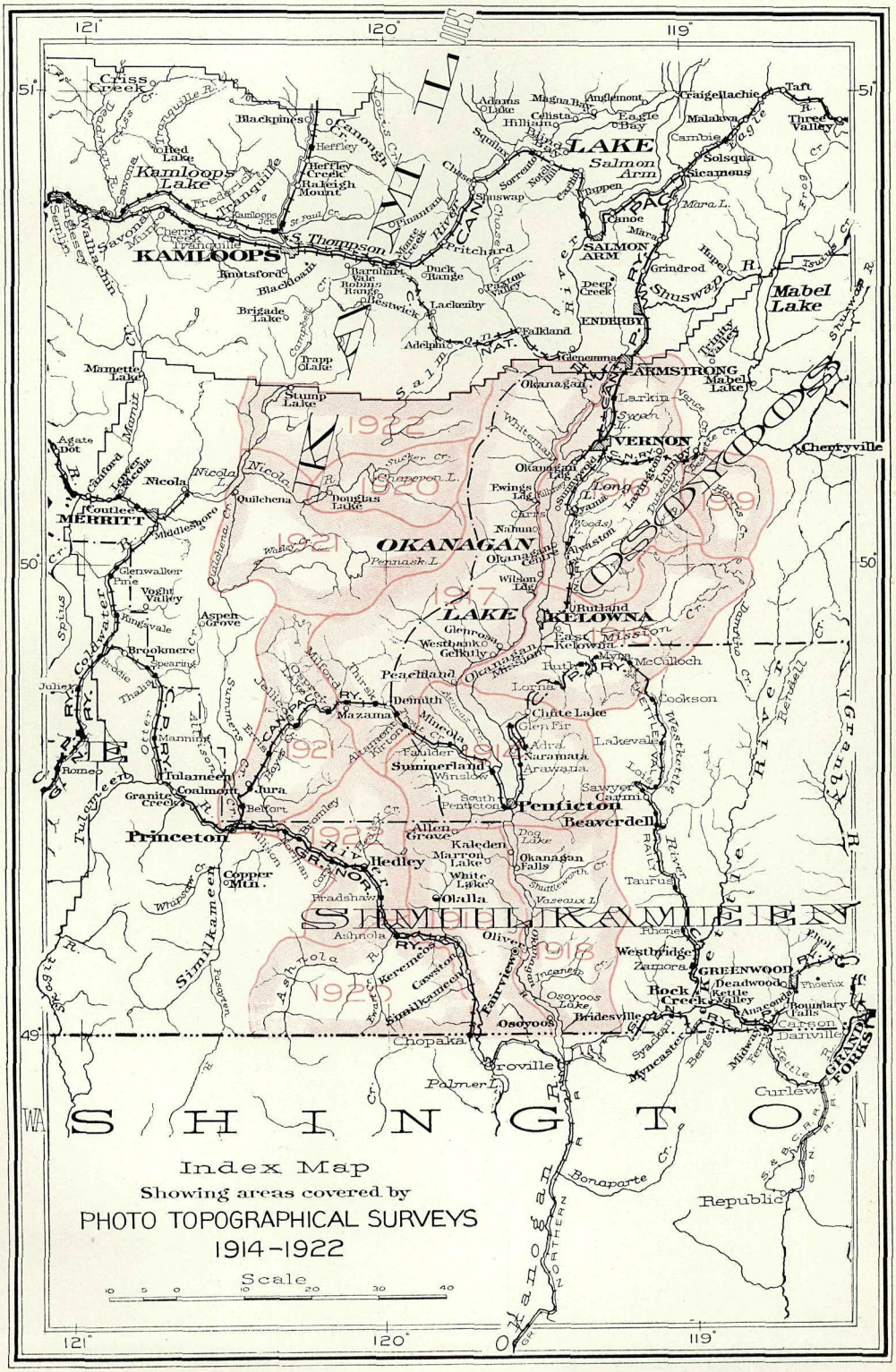
Between the West Fork of 20-Mile and 5-Mile and Red Creek a large portion of the country has been burnt in the past few years and timber is dead, although most of it is still standing. Between the forks of Bromley Creek there is a small area of willow and alder which could be used for sheep-grazing.

The timber over the whole higher area is for the most part black pine, with a few patches of spruce. In the Similkameen Valley and along the lower levels there is considerable fir and yellow pine of commercial value, and up Sterling Creek there is a very good stand of fir, spruce, and cedar.

