ANNUAL REPORT

OF THE

MINISTER OF LANDS

OF THE PROVINCE OF

BRITISH COLUMBIA

FOR THE

YEAR ENDED DECEMBER 31ST

1923

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
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1924.

VICTORIA, B.C., April 25th, 1924.

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 ended December 31st, 1923.

T. D. PATTULLO,

Minister of Lands.

VICTORIA, B.C., April 24th, 1924.

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 ended December 31st, 1923.

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.

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

VICTORIA, B.C., April 14th, 1924.

SIR,—I have the honour to submit herewith the annual report of the Lands Branch of the Department of Lands for the year 1923.

The accompanying statements contain complete information of the administration of the Crown lands during the year showing:—

(1.) The number of pre-emption records issued.
(2.) The number of pre-emption claims inspected.
(3.) The surveyed and unsurveyed lands sold.
(4.) The coal licences and leases issued.
(5.) The grazing leases and industrial leases of various kinds issued.
(6.) Statement of revenue received from land-sales throughout the Province; the revenue received under the "Land Act," "Coal and Petroleum Act," and sundry sources.
(7.) Statement of the number of Crown grants issued under the various headings in which Crown property is alienated, showing the total acreage deeded in each class.
(8.) A statement of letters received, both inwards and outwards.
(9.) Summary since the year 1911.

Five auction sales were conducted by the Department during the year of town lots belonging to the Crown in Stewart, Atlin, Burns Lake, Vanderhoof, and Prince George Townsites, and a number of lots in these places were sold privately following the auction, and also in Point Grey Municipality, Vancouver, and various other townsites in furtherance of auction sales previously held.

In connection with the South Okanagan Irrigation Project, three lots in the Townsite of Oliver and eighteen parcels totalling 136.81 acres were sold.

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

PRE-EMPTION RECORDS, ETC., 1923.

Agency.	Pre-emption Records allowed.	Certificates of Purchase.	Certificates of Improvements.
Alberni	11	29	2
Atlin	-----	29	-----
Clinton	67	126	9
Cranbrook	7	8	8
Fernie	4	17	1
Fort Fraser	84	56	10
Fort George	130	117	13
Golden	1	16	1
Kamloops	41	98	17
Kaslo	11	10	1
Nanaimo	-----	17	2
Nelson	6	71	4
New Westminster	2	-----	2
Penticton	31	72	3
Pouce Coupe	13	4	1
Prince Rupert	22	146	2
Quesnel	61	127	17
Revelstoke	-----	8	1
Smithers	37	47	6
Telegraph Creek	-----	1	-----
Vancouver	41	217	19
Vernon	36	43	3
Victoria	2	480	1
Totals	607	1,739	123

PRE-EMPTIONS INSPECTED, 1923.

Alberni	219
Atlin	.....
Ashcroft	14
Clinton	328
Cranbrook	98
Penticton	145
Fernie	19
Fort Fraser	414
Fort George	328
Golden	19
Kamloops	295
Kaslo	9
Nanaimo	34
Nelson	37
New Westminster	9
Prince Rupert	158
Pouce Coupe	89
Quesnel	452
Revelstoke	21
Smithers	111
Telegraph Creek	.....
Vancouver	437
Vernon	155
Victoria	15
Total	3,406

LAND-SALES, 1923.

	Acres.
Surveyed (first class)	811.79
Surveyed (second class)	6,629.48
	7,441.27
Unsurveyed	3,321.2
Total	10,762.47

CROWN GRANTS ISSUED, 1923.

Pre-emptions	223
"Pre-emptors' Free Grants Act, 1916"	50
Purchase	119
Mineral	196
"Soldiers' Homestead Act"	1
Town lots	187
Reverted lands (other than town lots)	72
Reverted town lots	131
Reverted mineral	31
"Townsite Proportionate Allotment Act"	2
"Dyking Assessments Act"	.....
"Schools Act"	3
Soldier Settlement Board	19
Land Settlement Board	14
Miscellaneous	26
Total	1,074
Applications for Crown grants	1,157
Certified copies	6

TOTAL ACREAGE DEEDED.

Pre-emptions	41,358.01
Mineral claims (other than reverted)	7,859.42
Reverted mineral claims	1,182.06
Purchase of surveyed Crown land (other than town lots)	7,360.998
Purchase of reverted land	5,858.893
Purchase of unsurveyed Crown land	1,134.02
Lands conveyed to Soldier Settlement Board	1,697.20
Lands Crown-granted to Land Settlement Board	1,324.90
Miscellaneous	1,169.732
Total	68,945,233

REPORT ON COAL LICENCES, LEASES, ETC., 1923.

COAL-PROSPECTING LICENCES.

Number of licences issued, 95; area, 60,800 acres.

SUNDRY LEASES.

Number of leases issued, 92; area, 6,360.84 acres.

STATEMENT OF REVENUE, YEAR ENDED DECEMBER 31ST, 1923.

LAND-SALES.

	Victoria.	Agencies.	Total.
Under "Coal and Petroleum Act"	$15,630 18		$ 15,630 18
Under "Taxation Act"	25,689 59		25,689 59
Townsite lots	28,656 13	$ 70,457 40	99,113 53
Country lands	5,464 05	51,634 08	57,098 13
Pre-empted lands		39,307 78	39,307 78
Mineral claims		3,443 92	3,443 92
Improvements		5,056 55	5,056 55
Totals	$ 75,439 95	$169,899 73	$245,339 68

REVENUE UNDER "LAND ACT."

	Victoria.	Agencies.	Total.
Sundry lease rentals	$35,080 00		$35,080 00
Grazing rentals	6,478 72		6,478 72
Survey fees	889 45	$5,075 48	5,964 93
Sundry fees	13,645 00	2,377 25	16,022 25
Royalty	185 34		185 34
Rent of property		450 00	450 00
Totals	$56,278 51	$7,902 73	$64,181 24

REVENUE UNDER "COAL AND PETROLEUM ACT."

	Victoria.	Agencies.	Total.
Coal licences	$ 9,300 00		$ 9,300 00
Coal rentals	12,107 45		12,107 45
Sundry fees	145 00		145 00
Lieu of work	800 00		800 00
Totals	$22,352 45		$22,352 45

SUNDRY RECEIPTS.

	Victoria.	Agencies.	Total.
Maps, blue-prints, etc.	$ 5,009 88	.....	$ 5,009 88
Miscellaneous	2,534 33	.....	2,534 33
Interest, South Okanagan Project	6,881 76	.....	6,881 76
Totals	$14,425 97	.....	$14,425 97

SUMMARY.

	Victoria.	Agencies.	Total.
Land-sales	$ 75,439 95	$169,899 73	$245,339 68
Land revenue	78,630 96	7,902 73	86,533 69
Sundry receipts	14,425 97	.....	14,425 97
Totals	$168,496 88	$177,802 46	$346,299 34

STATEMENT OF LETTERS INWARD AND OUTWARD, 1923.

Inward	19,381
Outward	14,688

SUMMARY.

	1910.	1911.	1912.	1913.	1914.	1915.	1916.
Pre-emption records	2,049	2,383	3,655	3,855	4,304	2,277	1,167
Certificates of improvements	439	624	715	962	1,002	665	465
Certificates of purchase	9,031	7,141	5,065	3,640	1,805	990	729
Crown grants	1,572	2,566	2,737	2,110	1,376	718	847
Total acreage deeded	300,587.79	524,325.99	253,143.60	390,036.32	245,244.78	75,225.00	98,452.00
Coal-prospecting licences	145	2,223	2,003	1,090	545	198	120
Sundry leases	92	121	47	46	51	38	86
Coal leases	.....	.....	75	207	71	29	31
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
Letters received	37,188	41,946	43,302	31,738	30,287	19,151	13,779
Letters sent	.....	23,568	21,612	17,305	14,790	10,104	8,432

	1917.	1918.	1919.	1920.	1921.	1922.	1923.
Pre-emption records	824	823	1,752	1,624	1,495	969	607
Certificates of improvements	541	379	326	328	217	154	123
Certificates of purchase	778	592	747	1,067	1,152	1,735	1,739
Crown grants	1,167	1,512	1,806	1,827	1,699	1,295	1,074
Total acreage deeded	187,111.64	260,321.40	512,844.87	215,364.50	163,161.76	116,990.85	68,945.233
Coal-prospecting licences	71	72	112	275	160	236	95
Sundry leases	73	83	51	113	104	122	92
Coal leases	7	3	1	12	6	17	.....
Cash received	$194,435 17	$369,392 51	$251,471 25	*$428,431 64	$381,860 60	$394,454 43	$346,299 34
Letters received	15,780	22,500	†53,835	32,180	28,951	22,857	19,381
Letters sent	12,632	12,500	18,063	19,912	22,372	16,517	14,688

* Cash received at Victoria only. † This includes total letters received by entire Department.

PART II.

SURVEY BRANCH.

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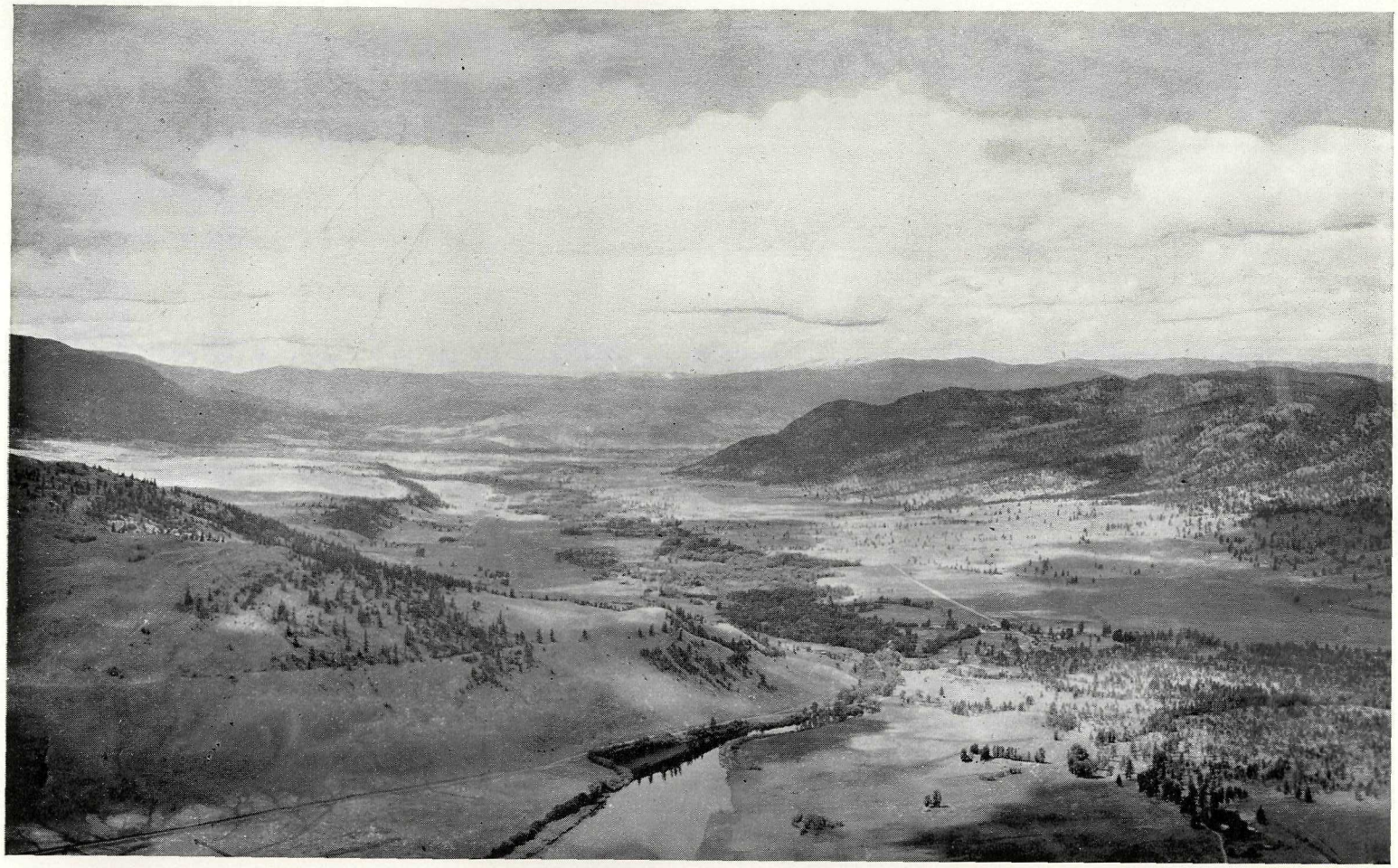


Nicola Valley, looking west from Nicola to Merritt.

REPORT OF THE SURVEYOR-GENERAL.

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 ended December 31st, 1923:—

Generally speaking, the work in the field was carried on under very favourable weather conditions which extended well into the autumn, with the result that all parties were able to report a satisfactory amount of work completed.

Forty-six qualified British Columbia land surveyors were employed during the season for various periods, thirteen of whom were employed as assistants. Twenty-four parties were in the field for more or less extensive periods, while the remainder were employed on work of limited extent.