The area is highly mineralized, but owing to the dense brush and windfalls, particularly up 20-Mile Creek, it is very difficult to prospect, but no doubt some day it will be quite a mining district. One of the best gold-mines in the Province to-day—the Nickel Plate Mine—is in operation at Hedley and there are many prospects being worked in the vicinity. Near Princeton there are large bodies of coal, some of which are now being worked. There are also large bodies of copper, which will, no doubt, be worked when prices are more favourable.

Large game did not seem to be very plentiful, although a few deer and black bear were seen, but I believe that after the snow comes deer are there in greater numbers. Blue grouse and fool-hens were very plentiful on the higher hills, while a few willow-grouse were seen in the valleys.

There are rainbow trout in the Similkameen River, although they are by no means plentiful and not very large. In 20-Mile Creek there were plenty of small trout. Hedley Lake, the only one of any size in this area, contains many rainbow trout up to 5 lb. in weight. Good catches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Adams Lake
Magna Bay
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Celista
Hillians
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Westbridge
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GREENWOOD
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Rock Creek
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Boundary Falls
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Midway
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GRAND FORKS
Republic
Bonaparte
Oroville
Palmer L.
Osoyoos
Osoyoos Lake
Bridesville
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can be made here in the late summer, but in June the popular method seems to be to gaff them when spawning in the small creeks.

A few fur-bearing animals are found in this area, including beaver, lynx, mink, marten, musk-rats, and coyotes, these last being the only ones at all plentiful.

The work on the maps is now in progress, and, as usual, triangulation, topographical, timber, and grazing plans will be prepared.

I have, etc.,
G. J. Jackson, B.C.L.S.

SURVEY OF THE BOUNDARY BETWEEN THE PROVINCES OF ALBERTA AND BRITISH COLUMBIA.

By Arthur O. Wheeler.

December 31st, 1922.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—At a conference held at Edmonton in October, 1921, at which the Dominion Government was represented by A. M. Narraway, Controller of Surveys; the Alberta Government by A. P. C. Belyea, Director of Surveys; and the British Columbia Government by yourself, the Commissioners being in attendance, a report was drawn up, and subsequently approved by the three Governments, by which it was laid down that the programme for the 1922 boundary surveys should be as follows:—

Instructions.

(1.) That R. W. Cautley's division shall complete the monument building and final survey of the 43 miles run by his division in 1920 from monument 73–7 southerly to the north bank of the Wapiti River, and that he shall then continue the survey of the 120th meridian southerly to the summit of the Rocky Mountains, or to a point on the meridian beyond which it would not be practical to produce the line by ordinary methods of survey.

Also that, in view of the totally uninhabited nature of the country through which the as yet unsurveyed portions of the 120th meridian will run, and the great additional cost of transporting monument material through such country, in future concrete monuments shall only be built at intervals of approximately 6 miles, and the secondary form of monument herein prescribed is hereby authorized for use at all intervening points.

The post is the standard Dominion Lands Survey post provided with a special cap. It consists of a piece of 1-inch iron pipe 30 inches in length filled with concrete. A malleable-iron foot-plate 3½ inches in diameter and a bronze cap 3 inches in diameter are fastened to the bottom and top of the post respectively. The method of use is to plant the post so that the top of the bronze cap is flush with the surface of the ground, and to stamp the number of the monument on the cap with dies. In practice it has been found that such a post, properly planted, is practically irremovable except by excavation. In connection with the use of the standard post, a system of trench and mound is also used. The use of a short rock post with similar cap is also authorized. It is for use in rock and is cemented into place after a hole has been drilled for its insertion.

(2.) That Mr. Wheeler's division shall carry on the topographical work from Yellowhead Pass northward by photographic methods as heretofore.

Mr. Cautley's Survey Operations.

During the end of January and the first half of February Mr. Cautley, with two men and a powerful team, made a trip up the Wapiti River for 37 miles from the location of the last settler, a man named Chase, on Section 10, Township 69, Range 10, to the crossing of the Calahoo Trail—an old Indian hunting-trail—but could get no farther on account of the rough ice. The point reached is 3 miles below the boundary crossing.

Having surveyed the river for 3½ miles on either side of the boundary and built a substantial log cache, the party returned and 12 tons of material—cement and gravel—were afterwards successfully delivered at the cache.

Mr. Cautley's party for the season's work consisted of himself, his assistant, A. O. Gorman, D.L.S., and eighteen men, with a pack-train of thirty-two horses. The party assembled at Grande Prairie on May 30th and proceeded on its way to the end of the 1920 work on the north bank of the Wapiti River.