FIELD-WORK.

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

Crown Land Surveys.—The area of Crown land surveyed during the season totals 152,504 acres. Out of this area, 107,489 acres were previously surveyed into lots of 640 acres for applications to purchase which reverted to the Crown under the "Soldiers' Land Act." The work in these areas consisted in establishing the "quarter corners" on the lot boundaries where they were not established in the original survey, and running out of the centre lines in each lot. This work is necessitated by the inability of the settler in bush country to determine his boundaries on lots of this description without the assistance of a surveyor. The principle adopted by the Branch is that each quarter-lot should have at least three sides run out on the ground and all four corners posted. The majority of the lands so subdivided lie adjacent to the Canadian National Railway between Prince George and Smithers, where settlement is fairly active.

The remainder of the lands surveyed are widely scattered throughout the Province and consist almost entirely of lands in actual demand for settlement, being areas which individuals have signified their desire to pre-empt or close-in areas which have been logged off and found to be suitable for settlement. The more important areas of the latter class are one near Salmo south of Nelson, and another near Cranbrook.

This work involved the running of 485 miles of new boundary-lines and the retracement of 429 of previously surveyed lines. The comparatively large mileage of retracement is occasioned by the resubdivision of previously surveyed lots referred to above.

It is estimated that 1,118 integral parcels have been surveyed, 244 of which are already occupied or held mainly by pre-emptors. In other words, the work of the season assisted 244 settlers in determining their boundaries and provides for 874 new settlers.

Control Surveys.—It is usual in all systems of survey, especially in the system applied to the survey of Dominion lands in the Prairie Provinces, to establish a network of control before the lands are subdivided for settlement. In British Columbia, doubtless due to the mountainous nature of the country and the consequent large expense which would have been involved in any comprehensive system of control, no such work was undertaken until recent years after the non-settled portions of the Province had been surveyed. Individual lots or groups of lots were laid out as occasion demanded and in many instances it was impossible to place the surveys in proper relative positions on the departmental maps. The inevitable result has been that frequently different surveys, supposedly a considerable distance apart, actually conflict with one another. This involves conflict of title and difficulties in making adjustments. During recent years a systematic triangulation of the Coast inlets has been carried on, with the result that a number of such conflicts have been discovered and adjusted. At the same time the triangulation affords a means of properly placing subsequent surveys, thus ensuring against similar complications in future, and at the same time supplying the foundation for the preparation of accurate maps. The work is also proving of value in connection with the administration of Crown timber, as it permits of clearing the numerous applications for timber-sales which would not be possible without accurate knowledge of the coast-line.

Triangulation surveys of this nature were carried on during the past season in Toba Inlet, Knight Inlet, Seymour Inlet, Milbanke Sound, Nass River, and the east coast of Moresby Island.

Control surveys of a similar nature are carried out on the larger Interior lakes; the lakes so surveyed during the past season being Adams Lake, Kamloops District, and Spanish Lake, Cariboo District.

In order to permit of mapping in true relative position the isolated groups of surveys in the various valleys in the Interior, triangulation nets are projected, using mountain-tops for stations and tying in where possible to intervening surveyed lots. Surveys of this nature were made last season in the vicinity of Bella Coola, the upper Chilcotin Valley, the upper Nechako Valley, and north of Babine Lake.

In all this work the Branch co-operates where possible with the Geodetic Survey of Canada, the Hydrographic Survey, and the Geological Survey. Special mention might be made here of a case of co-operation with the Geological Survey during the past season. A triangulation and topographical survey was being carried on by a survey party under the Geological Survey in the district north of Nelson, including Kokanee Park. By arrangement a Provincial surveyor, co-operating with this party, was able to locate and tie in a large number of floating surveys, mainly mineral claims, by connecting with the Geological triangulation. At the same time the Dominion surveyor also connected with numerous surveys found and flagged by our surveyor. The arrangement avoided considerable duplication of work and the attitude of the Director of the Geological Survey in this connection is greatly appreciated.

Topographical Surveys.—Two parties were employed on photo-topographic surveys extending the area previously covered in the Southern Interior. Weather conditions, which are a vital factor in this work, were fairly satisfactory during the past season.

DETAILS OF WORK.

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

The following paragraphs give the names of surveyors, the locality in which they worked, and the 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. Eight surveyors were employed in this area, as follows:—

Surveyor.	Locality.
1. J. A. F. Campbell	Cluculz Lake.
2. V. Schjelderup	Francois and Ootsa Lakes.
3. L. S. Cokely	Dunster Station.
4. R. W. Haggen	Quesnel Lake.
5. W. C. Merston	Upper Chilcotin Valley.
6. F. C. Swannell	Upper Nechako and Babine Lake.
7. G. M. Downton	Lillooet District.
8. O. B. N. Wilkie	Adams Lake and River.

Messrs. Campbell and Schjelderup were employed on surveying Crown land for settlement and quartering 640-acre lots.

Mr. Cokely re-established certain surveys in the vicinity of Dunster Station in the valley of the South Fork of the Fraser River, which surveys had become obliterated by fires, thus preventing settlers from locating their boundaries.

Mr. Haggen surveyed a number of scattered areas in Southern Cariboo District required for settlement, and made a number of traverse and triangulation control surveys in the vicinity of Likely, including a traverse of Cedar Creek, tying in a number of placer-lease surveys and a triangulation of Spanish Lake.

Mr. Merston made some land surveys in the Upper Chilcotin Valley and a triangulation and topographical survey over an area extending eastward from Anahim Mountain to the 124th meridian. The topographical work extends over the Itcha Mountains, which are shown to comprise considerable open and semi-open country suitable for grazing.

Mr. Swannell carried on the control and reconnaissance topographical work on which he has been engaged for three previous years, covering the headwaters of the Nechako River. An area of some 6,000 square miles has now been covered and a triangulation carried from the

53rd to the 55th parallel of latitude. He also made a connection between previously established nets of triangulation in the vicinity of Babine Lake and Nation Lakes.

Mr. Downton was employed on miscellaneous surveys throughout Lillooet District.

Mr. Wilkie commenced the season at Missezula Lake, south of Merritt, after which he made certain miscellaneous surveys in the valleys of the North Thompson and Adams Rivers, and completed the season by triangulating that portion of Adams Lake lying north of the Railway Belt.

Southern Interior.

Surveyor.	Locality.
9. P. W. Gregory	Princeton.
10. H. D. Dawson	Kaslo.
11. B. C. Affleck	Salmo.
12. B. A. Moorhouse	Cranbrook.
13. H. E. Whyte	Upper Kootenay Valley.

Mr. Gregory resurveyed for settlement certain lands south of Princeton in the vicinity of Allenby which were originally surveyed as coal licences, which expired. He also laid out some twenty lots in the vicinity of Myren Creek, adjacent to the Kettle Valley Railway.

Mr. Dawson was engaged in the area west of Kaslo, tying in isolated surveys, chiefly mineral claims. He worked in co-operation with A. C. T. Sheppard, D.L.S., employed by the Geological Survey on triangulation and topographical work.

Mr. Affleck was engaged on the subdivision of expired timber leases at Salmo, along the line of the Great Northern Railway between Nelson and Spokane. It is anticipated that there will be considerable demand for these areas when they are thrown open.

Mr. Moorhouse surveyed logged-off lands at Skookumchuck, Wasa, and Krag, East Kootenay.

Mr. Whyte surveyed a number of parcels in the valley of the Upper Kootenay River, adjoining the south boundary of the Dominion Government Railway Belt.

Coast and Vancouver Island.

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

Surveyor.	Locality.
14. M. W. Hewett	New Westminster District.
15. John Davidson	Toba Inlet and vicinity.
16. H. H. Roberts	Johnstone Strait and Knight Inlet.
17. J. T. Underhill	Ranges 2 and 3, Coast District.
18. P. M. Monckton	Ranges 4 and 5, Coast District.
19. A. E. Wright	Nass River and Wark Channel.
20. W. J. H. Holmes	Moresby Island.
21. L. S. Cokely	Rupert District, Vancouver Island.
22. R. P. Bishop	Range 3, Coast District.

All of these surveyors, with the exception of Mr. Cokely, who made a rectification survey near Port Hardy, were employed more or less on control surveys and making such isolated land surveys as were required in the district in which they were working. Messrs. Hewett, Davidson, and Roberts each surveyed certain logged-off timber licences.

Mr. Bishop was engaged in running a triangulation connection between the Coast triangulation net at Bella Coola and the Interior net covering the Upper Nechako area. A map showing the Coast inlets which have been triangulated to date will be found facing page 17.

MISCELLANEOUS SURVEYS.

In addition to the parties referred to above, the Department has employed other surveyors from time to time throughout the year to make small surveys in various localities as occasion demanded. Lands which reverted under the "Taxation Act" were subdivided at Salmo, Kootenay District, and at Bamfield Creek, Barclay District. Some lands required for settlement purposes were surveyed on the main fork of the Kettle River. A small subdivision was made on the Slocan River and some summer-home sites laid out on Christina Lake. A few lots for settlement were surveyed on Mission Creek, near Kelowna, and some miscellaneous surveys were made on the west coast of Vancouver Island. Subdivision surveys have also been carried out in connection with the development of Point Grey and the former Songhees Indian Reserve at Victoria.

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.

Mr. McCaw covered an area in the vicinity of Merritt, including the valleys of Mamit and Clapperton Creeks, and that portion of the valley of the Nicola River lying between Nicola Lake and the easterly boundary of the Railway Belt.

Mr. Jackson covered practically all of the Similkameen Valley above Whipsaw Creek.

The season was a good deal more satisfactory than the previous one from the standpoint of photographic conditions; practically no time was lost on account of smoke. An area of approximately 902 square miles was covered during the season. It is estimated that a total area of 6,748 square miles has now been mapped by photo-topographical methods. A sketch-map showing the areas covered annually to date will be found facing page 18.

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.

It is anticipated that the Commission will complete the work laid out for them during the year 1924. The boundary between the two Provinces will then be established from the 49th parallel to a point about 100 miles north of the Peace River.

SURVEYORS' REPORTS.

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

PRIVATE SURVEYS.

There was a decrease in the number of private surveys of pre-emptions and land purchases from the previous year. The acreage of mineral-claim surveys gazetted during the past year was, however, practically 100 per cent. greater than in 1922, which is a reflection of increased mining activity in the Province, more particularly in the Portland Canal Division.

The year 1923 marks the close of timber-licence surveys. Forty-five licences were surveyed during the year and the "Forest Act" was amended at the recent session of the Legislature to provide for the acceptance of these surveys.

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.

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

December 31st, 1923.

SIR,—I have the honour to submit the following report on the work of the Survey Division for the year ended December 31st, 1923:—

The personnel of the staff at the end of the year numbers twenty-two, being the same as at the end of 1922. Two new members have been appointed, however, owing to two members having resigned.

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 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 684 field-books were received, as against 650 received during 1922. The various surveys contained in these field-books consist of 663 land lots, 180 mineral claims, 43 timber licences, and 138 traverse connections or triangulations.

During the same period 674 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, while 326 miscellaneous tracings were also prepared.

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

	Acres.
Pre-emption surveys	991
Purchase surveys	3,341
Mineral-claim surveys	9,175
Timber-licence surveys	53,101
Coal-licence surveys	4,480
Lease surveys	2,790
Government surveys	147,927
Total	221,805

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 43 licences were received during the year, as compared with 45 during 1922.

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 204 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 784 applications for pre-emption, 175 applications to purchase, 438 applications for reverted lands, 163 coal licences, 171 miscellaneous leases, 1,103 Crown-grant applications, together with 1,217 timber-sales and 224 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. During the past year 21 new maps were compiled and 11 retraced.

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 from the copying of field-notes was $251.70, while the sum of $1,821.58 was paid in for blue-prints. It is calculated that 242 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	2,250
Surveyor-General's Branch	4,100
Forest Branch	8,616
Other branches of Government service	15,766
Total	30,732

There were also prepared 689 tracings (in duplicate) to be attached to Crown grants and 135 tracings (in duplicate) to accompany land leases.

CORRESPONDENCE AND ACCOUNTS.

During the year 5,923 letters were received and 5,503 sent out, which does not include interdepartmental memoranda.

Table B, attached to this report, gives a summary of the office-work for the year 1923 and comparative figures for 1922.

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
1923	991	3,341	9,175	53,101	4,480	2,790	147,927	221,805

TABLE B.—SUMMARY OF OFFICE-WORK FOR THE YEAR 1923 AND COMPARATIVE FIGURES FOR 1922.

	1922.	1923.
Number of field-books received	650	684
„ lots surveyed	889	663
„ lots gazetted and tracings forwarded to Government Agents	938	674
„ miles of right-of-way plans dealt with	250	204
„ applications for purchase cleared	165	175
„ applications for pre-emption cleared	969	784
„ reference maps compiled	18	21
„ Crown-grant applications cleared	1,295	1,103
Total number of letters received by Branch	6,228	5,923
„ „ Crown-grant and lease tracings made in duplicate	1,417	824
„ „ blue-prints made	36,238	30,732
Total revenue from sale of blue-prints	$1,942.70	$1,821.58

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 (Railway Belt to Mt. Olie)	„	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.	Upper Skeena and Babine River Valleys	„	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
19.	Lower Skeena and Zymoetz River Valleys	„	1 00

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

Price-list of Blue-prints—Continued.