It was found that a considerable quantity of provisions had been stolen from the log cache, which it was necessary to replace. On June 12th the survey had been carried across the river and everything had been so arranged that it was possible to move the entire outfit to the south side, which was done by means of an 11-foot canvas boat, capable only of carrying 450 lb., including the crew.

From June 12th to August 2nd the survey progressed steadily southward a distance of 31 miles, where it was left, in Township 61, on three outlying ridges to the west of a big mountain which Mr. Cautley named Torrens Mountain, a name since approved by the Geographic Board. Torrens Mountain is the first encountered on the 120th meridian. Its altitude above sea-level is only 7,315 feet, but it covers a large area, consisting of an S-shaped ridge 6 miles long, with a number of small peaks along it connected by low saddles.

The last monument on the line is a standard post, marked 61—4, surmounted by a cairn. It is on a well-defined, rocky ridge leading direct from the summit of Torrens Mountain, from which it is about 30 chains west and a little south. Besides the monuments on the 120th meridian, the summit of Torrens Mountain and two other mountains to the north-west were occupied as triangulation stations and cairns built at them. In the case of Torrens Summit a cairn 8 feet high, with a perimeter of 27 feet around the base, was built, so as to make a very distinct mark from distant mountain-summits to the south in the event of a connection being made from that direction.

Bush-fire smoke prevented useful observation and photography of the country to the south. Most of the time it was impossible to see any distance at all, and, even when the smoke lifted a little, it was so hazy that any estimation of distances was difficult and possibly inaccurate.

Mr. Cautley reports that the country to the south is distinctly mountainous and appears to consist of numerous isolated mountains of about 7,000 feet in altitude. How far it is along the 120th meridian from monument 61–4 to the summit of the Rocky Mountains is impossible to say. The intervening country is so mountainous as to preclude the idea of carrying on the survey by methods other than those adopted by the topographical division. The survey will have to be trigonometrical, and the topography is so broken and varied that it can only be satisfactorily mapped by the photographic method.

On August 5th Mr. Cautley's party got back to the Wapiti River camp and continued the work still to be done. This work consisted of building forty-three monuments and precise chaining, also checking and levelling 43½ miles of line which had been cut out in 1920; all of which was completed by September 9th.

The members of the party were paid off at Edmonton as from September 17th. Mr. Cautley and three men proceeded to Fort St. John, where he made arrangements to have the horses wintered and arrived at Edmonton on September 30th.

During the season 31.3 miles of line were cut out and 43.5 miles of old line were cleared out; 74.8 miles of line were precise chained; 43.5 miles of line were levelled; 7 miles of river traverse were survey; 49 concrete monuments were built; and 27 of the new-style standard-post type of monuments with trench and mound, were established. There was also a great deal of painstaking topographical exploration work done.

GENERAL DESCRIPTION OF COUNTRY.

Mr. Cautley reports that the country traversed by the 120th meridian from the north boundary of Township 73 to the Wapiti River in Township 66 is a high, gently undulating plateau with a slight but constant rise to the south and west, so that each succeeding height of land crossed in a southerly direction is appreciably higher than the last.

South of the Wapiti River the same formation is found, but in a more marked degree; that is to say, each succeeding height of land takes on the form of a definte ridge with a more noticeable gain in altitude, until Crooked River is reached at the southerly end of Township 62. Thus, from the height of land at the north end of Township 73 to the last height of land before reaching Crooked River, which occurs in Township 63, or in a distance of 68 miles, there is an irregular but constant increase in altitude amounting to 2,350 feet.

From Crooked River the line rises 2,200 feet in less than 1 mile of distance to the summit of the first and lowest outlying ridge of Torrens Mountain, beyond which the country takes on a generally mountainous character throughout.

The whole country has been so generally ravaged by fire that there is no timber of present commercial value, and the soil has been burned so badly that there is no future in sight for agricultural settlement. Most of the surface is covered with wind-fallen brulé, a condition which carries with it a constant menace of further fires to destroy the young second-growth timber.

Mr. Cautley reports that there are, in a great many places, vigorous stands of young spruce growing up through the brulé, and gives it as his opinion that they are all doomed to be burned before reaching commercial value, because the brulé will, sooner or later, carry fire through them. He also reports that the very heavy brulé north of the Wapiti River, through which the boundary was cut in 1920, has in the past two years been greatly reduced by fire, and expresses the opinion that the first move towards restoration of this and similar areas must be in the direction of clearing the brulé by controlled fires, or, at least, by clearing wide enough lanes through it to prevent fire running wild all over the country.

The main topographical feature of the district covered by the 1922 survey is Wapiti River, and also Crooked River, which is the left fork of the main Wapiti and enters the latter at a point 5½ miles down-stream from the boundary, but only 3 miles due east from it.

The Wapiti flows in a general north-easterly direction for a considerable distance on either side of the boundary, which it crosses in Township 66. Crooked River flows in a general due-east direction across the boundary in Township 62, and then turns to the north, and slightly west of north, to its confluence with the Wapiti in Township 66.

Both rivers present very similar characteristics, being swift of current and occupying deep, narrow valleys with steep banks from 500 to 900 feet high. It seems probable from the general appearance of the two rivers that the Wapiti carries more water during the early summer run-off, but during the first week of August, when Mr. Cautley crossed both rivers, there appeared to be more water in Crooked River. He suggests as a reason that Crooked River derives a larger proportion of its flow from glaciers.

To the south of the Wapiti River there is only one trail worthy of the name in the vicinity of the boundary, and that is the survey trail cut last summer. The Calahoo Trail, which is shown on several maps issued by the Department of the Interior, is merely a hunting-trail used, as explained to Mr. Cautley by one of the half-breeds on his party, in the early spring and late autumn when the muskegs are frozen. In the summer it is so bad that it was found impossible to use some of it at all, and those parts of it which follow high ground are obstructed by fallen timber.

Climatic Conditions.

The weather throughout the entire season was most extraordinarily and uninterruptedly fine. From May 31st to September 25th Mr. Cautley reports that he only lost five and a half days of working-time, of which one and a half days were due to bush-fire smoke in the vicinity of Torrens Mountain, where the trigonometric nature of the work necessitated long sights.

Due in part to the dryness of the season and probably partly to the continued presence of bush-fire smoke, the comparative freedom from mosquitoes was incredible to those who have spent many years in camp. Bush-fires were burning right across the boundary on the north side of the Wapiti River all summer. On the south side no fires were encountered until Torrens Mountain was reached, where the south-east slopes beyond the survey were on fire.

Minerals.

Mr. Cautley reports that there was a good deal of float-coal seen in the beds of the streams, and a small stringer seam of coal crops out on the very summit of Torrens Mountain. Some of the party made a small fire with it.

Game.

North of the Wapiti River there were a great many moose in 1920, but there did not seem to be so many this year, owing probably to bush fires. South of the river is an ideal moose and caribou country and a great many were seen. Beaver were seen on Huguenot Creek and Hiding Creek. On Torrens Mountain sheep, moose, deer, or caribou were seen on every occasion

when an ascent was made. Several bear were seen, but they did not seem to be very numerous. Ruffed grouse and prairie-chicken were very plentiful everywhere, and there were lots of ptarmigan on the mountains.

TOPOGRAPHICAL DIVISION.

SURVEY OPERATIONS.

The customary tests of cameras for levels and speed of plates used for photography were made on the course laid down at Banff, and the party assembled at Jasper on June 30th and completed organization.

July 2nd to 8th the party, in charge of my assistant, A. J. Campbell, B.C.L.S., travelled to the head of Miette River, considerable time being required for cutting out trail and packing in supplies.

Owing to the fact that north of Yellowhead Pass there was no possibility of a tie with the Dominion Lands system of survey until the 120th meridian as surveyed south by Mr. Cautley was reached, the Geodetic Survey of Canada had been approached and an arrangement made by which it was proposed to extend a triangulation from Yellowhead Pass to connect with the 120th meridian at the point named. The work was placed in charge of H. F. Lambart, D.L.S., of the Geodetic Survey, who took the matter up with me at Banff on June 2nd and a plan of action was arranged.