		Scale.	Price.
19A.	Skeena and Kitsumgallum River Valleys	1 inch to 1 mile	$1 00
19B.	Prince Rupert, Mouth of Skeena and Nass Rivers	„ „	1 00
20.	Skeena and Bulkley Valleys, vicinity of Hazelton	„ „	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 and Green Lake)	„ „	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.	Fraser River, vicinity of Big Bar Creek	„ „	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.	Canim Lake and North Thompson River, vicinity of Vavenby	„ „	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
50.	Halfway, Peace, and Graham River Valleys	„ „	1 00
51.	Fort Grahame and Finlay River	„ „	1 00

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

Price-list of Blue-prints—Continued.

		Scale.	Price.
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
60.	Taseko Lake and Head of Bridge River	,, ,,	1 00
61.	South Fork of Bridge River and Head of Lillooet River	,, ,,	1 00
62.	Head of Jervis Inlet and Squamish River	,, ,,	1 00
63.	Lillooet Lake and Green River	,, ,,	1 00
15–0.	Upper Elk and White River Valleys	,, ,,	1 00
15–9N.	Fernie and Crowsnest vicinity	,, ,,	1 00
15–9S.	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, April 1st, 1924.

REPORT OF THE GEOGRAPHIC DIVISION.

January 2nd, 1924.

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

SIR,—I have the honour to submit the report of the Geographic Division for the year ended December 31st, 1923.

The map production of the Geographic Division for 1923 is as follows:—

PRE-EMPTORS' MAPS.

Name.	No. of Copies.	Date of Issue.	No.	Scale.	Area in Sq. Miles.
Fort George. Compiled and drawn.	10,200	April, 1923	3A	3 miles to 1 in.	9,000
In Course of Preparation.					
Stuart Lake. Compiled and drawn. Topography and resources. In course of printing	5,500	March, 1924	3C	3 miles to 1 in.	9,000
Tete Jaune. Corrected and partly redrawn. In course of printing	2,600	March, 1924	3H	3 miles to 1 in.	6,000
Lillooet. Correction and revision at present in hand	.....	July, 1924	3K	3 miles to 1 in.	11,000

The new Fort George map is in three colours—black, outline of drainage, lots, etc.; buff, status of lands; green, Land Settlement Board areas; blue, bodies of water.

The production of the new Stuart Lake sheet presents the opportunity to make a beginning in showing the resources of the country upon our maps. Reconnaissace surveys by the Surveys and Forest Branches have been made of the major portion of the Stuart Lake map area. These were compiled and employed as the initial record for outlining a system of showing the resources information. and also topographical contours.

Resources Information.—The various branches of the Government are employed in their detailed work covering lands, forestry, agriculture, mining, water-powers, etc. It was suggested

that this information could be made readily available to the public, if a system were designed to show the resources information clearly, without going too deeply into the detail, and that the best method for recording, building up, and improving the resources data would be to publish this on our maps. The system is comprised in the following legend, which was prepared by the Geographic Division in conjunction with the following: Department of Agriculture, Forest Branch, Grazing Commission, Survey Branch. The objective of the system is comprised under the following six heads:—

Section A—Land form, shown by relief in contours.
Section B—Soil.
Section C—Forest-cover.
Section D—Grazing.
Section E—Geological and Mineral.
Section F—Game, Fisheries, and miscellaneous, such as features of special tourist interest.

The survey of the area of the British Columbia-Alberta Interprovincial Boundary, appearing on the Tete Jaune sheet, was completed in 1923. The outline of this information has been incorporated in the new Tete Jaune (1924) map.

It is a requirement, and was the intention, to make a compilation and new map of the Lillooet pre-emptors' area. With the demands on the time of the staff for other work, it is found impossible to do other than correct the old sheet, and bring it up to date as far as possible.

DEGREE SHEET SERIES.

Name.	No. of Copies.	Date of Issue.	No.	Scale.	Area in Sq. Miles.
Kettle Valley. Compiled and drawn	6,000	Aug., 1923	4K	2 miles to 1 in.	3,100
In Course of Preparation.					
Rossland. Compiled—surveys and drainage. Also major portion of road data	.....	.....	4A	2 miles to 1 in.	3,100
Nelson. Compilation of surveys and drainage about one-quarter completed	.....	.....	4B	2 miles to 1 in.	3,100

In 1923 we were able to proceed with the compilation of the Degree Sheets Rossland and Nelson, and it is hoped that when we have produced the new map of South-west British Columbia we will have the staff available for the drawing of these sheets for photolithography.

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	Oct., 1923	2D	4 miles to 1 in.	15,000

DISTRICT AND DIVISION SERIES.

Name.	No. of Copies.	Date of Issue.	No.	Scale.	Remarks.
Map of B.C. Precipitation, singly and combined	4,950	May, 1923	1JA	31.56 miles to 1 inch	
Map of B.C. Land Recording Divisions	20,000	March, 1923	1JC	31.56 miles to 1 inch	
Map of B.C. Mining Divisions	3,600	April, 1923	1JD	31.56 miles to 1 inch	
Map of B.C. Assessment Districts	1,000	March, 1923	1JE	31.56 miles to 1 inch	
Map of B.C. Provincial Electoral Districts—Redistribution, 1915	850	April, 1923	1JF	31.56 miles to 1 inch	
Map of B.C. Land Registry Districts and Counties	1,200	May, 1923	1JG	31.56 miles to 1 inch	
Map of B.C. Forest Districts	1,000	June, 1923	1J	31.56 miles to 1 inch	
In Course of Preparation.					
Map of B.C. Provincial Electoral Districts—Redistribution, 1923. In course of printing	1,200	Jan., 1924	1JF	31.56 miles to 1 inch	
Map of B.C. Land Recording Divisions. The division boundaries and naming corrected and brought up to date	5,250	Jan., 1924	1CX	50 miles to 1 inch	

GEOGRAPHIC SERIES.

Name.	No. of Copies.	Date of Issue.	No.	Scale.	Area in Sq. Miles.
South-west British Columbia.....	.....	Aug., 1924	1K	1/500,000= 7.89 miles to 1 in.	71,500
Wall-map of British Columbia	.....	Dec., 1924	1A	1/1,000,000	.....

South-west British Columbia Map.—This South-west British Columbia sheet will be especially designed to show tourist and commercial information. The available data for this purpose are now being examined and compiled. Contours of 1,000 feet interval—wherever topographical surveys have been made in this area—will be shown.

The sheet will link up with our Map No. 1EM, East and West Kootenay, thus giving the whole of the southerly portion of the Province, in two sheets, upon a common scale.

The size of the sheet is our maximum printing size, 44 by 32 inches. This size is not sufficient to include the whole Island in place. We are therefore using the south-western area of the map for an inset covering the northerly portion of Vancouver Island. There will also be an inset which will extend the area covered by the map to include Seattle, Tacoma, Mount Rainier, and Olympia.

There is common interest in South-west British Columbia and the North-west State of Washington for tourist purposes. This interest has been considered by designing the map to include, beside South-west British Columbia, the portion of Washington State contiguous to Puget Sound and British Columbia.

If space allows, there will be an inset map showing the cities and vicinities of Vancouver and Victoria; whilst distance tables immediately referring to the Coast area will also appear. It is proposed that a portion of the space on the back of the map will be employed to show statistical and general information of particular tourist and commercial interest.

Wall-map of British Columbia.—This work is proceeding as rapidly as possible. The "black" outline sheets are being compiled to correspond with recent new survey-work. About 90 per cent. of the compilation of the contour information to be shown on this map has been completed; whilst 25 per cent. of the drawing of the contours for photolithography is done.

The scope of the statistics covering resources and progress, obtained for Map No. 1K, South-west British Columbia, will be expanded, and a portion of the back of this map (1A) will be employed to give interesting data of the Province in concise form.

MISCELLANEOUS.

Name.	Scale.	For whom prepared, printed, etc.
Oliver Townsite Plans, Nos. 6A, 7, and 8	800 ft. to 1 in.	Water Rights Branch. (Published only.)
Photo-topographic Progress Map	25 miles to 1 in.	For Annual Report of Lands Department. Prepared drawing for reproduction.

A number of smaller works of mapping were undertaken for other offices in addition to the above.

GEOGRAPHICAL NAMING AND GAZETTEER.

Satisfactory progress was made in the geographical naming of British Columbia. It was possible this year to edit each published sheet for correct naming. More than the usual amount of geographical naming was dealt with, comprising Dominion Government maps and numerous names submitted to this office by the representative of the Geographic Board of Canada. These names were checked up and passed upon in accordance with our system of naming.

The following maps were edited for geographic naming in 1923:—

1. Kettle Valley degree sheet (rechecked), B.C. Government.
2. Powell Lake map (rechecked), B.C. Government.
3. Fort George pre-emptors' map, B.C. Government.
4. Stuart Lake pre-emptors' map, B.C. Government.
5. Alberta-British Columbia Boundary Survey names (24 sheets).

6. Alaska-British Columbia Boundary Survey names (5 sheets).
7. Comox District, G.S.C.
8. Reference Map No. 18–9s, B.C. Government.
9. Reference Map No. 30 (not completed), B.C. Government.
10. Selecting and naming appropriate features of British Columbia in honour of the British Columbia land surveyors killed in the Great War, B.C. Government.

The time expended to date in connection with the minimizing of duplication of naming of the geographical features of the Province, and correctly recording and affixing the naming, has proved well worth while. Delay seldom occurs now from incorrect or confusing geographical naming, compared with our experience formerly.

Gazetteer.—The compilation of the Gazetteer was in the hands of A. R. Bamford, who resigned from the staff early in the year. His work was taken over by A. D. Anderson, who resigned from the staff a few months later. These staff changes retarded the progress of this undertaking. The editing of the Gazetteer is now being carried on by G. P. Goddard, with the assistance of J. N. Givens as compiler.

Notwithstanding the delays and changes, a creditable volume of work has been accomplished during the year. The outstanding features of this work are as follows:—

1. The cross-indexing of all name-cards.
2. The completed entries as to the location of mountains, peaks, etc., for latitude and longitude.
3. Recording all railway-stations in British Columbia.
4. Recording all the names appearing on nineteen new maps of British Columbia-Alberta boundary.

Arrangements are completed for the printing of the Gazetteer. The first edition will be purely a gazetteer or compilation of the geographical naming in British Columbia. The printing will be spread over the time necessary to completely write up and edit the "copy," and the typesetting will be undertaken as the "copy" becomes available. A beginning has been made of the publication—the first of the "copy" now being in the hands of the printer. The publication will necessarily be accomplished slowly, as the location and descriptions of all names have to be closely rechecked.

COST-CARD SYSTEM.

This system, instituted in 1921 to keep account of the cost of the work executed for other departments, has proved so helpful that this year it was extended to cover the entire work of the Division. This year the number of demands for work from outside offices has considerably decreased, compared with former years, the number of orders from this source being eighteen, and most of them being very small works—with a total charge of $147.63.

This Division completed, or partially completed, seventeen pieces of work to fill our own requirements, with a total cost of $13,212.65.

MAP-MOUNTING.

There was a constant strong pressure for work in map-mounting throughout the year. The volume of work turned out created a record of annual work accomplished in this branch. The quality of production was maintained, and opportunities of saving in cost of production were carefully attended to. It may be said that the limit of production, with the staff employed in this branch, was accomplished this year. Should the demand for map-mounting work materially increase, it will be necessary to increase the staff.

In addition to carrying out the demands of the Survey Branch, the receipts and credits for the period January 1st to December 1st, 1923, amounted to $1,513.22, an increase of about 50 per cent. in this particular over the amount of last year.

	Work done, Receipts and Credits.
Geographic and Survey Branch	$1,263 78
Lands Department	841 42
Other Government offices	472 20
Public	199 60
Total	$2,777 00

PHOTOSTAT.

Photostat requirements attended to this year were greater than in any former year. The pressure of work was continuous, and it was apparent that the maximum production of our equipment and personnel has been reached.

A large amount of the work was of a precise nature, and careful effort was given to maintaining first-class quality of work.

It would appear that there is a continuous widening knowledge of the uses, speed, and saving of photostating. The photostat equipment is now indispensable, especially in the preparation of all forms of mapping.

The personnel of the photostat has been most efficient in carrying out the work of this year.

Year.	Requisitions.		Receipts and Credits.		
	Dept.	Public.	Dept.	Public.	Total.
1920..	474	245	$1,070.85	$975.10	$2,045.95
1921..	568	204	1,537.50	710.85	2,248.35
1922..	750	172	2,380.00	635 65	3,015.65
1923..	793	188	3,367.30	520.30	5,887.60

MAP STOCK AND DISTRIBUTION.

The distribution of maps to the public and departments of the Government has increased over last year; whilst the number of maps received into geographic stock was three times that of last year, principally on account of the publication of the single sheet new Commercial Map of British Columbia.

Year.	Maps issued to Depts. and Public.	Maps received into Geographic Stock.
1920	20,051	27,358
1921	16,375	24,492
1922	17,047	18,663
1923	19,800	57,102

1. Cash receipts for printed maps and draughting, January 1st to December 31st, 1923	$2,666 30
2. Credits (Lands Department) for printed maps and draughting, January 1st to December 31st, 1923	1,271 12
3. Credits (Government Agents) for printed maps	486 22
4. Value of printed maps issued free to Government Agents and public, January 1st to December 31st, 1922	1,444 30

The work of stocking and distribution was carried out economically and well. As a rule, each inquiry for maps was attended to on the same day as the communication was received. There was a marked increase in the number of inquiries for maps and mapping information. Amongst these there appeared to be a larger proportion than formerly of *bona-fide* inquirers for land-settlement purposes. Wherever it would be of assistance to the correspondent, his communication was also referred to other interested departments, so that the fullest available advice and encouragement would be given.

Year.	Letters received and attended to.
1920	965
1921	1,298
1922	1,318
1923	1,400

STANDARD BASE MAP.

The Standard Base Map staff has consisted of one computer and two draughtsmen. It was found necessary to employ one of the assistants on standard compilation in connection with the Rossland and Nelson degree sheet areas.

The receipt of new surveys necessitated revision of certain S.B.M. routes and in certain cases the compilation of new routes. The total length of traverse compiled was 1,820 miles.

The plotting of the skeleton routes on the scale of 1 mile to 1 inch was continued, six new sheets of 30-minute area being completed, besides which four 30-minute area sheets were entirely re-formed and re-plotted. To date, thirty-nine 30-minute sheets have been completed, representing 22 per cent. of the area of the Province covered by S.B.M. traverse routes.

The co-operation given by the Division in making the preliminary and final plotting of the land surveys in connection with the photo-topographical surveys, referred to in our report of last year, was carried out this year with equal success. The areas completed this year were those in Nicola and Yale, surveyed by Messrs. McCaw and Jackson, B.C.L.S. Seventeen of these 10-minute quadrangle sheets, on scale of 20 chains to 1 inch, were plotted.

The old surveys in the area covered in the Nicola District are probably some of the most difficult in the Province to plot accurately.

The Standard Base Map system, as it is developed in radius and strength, is becoming more and more extensively used in the compilation of geographic printed maps, the drafting of departmental reference maps, and in the work of other branches, a much greater speed and accuracy being obtained in this mapping than was hitherto possible.

In addition to the general Standard Base Map work, control nets were supplied for the following:—

Geographic Printed Maps.	Departmental Reference Maps.
Rossland Degree Sheet.	Nos. 4A, 6A, 6B, 6C, 18–9S, 20, 28,
Nelson Degree Sheet (incomplete).	27–29, 29B, 30, 58, and 15–0.
South-west of British Columbia.	
Tete Jaune Pre-emptors' Map.	
Stuart Lake Pre-emptors' Map.	
Lillooet Pre-emptors' Map.	

LAND REGISTRY PLANS.

During the year 377 Land Registry plans were received and indexed.

CENTRAL INDEX.

The work of the Central Index has been confined to the registering of new plans. The general work of indexing has been postponed until such time as the Gazetteer is published and the staff is available to proceed with the Central Index.

I have, etc.,
G. G. AITKEN,
Chief Geographer.

CLUCULZ LAKE AND VICINITY, CARIBOO DISTRICT.

BY J. A. F. CAMPBELL.

PRINCE GEORGE, B.C., November 3rd, 1923.

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 in the Coast and Cariboo Districts during the past season:—

Surveys were carried on in Townships 1, 7, and 8, Range 4, Coast District, and the country adjoining Townships 1 and 8 to the east, in the Cariboo District. These surveys consisted of subdivisions into quarter-sections of lands previously surveyed. Also certain vacant lands bordering Cluculz Lake to the south were surveyed into convenient-sized parcels, and Section 1, Township 8, was surveyed. The described area lies to the south of the Nechako River and adjacent to Vanderhoof. All told, about 58,000 acres were surveyed and subdivided.

Surveys were commenced at Hulatt, about 60 miles west of Prince George, the work first extending south to Cluculz Lake, then west through Townships 1, 7, and 8, and finally, swinging east to Stuart (now called Finmoore), where the season's operations were brought to a close late in October.

TOWNSHIPS 1, 7, AND 8, RANGE 4, COAST DISTRICT.

Townships 1, 7, and 8 may be said to lie in the Nechako Valley, for after an abrupt ascent of about 300 feet from the river-bottom the country is comparatively flat until the slopes of Sinkut Mountain, 15 miles to the south, are reached. Sinkut Mountain is the most commanding elevation bordering the valley, rising 1,500 feet above the surrounding country, and cuts into the south-east corner of Township 7 and the south-west corner of Township 8. Those parts of the townships lying on the slopes of the mountain are unsurveyed and are useless for agricultural purposes, although there is a possibility that the grassy slopes falling to the east may be profitably utilized for summer grazing.

The Telegraph Trail, one of the old routes to the Yukon goldfields, passes through Townships 7 and 8, and it was shortly after the rush to the Klondike that the excellent quality of the land in the Nechako Valley was brought to the attention of the general public. Occasionally a farmer is met who passed over the trail in the late nineties and after a few more or less unsuccessful years in the Yukon returned to the Nechako Valley to engage in the more peaceful but possibly more remunerative field of farming. The Telegraph Trail has lost all semblance to a trail and is now a first-class road, being one of the main arteries of the district, but it is still called the Telegraph Trail, and I have no doubt that it will always be known by that name.

With the exception of Sinkut Mountain, there are no outstanding topographical features, the whole country being one comparatively flat plain, with an occasional gentle roll. A noticeable feature in regard to the numerous creeks and small lakes in the area is that they are not in a deep depression as is usual in most parts of the Province, but lie only slightly below the surrounding land-level, and it is often with a feeling of surprise that lakes and streams are encountered when walking across country. When a well is sunk it is seldom necessary to go deeper than 20 feet, where an abundant supply of good water is obtained.

The soil in the townships is very similar, being usually a white clay silt, with vegetable mould, very fertile, and easy to cultivate. In some localities, especially in the vicinity of Mapes, in Township 8, there is a certain amount of fine sand intermixed with the soil, and on the easterly limits of Townships 1 and 8 there are occasional patches of gravelly soil. Where the base of Sinkut Mountain is touched by Townships 7 and 8 the soil is very sandy and gravelly, but taken as a whole the townships are one block of excellent agricultural land. There are many meadows, especially in Township 8 and the southern part of Township 1, that at one time were wet, due to flooding by beavers, but the majority of these have been drained, the soil, a black muck, being excellent for hay-raising.

The land is fairly free from timber, poplar, aspen, and cottonwood being the principal growth, with a few patches of scattered spruce and an occasional flat timbered with lodgepole pine. The poplar and aspen seldom attain any great size, usually varying from saplings up to 8 inches in diameter, with a few trees 12 inches in diameter. The cottonwood are found along the creek-bottoms and bordering lakes, while alder and willow grow along most of the creeks and the edges of the wet meadows. There is very little spruce, usually found in a swampy depression where the soil is rich and heavy. The lodgepole pine is generally found on a sandy flat, but at the same time it grows on the richest soil, and it is the one tree in the country that thrives on any soil, whether it be good, bad, or indifferent.

Clearing the timber, including stumping, burning, and preparing the land generally for the plough, varies greatly, not only in the different townships, but even in the same section. In the same section it may vary from $15 to $50 per acre, and where the timber is pine and spruce it may run as high as $75 per acre, but from all accounts I should judge that it would average about $30 per acre where the prevailing timber is poplar and aspen of average size.

There are many wet meadows, often erroneously called muskeg, that have been drained and are highly desirous on account of the rich soil and the heavy yield of hay and oats. There is, however, a large amount of labour involved in draining the wet meadows, as frequently, due to the flatness of the surrounding country, the drainage-ditches have to be carried long distances to obtain the necessary drop and flow, and it is often a question whether it is cheaper to drain the meadows or to clear the timber from land. After the ditches are constructed they have to be kept free from falling earth and other stoppages, while on timbered land the first expense of clearing is usually the last in that connection.

Most of the vacant land has a luxuriant growth of peavine, vetch, wild grass, fireweed, etc., and due to the land being free from any dense undergrowth, cattle and sheep can graze almost

anywhere during the summer months. Wild grass and red-top grow to heights of from 3 to 4 feet, and in many cases, when the farmer is short of timothy, wild grass will be cut and stacked for winter use. The usual variety of berries are found—cranberries, strawberries, raspberries, etc.

A large percentage of the land in Townships 7 and 8 is under cultivation, with a lesser proportion in Township 1. The size of the cultivated areas vary from a few acres up to 200 acres. Oats are grown on most of the farms and excellent crops are obtained, as high as 75 bushels to the acre being reported. Barley and rye do well, and in a few cases small crops of fall wheat have been tried and seem to ripen well. The principal crop is timothy-hay and throughout the district most excellent crops have been reported. This has been an exceptionally good year for timothy and most of the farms have plenty for winter use, with a surplus for sale on the market. Potatoes, beets, cabbages, turnips, and other vegetables have been successful, and those purchased for use of the survey party were of good quality and size. Most of the farms raise a certain number of cattle and hogs, and with the luxuriant growth of the open range, together with produce from the farm, the stock is easily fattened and bring a good price on the market.

Vanderhoof is the centre of the Nechako Valley trade and the majority of the farmers market their produce from this point, supplying the local market and shipping to different points along the line of the Canadian National Railway. At Vanderhoof is located a creamery where an excellent grade of butter is made, the cream being supplied by the farmers throughout the valley.

At Mapes, located on the South-west Quarter of Section 21, Township 8, is a general store and post-office. There are four schools established adjacent to the area described—one on the South-west Quarter of Section 28, Township 8; another near the west end of Sinkut Lake; one just across the boundary of Section 13, Township 8, in Lot 1164; while a school and post-office and general store at Hulatt supply the needs of those located in Township 1.

Between Canadian National Railway and Cluculz Lake.

The boundary between the Coast District and the Cariboo District passes along the eastern boundary of Townships 1 and 8 and is almost the dividing line between the open poplar country to the west and the more heavily timbered country to the east.

About forty lots, lying between Hulatt and Finmoore, on the Canadian National Railway, and south to Cluculz Lake and west to the boundary of the Cariboo District, were subdivided.

This particular area of land has a more or less heavy growth of poplar, aspen, lodgepole pine, and spruce, interspersed with stretches of lightly wooded country and a few wet meadows. It may still be considered part of the general Nechako Valley as far south as Cluculz Lake, when the gradual rise to the Telegraph range of mountains is encountered. The ascent from the Nechako River is about 300 feet high and very abrupt, but from the top of the river-bench the country flattens out, and with the exception of a few slight rises and creek-valleys the land is fairly level for about 10 miles south.

To the west of Cluculz Lake, in the vicinity of Sob Lake, the country is very flat and is not much above the level of either lake, and for about 4 miles there is a series of wet meadows. These meadows centre around Sob Lake and a great amount of labour has been expended on a drainage system with very good results. The largest of the meadows contains about 1,000 acres, mostly ditched and drained and part of it under cultivation. In ten sections in this vicinity I should estimate that 2,000 acres is meadow land, much of it wet meadow, but all capable of being drained, as most of it has no water standing on the surface, although the soil is too damp to cultivate in its present state.

In the area between the Canadian National Railway and Cluculz Lake a fair percentage of it is under cultivation, the greater part under cultivation being in the vicinity of Sob Lake. The principal crop is timothy-hay, enough of the crop being retained for winter-feeding of stock and the balance is sold and shipped to camps and mills located along the railway. Some of the larger meadows have not been sown to timothy, but the wild hay is cut, baled, and sold, though this is not always satisfactory, as just as much time and labour is required to harvest the wild hay and the price received is considerably below that obtained for timothy.

Clearing the land of the spruce and lodgepole pine runs to between $30 and $75 per acre, including stumping, etc. In some places where the timber is small poplar with stretches of

willow-bush the cost of clearing would be proportionally less, but with the exception of meadow land clearing is necessary on all the land.

Most of the hay and other crops from this area is marketed and shipped from Hulatt, although about the only steady demand is for hay of good quality, and most of the root-crop is used as fodder for cattle raised on the farm.

There is a general store, post-office, and school at Hulatt and the same at Finmoore, both these places being on the Canadian National Railway.

CLUCULZ LAKE.

Cluculz Lake is about 50 miles west of Prince George, 25 miles east of Vanderhoof, and 6 miles south of the Canadian National Railway. The lake is 10 miles long and not over a mile wide at its greatest width. The banks slope gently back from the lake-shore and the ascent is nowhere abrupt, except towards the eastern end, where the banks rise sharply for about 75 feet. In some cases the land has been cultivated almost to the water's edge, as there is no swampy land bordering the lake, with the possible exception of a small portion near the western extremity.