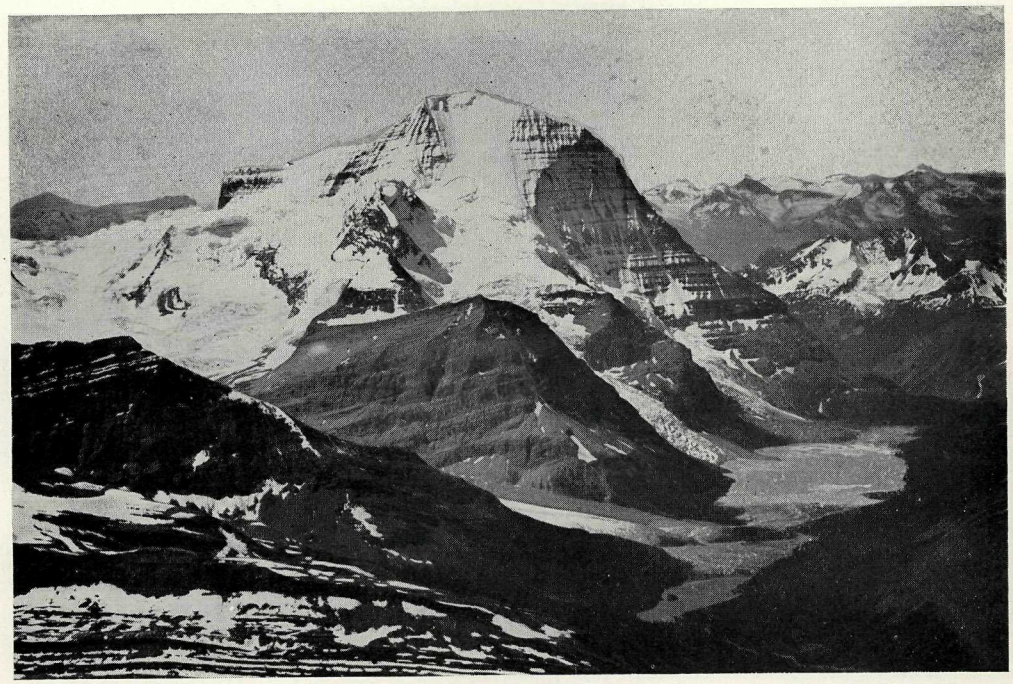
Early in June Mr. Lambart organized a party at Jasper and commenced work, using, as an initial base, Mr. Cautley's monumented survey across Yellowhead Pass, made in 1917. The work done during the past season was partly reconnaissance and consisted of the selection of suitable stations for the quadrilaterals of a system of triangulation, and in obtaining necessary information to permit of the measurement of a base and the reading of angles at the various stations selected.

The work was carried on until the end of August and the system extended for nearly 100 miles north-westerly from Yellowhead Pass. Notwithstanding the very smoky condition of the atmosphere throughout the greater part of the summer, Mr. Lambart made excellent progress and established some twenty-three stations. The completion of this triangulation, extending along the main divide of the Rocky Mountains, should be of much utility through providing a tie between the Dominon Lands system of surveys at Yellowhead Pass and those in the Peace River District, quite apart from the fact that it will serve to accurately locate the stations of the boundary survey.

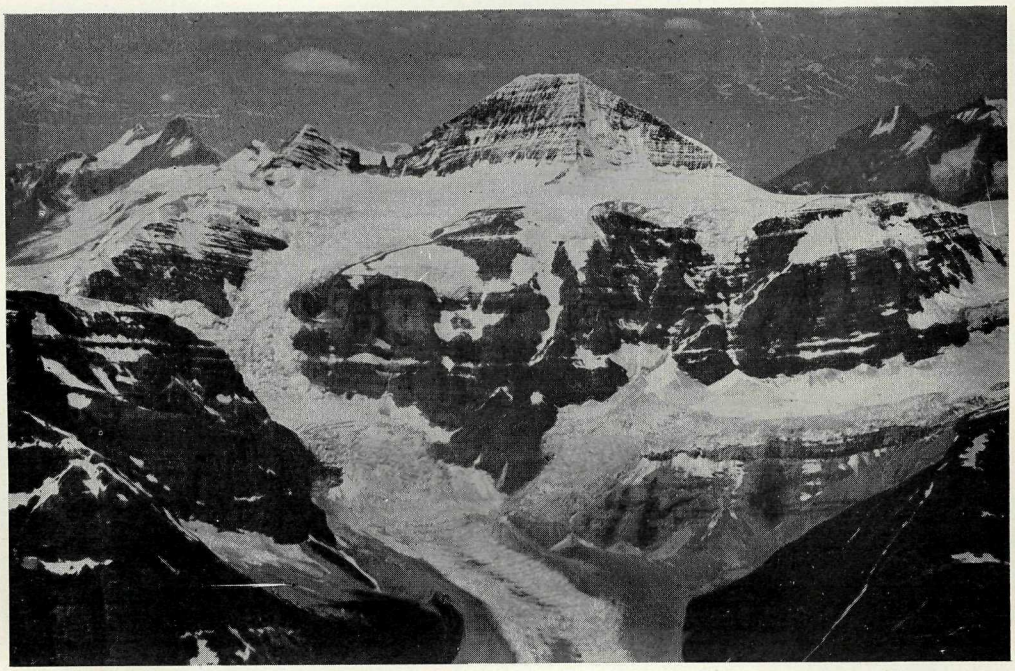
The Geodetic Survey had made arrangements with the Air Board to assist Mr. Lambart in his work, and at Mr. Lambart's suggestion I made a request to the proper authorities for a reconnaissance flight over the region along the line of the watershed with the object in view of ascertaining the nature of the country to be covered by the topographical division in its progress northward.