Vacant land adjoining the lake to the south was surveyed, the land towards the western part of the lake being surveyed into 160-acre lots, while to the east full-sized lots were run in. The land surveyed is somewhat similar to the general class of land throughout the district, having a white clay-silt soil with a vegetable loam. The timber is principally small poplar, pine, and a scattering of average-sized spruce and a few scattered fir close to the lake. There is perhaps a greater percentage of small meadows and fire-cleared land than is usually found in the same-sized area, this being true the farther the surveys were carried south.

The meadows, which in the majority of cases are fairly dry, follow the numerous small creeks that drain into the lake, and are not of any great width, though what they lack in width is made up in length, some of them a few hundred feet wide crossing an entire section. There are some average-sized meadows varying from a couple of acres to 20 acres that have good growths of wild hay and red-top, and no doubt will make excellent agricultural land when properly cultivated.

Considerable work is being done on a number of farms south of the lake, and a new road was built this summer from Sudgen's Point, a bold prominence on the south shore of the lake, south to different farms, giving them an outlet to the lake. A ferry was constructed to connect the south shore with the road on the north shore, this road connecting with Finmoore, about 6 miles north on the Canadian National Railway. On the north side of the lake there are a few farms that have considerable land under cultivation, each farm having a few head of stock. By far the greatest area under cultivation in this vicinity is near Sob Lake, a mile or so to the west of Cluculz Lake.

At one time early in the last century there was a large Indian village on the north shore of Cluculz Lake at the point now known as North Bay. According to "The History of Northern British Columbia," by Father Morice, O.M.I., this settlement numbered many hundreds, but most of the Indians in the village were massacred by the Chilcotins during a night attack. Those that escaped moved to Chinlac, at the mouth of the Stuart River, and after this village was wiped out by the same warlike tribe the few remaining settled at Nulki Lake, on what is now known as the Stony Creek Reserve, even at that time a large and prosperous settlement, where the numbers were too great for the Chilcotins to venture further attacks. Descendants of the original inhabitants of Cluculz Lake make yearly visits to the lake to fish and hunt. One old Indian told me that his father and grandfather had always come to Cluculz Lake in the fall of the year to fish for whitefish, of which there is an abundant supply in the lake and at the outlet of Cluculz Creek. The Indians in the district belong to the Carrier Tribe, and depend principally on fishing and hunting, with perhaps a few acres under cultivation on the larger reserves.

CLIMATE.

The precipitation in the Nechako Valley is light, but quite sufficient for all requirements. During the months of June to October, inclusive, there were seventeen days on which the rainfall was heavy, principally in June and early July and the later part of October, and a number of days of light showers. The prevailing winds are from the south-west, high winds being the

exception, although in the later part of June there were days of very brisk winds from the west and south-west.

No frosts were recorded until September 3rd, when the thermometer fell to 29° at 4.30 in the morning. From this date on there were occasional mornings when the thermometer would record below freezing at 5 a.m., the temperature quickly rising as the sun came above the horizon. Most of the early morning frosts were noticed when camped at lakes. The highest temperature recorded was 90° at noon on August 17th, the lowest being 22° at 5 a.m. on October 8th.

The average noon temperatures, taken in the shade and protected as far as possible from wind, together with the number of days in each month upon which rain fell, either heavy rains or showery, were as follows:—

	Temperature.	No. of Days.
June	67	8
July	68	8
August	71	9
September	67	6
October	59	6

The snowfall in winter is from 18 inches to 2 feet and is very light and powdery. Some years it may be greater than this, but it is seldom over 2 feet in an ordinary year. The winter temperature drops to 40° below zero, but the low temperatures are the exception and last only a day or so at a time; in some cases only a few hours. The average over the winter, from November 15th until April 15th, would be about 22° above zero. There are no high winds in winter, and this is especially true when the temperature is at its lowest. The first heavy snowfall usually occurs between November 15th and the first week of December and lies on the ground until the first week in April, when it rapidly disappears. A thaw regularly makes its appearance early in February, and from this time on there is very little further snowfall, but short periods of soft weather, with a stretch of fairly cold weather about the middle of March. The thaws make their appearance very regularly and the days of soft weather can be almost foretold to the day from year to year.

TRANSPORTATION.

The Nechako Valley is exceptionally well supplied with good roads. With Vanderhoof as the centre, good graded dirt roads branch out in every direction. During the summer months better roads could not be wanted, although in the spring, when the frost is coming out of the ground, they are not in the best of shape until the grader is run over them. Any part of the country adjacent to Vanderhoof can be reached by motor-car, and this is saying a great deal when it is taken into consideration that the country is comparatively new as far as settlement and road-building is concerned. A road runs from Vanderhoof to Prince George and is in good shape for wagon or motor-car, some 25 miles of new grading being completed on it this summer and the balance of the road put in first-class shape. There are other main roads from Vanderhoof—to Fort Fraser, Quesnel, and Fort St. James—that are graded, together with a number of well-graded roads through the farming areas. During the summer I used a motor-car on the survey and found no trouble in reaching any point of the work with the car. Some of the farmers have tractors and cars which assist them greatly in getting their produce to market and breaking the land. The Canadian National Railway from Prince Rupert follows the Nechako River and wagon-roads branching from the main roads are built to the majority of stations in the valley.

GAME AND FISH.

There are numerous lakes in the district, all well supplied with fish. Cluculz Lake has an abundant supply of rainbow trout, char, whitefish, and kokanee, some of the char or lake-trout running as high as 20 lb. in weight. The other lakes in the vicinity have a good supply of fish, especially trout and whitefish, although the char in the smaller lakes do not usually run as large as in Cluculz Lake. At Stuart Lake cabins have been built for the convenience of tourists, and the Hudson's Bay Company at Fort St. James has accommodation, both board and lodging, for a limited number. During the summer tourists have come from the United States and the Prairie Provinces to Stuart Lake for the excellent fishing obtained there and were very enthusiastic over the good sport obtainable.

Game is fairly plentiful, but not in as large numbers as farther east, although in the vicinity of Cluculz Lake, Stuart Lake, and a number of the smaller lakes there is a good supply of deer and black bear. On Sinkut Mountain there are many black bear and a short distance north on Bobtail Mountain a few grizzly have been reported seen at different times. In the fall of the year the deer are numerous along the Nechako River, and in the sloughs and slack water of the river the ducks and geese are very plentiful in September and October. There were many grouse this year, more than usual in fact, and I think that the killing of great horned owls, the greatest enemy of the grouse, has had a great deal to do with the grouse returning in large numbers, as a few years back the country was almost depleted of grouse.

TIMBER.

There is no merchantable timber of any amount in the Nechako Valley. There are good stands of milling-timber on the Stuart River, but this has to be cut and driven down the Stuart to a mill erected on the railway before it can be profitably utilized. An industry that is developing rapidly, however, is that of tie-making, and there are some good stands of lodgepole pine in the vicinity of Hulatt and Finmoore and farther back at Cluculz Lake that may be logged with profit. Outside of the timber on the Stuart and the tie-timber mentioned, no merchantable timber came under my notice during the summer.

I have, etc.,
J. A. F. CAMPBELL, B.C.L.S.

RANGES 4 AND 5, COAST DISTRICT.

BY V. SCHJELDERUP.

BURNS LAKE, B.C., December 15th, 1923.

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

SIR,—I have the honour to submit the following report on my season's surveys in Ranges 4 and 5, Coast District:—

The work was scattered over a large area, involving long and frequent moves. Some 47,200 acres of previously surveyed lots were subdivided and 1,730 acres of original surveys made. In performing these surveys, 91 miles of new line, 52 miles of retracing, and 4 miles of traverse were run, making a total of 147 miles for the season.

Reports of former years have very carefully covered the main characteristics of the district as a whole, also describing in detail the various sections and development therein. I therefore confine my remarks this year to matters relating to improvements which have developed during the last year.

There is a marked improvement generally in the roads throughout the district, and on the main roads motor-cars and trucks have almost entirely taken the place of horse transportation. There is no doubt that this is the surest means of placing Central British Columbia on the map, as one who voices the opinion of many and who has lately visited the district has been heard to remark that, contrary to the general belief that the country adjacent to the Grand Trunk Pacific Railway was somewhere near the North Pole and quite impossible as to roads, etc., he found it in a surprising condition as to good roads and general development.

J. L. Duthie, of Seattle, has opened up several mines in the vicinity of Smithers and the Babine and these are now being worked. At Hudson Bay Mountain the Federal Mining & Smelting Company, of New York, has taken a very substantial interest with him and is conducting the operations there. Mr. Duthie looks upon the Smithers centre as the most important mining area in the country. He says that next season there will be at least 750 miners employed about that part of the Omineca Mining Division.

The Federal Mining & Smelting Company is so satisfied with the result of its explorations at the Jefferson Group on Dome Mountain, 23 miles east of Telkwa, that it has paid a substantial deposit on the property and has undertaken to spend $500,000 in further development. The group consists of thirty claims. The main value of the ore is in gold. Two groups of mineral claims at Owen Lake were late in the fall of this year bonded by the Federal Company and development-work has already commenced. Owen Lake is some 30 miles south of Houston.

From Vanderhoof, the eastern end of my district, comes news of renewed activity in the old Omineca goldfields. P. O. Bangert, capitalist of Philadelphia, has acquired the leases formerly worked by the Kildare Mining Company on Slate Creek, and after spending some six weeks on the ground with a mining engineer and a small party is now in the East, where he is making arrangements for transportation of machinery, etc., in order that mining operations may be commenced next summer.

The tie industry along the railway is attaining larger proportions every year and is a great boon to the settlers, affording work during the winter months, as well as an opportunity to dispose of their farm produce. Taking the Decker Lake, Priestley, and Francois Lake camps alone, they are planning an output for the season of some 500,000 ties.

Fall fairs were held at Smithers, Houston, and Vanderhoof, and at these excellent displays of farm produce and cattle were given. Judges from various parts of the Province attended, and there could be no better advertising medium than to give these visitors a chance to see an aggregation of the country's produce. Potato exhibits from the district were sent to the Provincial Potato Show at Victoria, where their initial display gained a position on the list which would encourage them to compete with the more experienced growers for a higher standing in the future displays. Individual exhibits were very encouraging. R. C. Stanyer won third prize with his exhibit of Irish Cobblers grown on his farm at Francois Lake. The Forestdale District won some prominence when in the division for boys and girls the second prize was won by W. T. Gair with Irish Cobblers, and third prize went to G. H. Gair with an exhibit of Early Six Weeks variety.

Exhibits were also sent to the New Westminster Exhibition, a report of which appeared in the *Columbian*, described as a revelation to the people in the south, and which read as follows:—

"Illustrative of the great possibilities of Northern Central British Columbia as an agricultural district is the very comprehensive exhibit of fruit, vegetables, and practically all other varieties of products of the soil from this territory entered in the district exhibit competition for the Dewar shield at the Provincial Exhibition. The exhibit, articles for which were collected from all parts of the district between Prince Rupert and Prince George, contains some magnificent specimens of produce, no small number of which are of a suitably high quality to win prizes at any fair in the world. This denotes wonderful possibilities as a farming district for this vast area of the finest agricultural land in the world. In addition to the soil products, there are a number of other articles on display, the whole of which is attractively arranged and is drawing much attention to the Agricultural Building.

"The exhibit was first proposed by Duncan Munro, director of the Provincial Land Settlement Board at Telkwa, and one of the district's most prominent boosters, who saw in the district exhibit competition at the largest agricultural fair in the Province an opportunity of putting the great advantages of Northern British Columbia before the many thousands of visitors who attend the event. In the preliminary arrangements no small amount of work was done by the Prince Rupert Agricultural and Industrial Association, which undertook much of the clerical work in connection with sending out circulars to the farmers to create an interest in the proposed exhibit. The Smithers Agricultural Association was also an active and enthusiastic supporter, while practically all the residents of the great district fell in with the plan and worked hard for the success of the exhibit, so that while it may not be so elaborate as others in the competition, it is truly a co-operative effort and represents an extensive farming advance in the whole of Central British Columbia.

"Contributing to this advance are the men who first came into the country, chose their land with great care, cultivated it, and then selected the best seed from which has been produced grain and field and garden produce equal to the best. This has proved beyond a doubt the fertility and resourcefulness of the new land, demonstrating that it is past the experimental stage in agriculture, and that it only needs the application of capital to the soil and of hard work and experience to make it one of the richest and finest farming districts in the world.

"It is with just pride, says a recent visitor to the country, that Duncan Munro can show farm upon farm area in this district, sloping up to the hills and producing the finest of crops in the purest seed form. This pure seed, containing absolutely no weed-seeds, and potatoes devoid of any disease, are perhaps the greatest advantages of the country, and already the areas have achieved a name for the excellent seed-grain and potatoes that are sent out.

"At the present time the farmers are going in for dairying and are building silos, raising ensilage, and they are certainly building along the right farming lines, which will ensure in years to come great prosperity for this as yet comparatively new land.

"The fact that the exhibit did not secure the premier honours in the competition matters very little, for through it a complete insight is given into possibilities of the district to Fair visitors, many of whom are decidedly enthusiastic over it after seeing the display, so that, if nothing else, the district has gained much prominence.