This request was acceded to, and on July 11th an aeroplane, D.H. 4B, G — C Y D M, from the Air Board Air Station at High River, Alberta, arrived at the landing-field at Henry House, between the railway and the Athabaska River, about 10 miles north of Jasper. The machine was piloted by Captain J. H. Tudhope, of the Air Service. July 12th the Superintendent at Jasper Park, Colonel S. M. Rogers, motored me to the landing-place and Captain Tudhope took me on an initial flight over the vicinity of Jasper.

On the 13th I was taken from Henry House landing over the course of the Interprovincial Boundary, the main watershed of the Rockies, from Yellowhead Pass, following Miette River to Colonel Mountain, Moose Pass, Bess Pass, Jack Pine Pass, and Jack Pine River. Farther north the clouds were rolling over the divide and it was too dangerous to attempt crossing the mountains hidden in them. As a result of frequently edging away the wrong divide was followed and we came out in view of the Fraser Valley. An attempt was made to retrace our course, but the clouds were getting lower and travelling was becoming more and more dangerous amidst the close mountain surroundings. We had been out for nearly three hours, so Captain Tudhope decided to return to the Fraser Valley and effect a landing somewhere. A level field of timothy, showing like an emerald-green spot from the air, near a railway-station surrounded by buildings, was selected and a good landing made. We found we were at McBride, 120 miles from our starting-place. Gasolene was procured and a return flight made up the Fraser Valley



Aeroplane view of Mount Robson and Robson Pass Summit, showing Berg Lake and Lake Adolphus.



Aeroplane view of Mount Sir Alexander (Mackenzie) from the south, showing glaciers, source of Big Salmon River. (Photos by H. F. Lambart, D.L.S., Geodetic Survey of Canada.)

at an altitude of 8,000 feet. It was a serious matter to be practically lost amidst the clouds in a region of high mountains, as no known landmarks could be distinguished, but the competent skill and good judgment of Captain Tudhope brought the flight to a safe ending. Colonel Rogers and Mr. Lambart at Jasper were greatly concerned at our protracted absence, as the plane was long overdue for return. Some useful information was obtained which prevented loss of time in the survey-work.

On July 16th Captain Tudhope took Mr. Lambart for a most successful flight along the entire length of the watershed from Mount Robson to Jarvis Pass, close by where it is supposed the 120th meridian crosses the watershed of the Rockies on its northward course. The weather conditions were absolutely perfect and Mr. Lambart obtained a large number of photographs from the air. Those of Mount Robson were very fine, and also of Mount Sir Alexander (Mackenzie) and Mount Ida, the big prominently seen mountains about 100 miles north of Mount Robson, situated a short distance south-west of Jarvis Pass in British Columbia. Jarvis Pass was identified by the chain of lakes at its summit. Some of the views obtained will be of considerable use to the topographical division for its map-work.

Of the trip Mr. Lambart writes: "Mount Sir Alexander will never be climbed. It is an absolute knife-edge of snow, not even corniced along its full length. It is surrounded by a high-level ice-field, the best approach to which is from the north. The only possible attempt at an ascent is from the east side. I have photographs looking straight down on the peak. Mount Ida, only a few miles away, is another Matterhorn of the Canadian Rockies and is not much lower than Mount Sir Alexander. The mountains and wide open valleys north of Mount Bess are easy, and the timber seems particularly vigorous. North of Jarvis Pass the country is not excessively high, as the snow- and ice-covered mountains from here on seem to swing distinctly more to the westward."

From July until September 7th the time was spent in occupying necessary camera stations when the weather conditions permitted. Smoke from bush fires was very prevalent throughout the summer and proved highly detrimental to photographic work. It would have proved disastrous but for the following fact:—

In 1911 an expedition to the Mount Robson region was organized by the Alpine Club of Canada under my leadership. With this expedition the Smithsonian Institute of Washington collaborated for zoological and botanical purposes. I then made a photo-topographical survey of the area traversed by the watershed from Yellowhead Pass to some distance north of Mount Robson, which resulted in a preliminary map of the region. The Department of the Interior assisted the expedition by supplying the necessary instruments and photographic plates, and subsequently made the enlargements of the views obtained for map-work. The British Columbia Government assisted the expedition financially.

The photographic negatives then obtained were filed with the Surveyor-General at Ottawa and were available for use in conjunction with last season's work. Owing to this fact material for a very full season's work was in hand and a larger area is ready for mapping than could possibly have been obtained otherwise, even had the weather conditions been most favourable. The supplementary data of the 1911 survey was particularly fortunate in view of the fact that the season of the topographical division was necessarily cut short in order to permit of Mr. Cautley's division completing the production of the 120th meridian southward as far as possible towards the summit of the main range.

Work was closed on September 7th and the party returned to Jasper by way of the Robson Pass and Fraser River valley. It was paid off at Jasper on September 14th.

In 1917 the watershed had been located and the adjacent country mapped for some 9 miles north of Yellowhead Pass. The survey was now carried to Bess Pass and Mount Bess, 20 miles north-west of Robson Pass and 50 miles north-west of Yellowhead Pass in direct distance.

In all, eight passes across the watershed were located, viz.: (1) Miette Pass; (2) small pass at the head of the South Branch of Stony River; (3) Colonel Pass at the head of Colonel Creek; (4) small pass at the head of a tributary of the East Branch of Moose River; (5) Moose Pass; (6) Robson Pass; (7) Wolverine Pass; and (8) Bess Pass. At least three of these should be surveyed and monumented.

On August 27th, with one man, I left the camp at Bess Pass and travelled over the Jack Pine Pass, north of Mount Bess, and down the Jack Pine River to find Mr. Lambart and ascertain the extent of his work and the facilities of the country ahead for travelling with a pack-train.

The second day out I met Mr. Lambart returning with his party, having closed the work for the season.

In all, the topographical division occupied forty-two camera stations and obtained 316 views from which to make maps of the country covered.

MIETTE PASS.

This pass is situated at the headwaters of the Miette and Stony Rivers and divides them from the headwaters of Grant Brook, a tributary of Fraser River. The pass has three distinct passages, the most southerly draining to Miette River and Grant Brook respectively, and the other two to Stony River and Grant Brook. They lie in open grass-land country and their summits are practically above timber-line. This pass should be monumented.

STONY RIVER PASS.

The summit is at the head of the South Branch of Stony River and is only a few miles from Miette Pass in a north-westerly direction. It lies in a narrow valley and its chief importance is that the direct trail from Yellowhead Pass to Colonel Creek and Moose River crosses it. A detail survey would not be recommended.

COLONEL PASS.

This pass is at the head of Colonel Creek, a tributary of Moose River from the east. The vicinity of the summit is a delightful spot on the Alberta side, with two little lakelets and charming camp-grounds. The crossing is a low one and lies in timber. The descent on the British Columbia side is steep, but horses can easily be taken across. Some 5 miles of newly cut trail down the creek connects with the trail up Moose River. The summit of the pass is well defined and monumenting is not recommended.

MOOSE PASS.

The summit is in a narrow valley filled with rock-fall and is well above timber-line. The characteristics here are peculiar: crossing from the south, the summit is apparently reached, when it is discovered that a small tarn in a deep basin sends its flow southward to Moose River. The tarn is lower than the apparent summit, owing to a piled-up mass of rock debris, through which the stream flows, having filled in the valley below it. The valley is very narrow and the sides rise steeply from its bottom, but it would appear useful to have a monument or two placed to define the actual summit, owing to the fact that the Moose River Trail to the Smoky River travels across the pass. The approaches on both sides of the summit are gradual and easy.

ROBSON PASS.

A wide shingle-flat with scattered bunches of small spruce fills in the space between Berg Lake on the British Columbia side and Lake Adolphus on the Alberta side, a little over a mile apart. The flat is at the foot of the Robson Glacier, which is divided into two tongues by a nunatak much covered by moraine. The north face of the nunatak is free from ice, which has now retreated on either side and leaves it as a boundary to the flat. The main flow from both tongues is to Berg Lake, but a certain amount of water finds its way from the eastern stream to Lake Adolphus.

The location of the watershed is something of a problem and it is thought that it will be up the centre of the Robson Glacier to the crest of the mountain ridge that contains the ice-field at its source. The proper location can only be decided by careful detailed survey. The whole of the mass of Mount Robson is in British Columbia. The massif with its glaciers and glacial lakes covers an area of over 30 square miles and measures 3 miles through at the base, where it rises 1¾ miles into the air above the Grand Fork Valley.