"Those in charge of the display and responsible for it include J. B. Munro, E. Bewell, and George E. Smedley."

In the Canadian Railways magazine, *The Last West*, is published the following of interest to the people of Central British Columbia: "Field corn for ensilage was harvested in the Bulkley Valley on September 7th. The corn stood 10 feet high and gave an immense yield of fodder. Grain-crops in the Bulkley and Nechako Valleys this year (1923) were uniformly good; wheat yielding up to 50 bushels to the acre and oats 80 to 100."

Quite a number of farms are now fairly well developed in the various settlements, and the output of grain, cattle, and dairy products will increase rapidly from year to year. Naturally a beautiful country in its primitive state, its attractiveness is enhanced by the many farmsteads that now dot the landscape on hill and dale.

Government Illustration Stations have been established in this district at Smithers, Telkwa, Francois Lake, and Vanderhoof, and A. E. Richards, Superintendent of Government Illustration Stations, gave the following report when interviewed by the Vancouver *Province*:—

"The land of Central British Columbia is not only adapted to dairy-farming, but also to the growing of seed-potatoes, stated Mr. Richards. Excellent results have been secured on the Illustration Stations with Green Mountain, Early St. George, and Irish Cobbler varieties. The fact that the land of the district along the Grand Trunk is virgin makes it all the more desirable for certified-seed growing, as the soil has not yet been inoculated with disease-producing bacteria.

"Excellent crops of grain have been harvested this season, according to Mr. Richards. At Vanderhoof the illustration plot on the farm of D. Turcotte yielded 90 bushels of Runner oats to the acre. Silage-crops have also done well, excellent sunflower and peas and oats having been reported.

"New mills and mines are opening up all through the central part of the Province, and as a result the market is absorbing all that the farmers of the district are able to produce. Many of the pioneers are making considerable money during the winter manufacturing ties, for which there seems to be a good demand at present. The creamery at Vanderhoof is absorbing large quantities of cream produced in the vicinity of this thriving little settlement, and the high quality of its product is gaining it markets in competition with older-established brands.

"One of the most encouraging features of this new country is the continual and increasing flow of traffic along the railways and over the country roads, stated Mr. Richards. Hardly a day passes but some settler is seen passing along the roads with his wagon-loads of farm implements and other goods in search of a home in the fertile farm lands of Central British Columbia."

I have, etc.,

V. SCHJELDERUP, B.C.L.S.

UPPER FRASER VALLEY, CARIBOO DISTRICT.

BY L. S. COKELY.

COURTENAY, B.C., November 13th, 1923.

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

SIR,—The Fraser River has its source in the Yellowhead Pass and flows westerly until Prince George is reached, where it makes an abrupt turn to the south. My work this season lay in that portion of the valley to the east of Prince George. Near the pass the valley is very narrow and the river so small as to be easily forded; as one goes west the valley widens to a width of about 3 miles at McBride and 7 miles lower down. The Grand Trunk Railway traverses the valley as far as Prince George, where the river is left as the railway continues on to the west.

Throughout the valley are evidences of a good stand of Douglas fir and spruce, but repeated fires have brought devastation. The first great fire to sweep the district occurred, according to the Indians, about sixty years ago, and since then, notably during railway-construction days, the valley has been repeatedly burned over, and there is now little of the original timber left. It was noted that there was practically no reforestation of the coniferous trees, but the country is fast growing up with poplar, alder, and willow. In various places are stands of fire-killed cedar which are being cut for poles and shipped to the Prairies. In view of the keen demand for poles at the present time this constituted one of the principal industries this year, pole camps being in evidence in every locality.

My work consisted of restaking a portion of the burned-over area. In many places, although the original survey was only eleven years old, not a trace of the old lines or posts remained. In the valley generally the only method available for marking a survey corner is a wooden post and bearing trees, it being impossible to erect cairns about the posts, as there is a complete absence of stones except on the side-hills. Consequently, when there is a thorough burn no evidence remains. The soil is a clay loam, in which are many small scales of mica, which make the surface glisten in the sun.

My first camp was near Dunster, a station on the Grand Trunk Pacific about 20 miles west of Tete Jaune Cache, which was so well known during construction-days, but which has dwindled down to two or three settlers now. At Dunster a good bridge crosses the Fraser, which is a fair-sized river at this point. Here there is quite a large settlement and many of the farms appear in a prosperous shape. The soil is fertile and clearing is cheap, and with the absence of stones a tract is soon put in condition for the plough. The surface is generally level, consisting of a series of benches. The valley is quite regular, but the river winds from side to side, easily doubling its length. Grain is one of the chief crops, but this has to be cut green and there is no threshing outfit available yet. Potatoes and roots and small fruits do very well, better on the benches than on the low-lying land along the river, which is more subject to frosts. The climate is not adapted to larger fruits on account of the severe frosts after the sap starts in the spring.

On either side of the valley the mountain ranges rise to a height of over 7,000 feet, or 5,000 feet above the level of the river. Here the mountain-slopes are quite regular and are easily climbed. The top of the range consists of a series of plateaus and it is delightful to spend a day on top, as one can walk for miles over a carpet of moss and lichen, away above the timber-line. There appears to be nothing but a broken mountainous country on either side of the valley, and in every direction snow-capped peaks are to be seen.

A continuation of these same ranges to the east form Robson Park and Jasper Park. Both of these parks attracted a large number of tourists this season, who spent considerable time traversing the many trails leading to interesting points away from the railways.

This is a favourite country for the sportsman, as big game abounds; goats are very plentiful and are of a large variety, some them going as high as 450 lb. They range close in, but stay high on the mountains. Caribou are plentiful, but being more timid range farther back. Moose range in the vicinity of McBride and are quite easily obtained. There are many deer throughout the valley, and grizzly bear, the great prize of sportsmen, as well as black bear can be obtained by following up most of the tributaries of the Fraser. There are no sheep on the British Columbia side of the summit, but many range on the Alberta slope. As this is a good fur country, a few of the settlers do very well trapping in the winter.

The climate is milder than on the Prairies, although the altitude is about the same. The summers are warm, but the nights are cool even in the hottest weather. Winter comes early and the river freezes over the first part of November. The snowfall is not excessive, averaging about 2 feet. During the winter are cold snaps when the mercury is apt to drop away below zero for a short period. An abundance of rain falls during the summer, so no irrigation is needed. Some years the Fraser overflows its banks and floods the surrounding country; when this happens there is a plague of mosquitoes. Luckily, we had no mosquitoes this year; black-flies were a little troublesome, but this is certainly not a bad fly country.

The settlers seem very contented and satisfied with their prospects, and they will undoubtedly make a success of farming. At present they feel the lack of roads, but this condition is fast being improved.

I have, etc.,

LEROY S. COKELY, B.C.L.S., D.L.S.

VICINITY OF QUESNEL LAKE, CARIBOO DISTRICT.

BY RUPERT W. HAGGEN.

QUESNEL, B.C., October 24th, 1923.

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

SIR,—The surveys made by me during the past season consisted of the subdivision of certain reverted lands in the vicinity of Quesnel, at 6-Mile Lake, and in the Alexandria section; the survey of three lots at Quesnel Lake and traverses of roads in the vicinity of Quesnel Lake, Spanish Lake, and Cedar Creek, tying in all surveys made to date in that locality and establishing points to which future surveys may be tied; traverse of Quesnel Lake from the outlet to Horsefly Bay; and the survey of three lots for settlement in the vicinity of Moffat Creek, near Horsefly.

Five sections were subdivided in the vicinity of Bouchie (6-Mile) Lake. These lie on or near the Quesnel-Blackwater and from 6 to 12 miles distant from Quesnel; pre-emptors have filed on eleven of the twenty quarter-sections, and, though they have only been in occupation for a short time, considerable work has been done. A road that would serve to give access conveniently was built in the settlement since the survey.

On Lot 903, the southerly of the lots, there is a large swamp, or perhaps one should say muskeg, that at present produces no grass; this is now being drained in the expectation that it will be good farming land; the ultimate value of such places is in my opinion very doubtful, as many of them have no soil with any life in it. The surrounding land is uneven, wooded with jack-pine and spruce, and the soil is poor.

On the remainder of the lots, there is bottom land lying in a depression which runs about parallel with the road and on which there is a deep rich loam; even crops that had received no care during the summer (the pre-emptors having to earn a grub-stake away from home) did well. The bottom land is very heavily wooded with willow, alder, poplar, and birch, but those who keep working at it seem able to clear an acre a month; the balance of the land consists of rolling or broken country wooded with birch, jack-pine, and poplar, with poor soil, but affording very good summer pasture. The whole area seems to be one well adapted to mixed farming; within 12 miles of Quesnel if the day comes when that town once more becomes a market, and a locality where the settlers are close enough together to have some community life.

There is a school near Bouchie Lake, practically in the centre of the settlement.

At Alexandria three lots were subdivided and a tie run along Australian Creek Valley to Lot 307.

Australian Creek here is in a low depression in the rolling, jack-pine country; in the valley there are some small meadows, one only of which I would consider of any value, and it would produce but a small quantity of hay. A road leads into the section from Moffat's ranch at Alexandria, midway between Soda Creek and Quesnel, this road giving access to the Cuisson Creek section and numerous lots along the bench.

At Cuisson Creek two lots were subdivided. These lie on a large swampy area, part of which has been reclaimed for hay land. These lots, 8002 and 8003, have been settled for several years. Access is by way of road from either Mile-post 182 or 187 on the Cariboo Road, the former road having been built this year. The Cuisson Creek Valley, while rather inclined to be frosty, has some good soil in addition to the hay meadows, and will be a good dairying and mixed-farming section in the course of time.

Lot 651, surveyed on the west side of the Fraser near Alexandria Ferry, is a good agricultural lot, similar to the land on the Webster and Middleton places adjacent; while it is not hay land, irrigation being necessary for this crop, it is excellent for the production of grain and vegetables, the locality being generally considered as the best for this purpose in the district. This lot is near school and post-office and a good road leads to Alexandria Ferry and also to Quesnel. This locality is free of summer frost; domestic water is obtainable on Lot 651; there is very fair pasture in the locality, and, when conditions take a more favourable turn, every reason to expect that settlers will do well.

From Alexandria I moved to Quesnel Lake, the scene of the Cedar Creek gold discovery. A village has sprung up at the outlet of the lake, the old Golden River Dam, and the post-office at this point is called Likely. A weekly mail service, maintained between Williams Lake and

Keithley Creek, and passing through Likely en route; an auto-stage service and freight-trucks all provide good transportation; the telephone-line from 150-Mile House via Horsefly connects with Likely, and this line is now being diverted so that from Horsefly it will follow Beaver Valley to Beaver Lake; thence follow the main road 24 miles to Likely. In addition to the main road there is a short road via Quesnel Valley to Quesnel, 65 miles distant; a road to Cedar Creek, one to Quesnel Forks, and one to Spanish Lake. Likely is about 65 miles distant from Williams Lake and 20 from Keithley Creek.

The move from Alexandria was made by way of a road which leaves the Cariboo Road at Macalister Station and crosses by the north end of Macleese Lake; thence via Sheridan Creek, Whitestone Lake, and McInnes's ranch on Beedy Creek to Beaver Lake, a distance of 30 miles. As there is considerable settlement in the neighbourhood of this road, it is probable that it will become a much-travelled route in a few years' time; by this road Macalister becomes the nearest point on the railway to Beaver Valley, Likely, or Keithley Creek, the saving in distance being about 10 miles. However, the route does not offer the easy grades or excellent road-bed that one follows between Williams Lake and Beaver Lake. To points north of Soda Creek it is much the shorter route.

The surveys made near Likely consisted of three lots, one embracing an island between the old spillway and Quesnel River, one covering an old pre-emption near the dam, and one being a resurvey of a pre-emption now abandoned, the lake-front at this place having changed considerably as a result of the lowering of the dam. As agricultural ventures these parcels could not be recommended, as Quesnel Lake generally is not replete with farm lands; they are merely home-sites, though Mr. McMahon has a nice garden on his place. From the lake-shore the hills rise abruptly; in areas where fires have never broken out there is a growth of balsam, spruce, hemlock, and cedar; where fires have swept there is a tangle of brulé, a variety of second growth, and, to add zest to the lives of those who travel in such places, some devil's-club ready to grab if one is dubious of his balance.

The first traverse made was along the new Keithley Road, which replaces the old road from Quesnel Forks; this road follows the valley of Coquette Creek through a deep valley with precipitous sides; then skirts the benches of the North Fork of Quesnel River to Spanish Creek, where the North Fork is crossed, the valley being followed to Keithley Creek. One or two cars went to Keithley Creek this year, though the road is only now completed. Along this traverse lots and placer leases were tied in, mile-posts, permanently set, left as points to which future surveys can be tied, and extensions of this traverse made to map Spanish Lake, Spanish Creek, and the mouth of Coquette Creek; the traverse was tied to Lot 218, an old survey on the North Fork, which I had tied in in 1916, from Quesnel Forks, and from which connection is made to Keithley.

At several points along this road there is mining being done and some gold being recovered, though no discovery has been made that has developed into a producing mine. A quartz property is being prospected near the lower end of Coquette Lake and has good enough indications to warrant thorough prospecting.

Along the Spanish Lake and Black Bear Roads several miners are working ground and a fair recovery is being made; in two cases at least the "pay" is said to exceed wages, and there is always the expectation that some really big discovery may be made. Along these roads, which leave the Keithley Road about 2 miles from the dam, there is a heavy forest-growth. Spanish Lake, nearly 5 miles long, lies in a deep valley, its outlet, Spanish Creek, being 7 miles by road from Likely. A big dam has been built at the lake and a start was made on a huge ditch and pipe-line to take the water to the Bullion Mine; two steam-shovels were used to make this ditch, but long before the work was completed the company decided to abandon the project and the shovels are where they were abandoned.

The next traverse made was one to locate the position of Cedar Creek and Cedar or Boswell Lake. This work was near the Cedar Creek Mine, which created such excitement two years ago, and which is a very rich piece of ground and an excellent example of the placer-miner's truism, "Gold is where it ain't." It is a certainty that no experienced prospector would have ever located the "nugget-patch," for there was nothing to even indicate a channel at the point; yet the writer has information from a source that must be considered reliable that the average value per yard on the ground worked was $52, and at the present time it continues as rich as ever. There is some difficulty in working owing to lack of water, and the former bonders got

into difficulties, but the claim is again working. There seems to have been some idea that the Cedar Creek strike was a fiasco among people outside the district; actually it is the richest strike made in the district in a good many years, but no strike of consequence has been made except on the one claim.

On completion of this work I traversed Quesnel Lake to Cariboo Island, connecting with the triangulation of the upper lake; traverse was made of one side only, points on the opposite side being tied in at frequent intervals and permanent marks set. On completion of this work I closed operations; there was some work to be done at Moffat Creek, but, as it was necessary to consult the applicants and they were then haying, I deemed it best to stand the work over till haying was finished.

Fish and game, a few years ago numerous, are scarce in the area in which we worked. Quesnel Lake at the dam was one of the most famous spots in the Province for trout-fishing; now the fish are very scarce. When the dam was standing and the water diverted through the gates and spillway, the eddy below the latter was well stocked with trout, many of great size; probably they would stay there until they made up their minds to essay the hard trip up the fish-ladder and into the lake, and it is not beyond reason to suppose that before essaying the journey they were really hungry and keen to bite anything that came in sight. Now the river flows in the natural channel with no more obstacle than a low drop over portion of the dam; the superstructure, which had pretty well rotted, has been removed and a bridge built on the old foundation of the dam. This change may account for the falling-off in fishing, but in that case it would be reasonable to expect the fish to be numerous up the lake and in the tributary streams; unfortunately this is not the case, and the theory is now advanced that the ova and fry have been destroyed by other fish, especially whitefish, which are now in swarms in the streams.

Of game there is a lessening in fur-bearing animals and grizzly bear; moose, caribou, deer, and black bear continue to increase; grouse of all kinds are more numerous this year than I have ever known them to be in the district. Of the migratory birds there are fewer ducks this year than is usual, but more geese.

The final work of making the surveys near Moffat Creek was done early in October, three parcels, containing 400 acres, being surveyed. These are all dry meadows, containing deep humus, and the settlers are satisfied that they can make good fields of them by cultivation. Certainly the cost will be small for clearing and the soil is good enough to justify optimism. If it is demonstrated that the development of these dry meadows, which lie at an altitude of some 3,000 feet, is justifiable it is going to be of great aid to the district, enabling settlers to be producing something in the second year on their places. I know it is not uncommon to refer to the wild-hay meadows as the curse of the country, yet they do not involve the heart-breaking, unremunerative work of clearing, which comparatively few settlers are able to stand. If it is practicable to develop the dry meadows to timothy and clover fields it is going to rather upset a prevalent idea that ploughing ruins the meadows.

I saw the nicest produce raised in the Moffat Creek Valley at R. Kinvig's place that I have seen in the district. This land must lie at an elevation of 2,600 feet and in a valley notorious for summer frost. The potatoes, beets, cauliflower, peas, oats, and rye would have justified exhibit at the Provincial Fair; the wheat, which was well filled, was rather soft. This was grown in willow bottom. Experiments with crop on the jack-pine land were unsuccessful. Mr. Kinvig states that the potatoes were frozen down three times, but not injured. The method he uses in a frosty locality is to get the eyes sprouted in the light, but under cover, before planting; then, as the sprouts come above the ground, to keep them hilled for some time, the main idea being, I take it, to have the plants thoroughly matured before the nights become frosty regularly. We have been prone to consider agriculture in some of these upland valleys as very limited in its possibilities; the production of such crops as were raised in this case cannot fail to alter that view, and I feel that some measure of instruction to settlers is the great necessity. It does mean that it is necessary to use intelligence in raising crops and to devise means of combating obstacles which the district naturally offers. Some variation may perhaps be necessary in the methods used in the Lower Fraser Valley or on the prairie, and even with the best of instruction and opportunity the personal element making for success or failure in the individual will have its effect too.

A road from Lac la Hache to Horsefly, as the former Harpers Camp is now styled, runs through Moffat Creek Valley; a road also runs from the Halfway House on this road to the 141-Mile House on the Cariboo Road. From Kinvig's, 8 miles from Harpers Camp, a road has been built this year direct to the Horsefly–Williams Lake Road. Two of the meadows surveyed lie west of McIntosh Lake and a road extends about 8 miles westerly from the lake. These meadows are actually about 15 miles from the 150-Mile House, and roads from the 150- and 144-Mile Houses come within a few miles. If settlers decide to take up these dry meadows, of which there are many more surveyed and unsurveyed in the townships and their vicinity, this would be the route for access instead of via Horsefly.

While the past season has not been a good one for the farmer on account of the continued low prices for cattle and produce, it has been almost ideal for crop production, haying, and harvesting, and, the ranges being in excellent condition, the cattle, the big item of export from the district, have weighed considerably in excess of the average.

Almost the only means of marketing farm produce is through the firm of Smedley & Sharpe, who have built a warehouse at Williams Lake, with the idea of buying from the settlers the crops and shipping by car-load to Coast markets. However, prices on the outside being far from high, the price available to the producer is decidedly low, and the year's produce on the smaller farms leaves no margin of profit.

At Quesnel, where a creamery is in operation handling cream from over the district, the shippers have a regular cheque, but low prices on butter also prevent much being earned in the dairy industry.

Some car-load lots of sheep and hogs have been shipped during the past two seasons.

During the time I was in the field we had, strange to say, considerable rain, though the work was not interfered with to any extent. At Quesnel and Alexandria there were heavy thunder-showers in July; at Likely it rained nearly every day in August.

I have, etc.,

RUPERT W. HAGGEN, D.L.S., B.C.L.S.

RANGES 2 AND 3, COAST DISTRICT.

BY W. MERSTON.

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

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

SIR,—In accordance with your instructions, I left Victoria on May 31st and proceeded by Pacific Great Eastern Railway to my point of organization at Williams Lake. My work this season consisted in the survey of new lots for settlers and subdividing old surveys, thus giving settlers their boundary-lines.

In addition to the land-survey work, I ran a triangulation tie-line from Anahim Peak to the 124th meridian. This triangulation, in conjunction with Mr. Bishop's work this season, forms a valuable tie from the Coast in the neighbourhood of Bella Coola to the 124th meridian, besides allowing of the accurate mapping of the watersheds of part of the Upper Blackwater and Dean Rivers.

From Williams Lake I travelled by motor-stage to Tatla Lake, where I met my horses and supplies and commenced my season's operations.

THE CHILCOTIN WAGON-ROAD.

From the 150-Mile House on the main Cariboo Road a branch road runs west through Williams Lake to Anahim Lake. This road follows the Bella Coola telegraph-line and is the main artery of the Chilcotin country. Between the 150-Mile House and Redstone Post-office, where the road leaves the Chilcotin Valley, the country is comparatively thickly settled. Good general stores and stopping-houses are dotted along the road at intervals of 10 and 15 miles. A weekly motor-stage handles all the passenger transportation, while numerous motor-trucks operated by some of the local storekeepers and by Tommy Hodgson, the mail-carrier, handle all the freight going into the Chilcotin and Chezacut countries.

From Redstone to Anahim Lake the country is not so settled. Thirty miles beyond Stuart's store and post-office at Redstone is Chilanko Forks store, and again 35 miles from there is Tatla Lake Post-office, the last mail-delivery point served from Williams Lake. A weekly mail service is operated between Williams Lake and Redstone and a monthly service from Redstone to Tatla Lake.

The country between these post-offices is of little use for agriculture and there are no settlers. A few open patches are used by cattle for grazing, but for the most part the land is rocky and covered with small jack-pine. From Chilanko Forks branch roads run north to Indian hay meadows around Puntzi Lake and Palmer Creek.

Five miles east of Tatla Lake a road runs south to Tatlayoko Lake. At Tatla Lake there is a large cattle-ranch owned by Bob Graham. He owns all the best land in this vicinity and runs several hundred head of cattle. I surveyed a small piece of land here for an American named Bryant, who is putting up a store, stopping-house, and school. It is expected that the latter will be opened this winter. This will be the only school within a radius of 150 miles. which gives some idea of the scattered nature of the population in this part of the country. From Bob Graham's a wagon-road runs south to the valley of the West Fork of the Homathko River.

Travelling beyond Tatla Lake it is advisable to leave your motor-car behind and to take to horse transportation. Although motor-cars have been as far as Towdestan, they have always had to be hauled back by horses, partly owing to the rocky nature of the road and partly owing to some of the settlers constructing irrigation-ditches across the highway.

Nine miles beyond Bob Graham's lives Pat McLinchy, an old-timer in the country, who runs 200 or 300 head of cattle. Twelve miles beyond him again is Frank Render, who has been busy during the past two years getting water on to a large flat, completing his ditch this year and succeeding in irrigating about 400 acres of good hay land. Besides hay he grows vegetables, potatoes, and oats, which ripen about September. This is the most westerly point drawing supplies from Williams Lake, all the inhabitants to the west getting their necessities from Bella Coola.

About 30 miles from Frank Render's is the next settler, George Powers, who has bought the old Ingelbritchen Ranch at Towdestan. Between Towdestan and the Bella Coola Valley there is only one white settler, a Norwegian named Schilling, who owns about 500 acres in the Dean River Valley and runs a few head of cattle and horses.

TATLAYOKO LAKE.

Five miles east of Tatla Lake Post-office a wagon-road branches south and winds for a distance of approximately 30 miles to Tatlayoko Lake. Running into the northern end of Tatlayoko Lake is the Homathko River, which forms a valley lying about 400 feet below the level of the surrounding country. The bottom of the valley is approximately half a mile wide and in places is filled by shallow lakes. The soil is fertile and settlers grow potatoes, vegetables, and small fruit.

One of the settlers, Ken Moore, has started a dairy-farm and sells his butter locally to his neighbours and to the local store. On my first visit to this neighbourhood in June there were only two families of settlers at home; on my return in September four new families with wives and children had come in to take up land and earn their living off the soil. Two of these families came from the United States and two from Alberta.

My work in this valley covered a pre-emption at the north end of Tatlayoko Lake and subdividing existing surveys in the valley of the Homathko. In this valley there are still six or seven pieces of land, which, if surveyed, could be taken up for pre-emption.

Tatlayoko Lake lies at an elevation of approximately 2,700 feet and is a beautiful sheet of clear water, with mountains rising sheer from its edge to a height of 8,000 feet. There are no fish in the lake and for some unknown reason it does not freeze in the winter. From a scenic and hunting point of view it cannot be beaten. Signs of goats, deer, ad bear were seen daily.

WEST BRANCH OF HOMATHKO RIVER (MOSLEY CREEK).

On completing my work at Tatlayoko I moved back to Tatla Lake Post-office and then south by wagon-road for 14 miles, along a road which ends at the northern end of Bluff Lake. Here I found a family named Holt, lately arrived from the United States, squatting on a piece of land

which they wish to pre-empt. After surveying a pre-emption for them I continued by pack-horse to the south end of Middle Lake, where I surveyed the pre-emption taken up before the war by Newton Irwin.

The valley of the South Fork of the Homathko will never be of much use from an agricultural point of view. There are a few small wild-hay meadows scattered along the bottom and in a few places the land might be cleared to grow vegetables, but there is not sufficient good land to afford support to a settlement.

The valley, with its steep sides and swampy bottom land growing scattered clumps of fir and spruce, is an excellent country for trapping and some thousands of dollars' worth of skins are taken out each year.

The only settler in the valley below Bluff Lake at present is a French-Canadian named Vallou, who has built cabins at intervals down the valley and runs about 120 miles of trap-line through the country. One of the great drawbacks to this valley is that it is only passable by pack-horses during the months of September and October. Large creeks from the snow-mountains make horse-travel impossible at other times. On my way back to Tatla Lake I was met by another would-be settler named Perjue, who was squatting on a piece of land at the south end of Bluff Lake which he wished to take up for pre-emption. I surveyed 160 acres for him as Lot 1347.

KLINAKLINI VALLEY.