The widespread fame of this great mountain, the highest of the range, and the spectacular beauties of its ice-bound surroundings attract a large amount of tourist travel. On this account it is advisable that a detailed survey should be made and the pass summit be monumented. It is, moreover, the direct route from the Fraser River to the headwaters of the Smoky River, a tributary of Peace River, although at the present time it is only open to pack-train travel.

Wolverine Pass.

This pass presents a most complicated bit of topography and an example of a crossing of the watershed of the Great Divide such as has not heretofore been seen by the boundary survey. Glaciers from Mounts Whitehorn, Longstaff, and Gendarme here converge in a magnificent ice-fall at the head of a valley, and the streams flowing from it spread out into many channels and find their way to a wide, marshy, open area a mile distant, which resembles a muskeg. They then divide in the direction of their flow, the larger quantity of water flowing north-west to form the Beaver River, a tributary of the Fraser, and the smaller flowing north-east to form Wolverine Creek, a tributary of Smoky River.

It would be a matter of very great interest to define the watershed accurately across Wolverine Pass, but it is doubtful whether the prospective utility of the route, as from the Smoky to the Beaver River Valley, would at the present time warrant the cost of a detailed survey and monumenting. It would be a difficult and lengthy operation, particularly so that the watershed lies directly across the marshy open, which is, for the most part, under water to the depth of several inches.

Bess Pass.

The summit of Bess Pass is reached by the valley of Bess Creek, a tributary of Smoky River. The approach on the Alberta side is short, some 6 miles, and presents an easy grade all the way, the route for the most part lying along the shingle-flats of the stream and crossing the many channels intersecting them.

On the British Columbia side, however, there is a very steep descent to the bed of Beaver River. A short distance west of the summit the trail climbs a shoulder of Mount Bess and, having descended for several hundred feet, traverses the south-western flank of the mountain to Jack Pine Pass. A few miles north of Mount Bess is Mount Chown, the most northerly outstanding peak of the Rainbow Mountains group, of which Mount Robson is the central massif.

Bess Pass is the direct line of communication from the Smoky River Valley on the east side of the watershed to the Fraser River Valley by way of its tributary, Beaver River. At the present time there is no trail leading from the summit of the pass to the Beaver Valley, and the descent on the British Columbia side is more than 2,000 feet. It is thought that this pass should be surveyed in detail and monumented.

Game and Fish.

Game is plentiful throughout the area covered by the survey. A number of moose were seen in the Wolverine Pass and tracks were plentiful elsewhere. Woodland caribou frequent the highland meadows. Small deer are plentiful. On the high crags the mountain-goat has its home and bear are in the woods. Several species of grouse were noticed and ptarmigan in the rocky ground on the alp-lands. The porcupine pest was much in evidence.

Trout were caught in the upper waters of Miette River, where they are plentiful, and Mr. Lambart reports that trout were caught in Grant Brook on the British Columbia side. There may be fish in the Moose and Smoky Rivers, but the waters of these streams were in a very muddy condition all summer owing to the continued dry, hot weather, and none were seen.

General Remarks.

North and south of Yellowhead Pass Summit much of the timber has been burned and is now a dense brulé. A small quantity still remains on the slopes that may be of use. Where green timber is seen in the Moose and Smoky River Valleys it is of moderate size and not of high economic value owing to the impossibility of getting it out. A few small stands of apparently good cedar are located in the valley of the Fraser River tributary known as the Grand Fork, but there is no large quantity and much of the timber along the stream and north of its source in Berg Lake has been burned.

The area is not as yet well served by trails, and where they exist they wind through very marshy or rough, rocky ground and climb up and down over mountain-ridges in steep ascents or descents. The trail up Moose River is particularly bad. Much time was spent in opening up new pieces of trail to reach necessary objectives. Beyond Bess Pass conditions grow worse, particularly in the Jack Pine Valley, and the hills it is necessary to ascend and descend are stupendous.

The Rainbow Mountains group, across which the survey extended, is very fine and has attracted considerable attention the world over. Mount Robson is the climax of the group. Besides having the distinction of being the highest peak of the main range of the Canadian Rockies, it presents a most spectacular setting of ice and snow and many fine glaciers descend from it. Mountain tarns of intensely blue colours are seen in the surrounding valleys and delight the eye. There are many other ice-fields and glaciers in the vicinity and magnificent waterfalls abound, so much so that the name "Valley of a Thousand Falls" has been applied to the one encircling the base of Mount Robson on the north-west.

In this magic region of natural beauties British Columbia possesses a great heritage and one that is attracting, and will attract, tourists from many lands.

I have, etc.,

ARTHUR O. WHEELER,

Interprovincial Boundary Commissioner.

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