From Tatla Lake I continued west along the wagon-road to Frank Render's (Lot 559). Here an old pack-trail runs south for a distance of about 20 miles to a group of iron claims located in the basin of a mountain called Perkins Peak. This is one of the highest mountains in the Coast Range and rises to an elevation of about 9,500 feet. On the summit I erected a monument which will be visible from a distance of 50 miles and will form in the future a valuable triangulation point for connecting triangulations in the Taseko country. I tied in this peak to my traverse from the mineral claims to Frank Render's (Lot 559).

There is no agricultural land in this vicinity. The country is rocky and covered with small jack-pine; in places it has been burned over, leaving a rocky surface.

Another trail runs through Frank Render's, down the Klinaklini River. I followed this trail for a distance of about 25 miles to a pre-emption taken up by George Turner.

The valley-bottom varies from a quarter to half a mile in width and is covered with a dense growth of willow. The Klinaklini River, some 2 chains wide, winds in all directions through this bottom land, so cutting it up that it is not worth while spending money clearing this portion of the valley for agricultural purposes.

The only settler here is George Turner, who has cleared about 10 acres of land and grows vegetables, potatoes, and a small quantity of hay for his own use. He makes a living trapping up and down the valley and has successfully kept his trap-line free from Indians and other white men.

At various times settlers have taken up pieces of land along the Klinaklini River, but were unable to make a living and left the country.

DEAN RIVER VALLEY.

From the Klinaklini I continued to the Dean River Valley. The Dean River rises out of Chantsler Lake and is fed by waters coming from the Itcha Mountains on the north and from lakes and swamps on the south.

At Towdestan the Chilcotin Wagon-road first crosses the river. Here it is a sluggish narrow stream running between low-lying banks over a muddy bottom. It is fordable in many places until it emerges from Abuntlet Lake, when it deepens and is only fordable at low water.

The Dean River winds through a wide low-lying valley chiefly covered with small jack-pine and dotted with many wild-hay meadows. These have all been surveyed into sections and were at one time taken up by the Pembertons for a large cattle-ranch. They have now reverted to the Government and are available for settlers. Altogether 2,000 or 3,000 acres of vacant wild-hay lands were seen in this valley and there is room for 2,000 or 3,000 head of cattle.

The Indians in this part of the country are cutting hay and feeding their cattle on Government land and are raising sheep and horses very successfully.

They are much more civilized than any Indians I have ever seen in the Province. Squinus, the Chief, has a good house on a small hill overlooking Anahim Lake. On entering the house

I was surprised to find it spotlessly clean. A telephone was hanging on the wall and arranged around the sitting-room were a large gramophone, a sewing-machine, and an up-to-date washing-machine. The younger members of the family all slept in beds, but Squinus himself (although he has a bed which he proudly shows to all visitors) prefers sleeping on the board floor after the custom of his forefathers.

On Abuntlet Lake, a few miles down from Anahim Lake, there lives a well-known Indian called Capoose. The mosquitoes in this valley are very bad during June, July, and August. I asked Capoose if the Indians ever got accustomed to them, and he said no; they were inflicted upon them by the Great Spirit for their early sins and so he would never kill a mosquito for fear of angering the gods. On further questioning, Capoose explained that years ago the early tribes were in the habit of eating one another. This angered the Great Spirit, until finally, after many warnings, he descended to Anahim Lake. He called a big potlatch and there slew the worst of the man-eaters. He built a large fire and burned the victims to fine ashes; then, taking handful after handful on the palms of his hands, he blew them all away into the air, saying, "Now you go be mosquito and eat man for ever."

ITCHA MOUNTAINS.

While my party was completing the surveys on the Dean River I made a trip into the Itcha Mountains to locate points for a triangulation survey between Anahim Peak in the valley of the Dean and Mount Palmer on the 124th meridian. Mr. Bishop was at the time linking Anahim Peak with the geodetic triangles on the Coast, thus giving a tie from salt water, in the neighbourhood of Bella Coola, to the 124th meridian north of the 52nd parallel, a distance of approximately 200 miles.

After completing the ties on the Dean River the party moved into the Itcha, or, as they are locally called, the Atchi Mountains. Just above timber-line, which here is in the neighbourhood of 6,000 feet, a suitable place was found for a base, half a mile in length. The broken nature of the country made a short base with good extension angles preferable to a larger one.

The chaining was done with two 500-link tapes and the mean of three measurements with each tape taken. This distance was then turned into feet and corrected for slope and altitude above sea-level.

The peaks used as trigonometrical points were all monumented, usually with rock cairns standing about 6 feet high, but where timber was available a tripod of three trees lashed together was fitted with a brush top about 15 feet from the ground. Enough space was left under the tripod to set up a transit. All the monuments were visible against the sky-line for a distance of 30 miles.

A plane table 30 by 24 inches with telescopic alidade proved very successful for quickly and accurately mapping the country. It was used in conjunction with a transit and was found well worth the extra trouble of getting to the top of the mountains.

The Atchi Mountains are a low-lying range of hills rising steeply, timber-covered from the north and south to an open plateau. This plateau lies at an elevation of 5,500 feet and is about 25 miles long and 10 miles wide. It is broken up by numerous small streams lying in shallow depressions, along the bottom sides of which grow grass and a great variety of alpine flowers.

Cattle and horses could range this country from July to November, but at present it is little used, except by Indians hunting caribou and deer.

From the ends of this plateau rise two groups of multicoloured and quaintly shaped peaks. The westerly group rises to a height of 8,100 feet and is named the Ilgatch Mountains; both groups are so closely allied that they are usually spoken of as the Atchi Mountains.

MINING.

Many prospectors were met during the summer and several new mineral-claim locations were seen. One prospector was seen staking lake-bottoms, and some open flats which had previously been lake-bottoms, for ichthyol. I believe the only ichthyol found is in Austria, and should he be successful in his experiments there should be plenty of scope in this direction for other prospectors.

A few miles south of Tatlayoko Lake a couple of men were working on some gold-quartz claims. They had driven a tunnel about 200 feet into the mountain-side and seemed hopeful of finding ore in paying quantities.

Down the West Branch of the Homathko River three mineral claims were staked this summer for gold, and in September two or three Indians went down the valley to stake a gold ledge that they claimed to have discovered.

A mining boom would help this part of the country tremendously, as it would give the local settlers a chance to market their produce.

GAME.

Grouse were not so plentiful this year as in the previous year. This I attributed to the bush fires last year, which destroyed so many of the nests. On the Atchi Mountain Plateau I saw hundreds of ptarmigan, which formed a welcome addition to our food-supply. Deer were very plentiful, especially around Tatlayoko Lake, where we saw two or three every day. There are still caribou left on the Atchi Mountains and on my first week up there I saw four. In September I saw many signs of moose, but we did not actually see any this season. They are working south, and last winter one was shot walking on the Cariboo Road near the 150-Mile House.

With the exception of the Dean River, the fishing was very poor, but the few days we were on the Dean made up for the scarcity of fish in other waters.

I have, etc.,

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

CENTRAL LILLOOET DISTRICT.

BY G. M. DOWNTON.

LILLOOET, B.C., December 2nd, 1923.

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

SIR,—I have the honour to submit herewith the following report on the areas in the Lillooet District in which I have carried out surveys this year:—

These areas were scattered, but, generally speaking, lie east and west across what may be termed the Central Lillooet District. Describing them briefly from east to west, they are as follows: Gang Ranch area, lying on the west side of the Fraser River between Churn Creek and the Chilcotin River; Dog Creek area, lying on the east side of the Fraser River and drained mainly by Dog Creek or tributary streams; Green Timber Plateau, lying north of the town of Clinton and between the Marble Mountains and the Cariboo Road; Lac la Hache area, lying south-east of Lac la Hache and east and west of the Cariboo Road; Crystal Lake area, lying about 36 miles due east of the 70-Mile House on the Cariboo Road; and, lastly, some small areas on the east side of the Fraser River in the vicinity of High Bar and Canoe Creek.

My point of organization was Lillooet, and my work consisted throughout the season, with a few exceptions, of tie-work for mapping purposes, although later in the season several isolated surveys of Crown land required for lease or pre-emption materialized.

This work entailed a large amount of travelling, and as all of it lay in well-settled country, with fairly good roads, I was able to use my Ford car to great advantage.

I was assisted in this work by Major D. M. McKay, O.B.E., and instead of organizing a regular survey party, made my headquarters at the nearest ranch-house and hired local help where I found it necessary. I found this method possible owing to the fact that I could get my car right on to most of the work, and it avoided considerable loss of time in travelling, moving camp, and getting in supplies.

I left Lillooet on May 28th and proceeded to the Gang Ranch area, where I carried out operations until June 19th.

GANG RANCH AREA.

This area lies on the southern fringe of the open cattle-ranges of the Chilcotin and deserves as detailed a description as space will allow.

The most noticeable feature of this area is the comparatively wide stretch of open or semi-open grassy uplands which border the Fraser River and the streams flowing into it from the west in this locality. All of this open country is covered with a growth of bunch-grass and wormwood and is dotted over with isolated clumps of Douglas fir and aspen poplar.

As the elevation above the rivers and streams increases the timber becomes thicker and the low rounded summits of the hills are covered with a uniform and fairly dense growth of stunted Douglas fir, and natural pasture-grounds for cattle in different seasons of the year are formed by the aspect of the ground and the protection of the timber.

Thus an area lying along the south side of the Chilcotin River, and having a northerly aspect and more timber, holds the snow longer in spring and provides a good summer range, with springs and natural streams, while the open slopes on the north side get all the winter sun available, protection from north winds, and an immunity from snow which makes it an admirable area for wintering stock.

This is only an instance of the varied nature of this natural home for stock where almost every valley presents like advantages. This area is, in fact, a stock-raising one of great value, and this value is greatly enhanced by the fact that large quantities of water are available for irrigation on the lower levels.

The "Gang Ranch" is a general term for the holdings of the Western Canadian Ranching Company, which controls, I understand, about 50,000 acres of land in this and adjoining areas. The home buildings and cultivated lands lie on an elevated open bench about 1,000 feet above the Fraser River on the west side at an elevation of about 2,200 feet above sea-level, and large crops of alfalfa are raised here and two crops cut yearly.

For the past five years persistent drought has played havoc with the ranges, and in many places, especially along the Fraser River, the bunch-grass has been almost entirely killed out, but the generous rains of the past spring have transformed the appearance of the country to an almost unbelievable extent, and the bare brown hills, which for several seasons have been the despair of cattlemen, presented in June of this year a beautifully green appearance, and another moist season or two will give the bunch-grass a chance to reseed and the ranges to recover.

The improvement of the range this year has been reflected in the condition of the stock, and the hay-crops this year throughout the area have benefited to a like extent and the yield has been the heaviest for many years.

Had the past year been as dry as previous ones, it appears likely that a number of stockmen would have faced disaster, and even now the persistently low price offered to the producer for his beef has created a situation in this district which is most discouraging.

Reports on this area have from time to time spoken of this locality as an ideal one for sheep-raising, and while not wishing to say anything to discourage the raising of sheep as a profitable enterprise, I cannot concur in this optimistic opinion; one of my reasons being that the pasture on the ranges is very thin and easily killed out, and there is no sod whatever, being entirely different from areas such as parts of Texas, where the sod defies the possibility of trampling the pasture out of existence; and I consider that settlers would be wise to think very carefully before embarking on sheep-raising or discarding cattle to raise sheep in an area which has been described as one of the finest cattle-raising areas in the world.

On June 19th I completed my work in the Gang Ranch area and proceeded across the Fraser River to the Dog Creek area, which lies opposite the Gang Ranch on the east side of the river.

DOG CREEK AREA.

This area is similar to the Gang Ranch area, but the open lands available for range lie at a higher altitude and there are not the same natural advantages of summer and winter range, and the country generally is more heavily timbered.

Dog Creek itself lies in a very narrow valley with precipitous sides, so like many of the stream-valleys in their nearer approach to the Fraser River, indicative of the transformation which has gradually taken place in the valley of the Fraser itself, which in the course of ages has worn its way deeper and deeper into its bed and left evidence of its former level in the form of flat benches and wide gravel-bars now above the present river-level and at varying elevations.

Tributary streams have in like manner cut their way down through the varying material composing the valley-sides and reach the present level of the main river either through deep and, in some places, gloomy ravines, or, where the strata have been too hard for erosion, by plunging in cascades down the valley-sides from the high plateau above.

Dog Creek may fairly be said to preserve a mean between these extremes and only at its near approach plunges abruptly a short distance to the Fraser River.

Several ranches occupy the narrow valley, the cultivated land on which lies along the creek, and its waters are utilized to irrigate the crops of alfalfa, clover, and timothy which are raised here for winter feeding to the cattle, which range during the summer on the open uplands to the north of the valley.

Practically no land suitable for settlement now remains unsurveyed along the creek, and the area in general is unsuitable for anything but stock-raising, although garden produce for local needs can be raised successfully along the last 6 or 7 miles, where the gradually lowering altitude of the creek renders the climate suitable.

Some years ago Dog Creek Post-office and store, situated about 3 miles up the creek from the Fraser, was a local centre of some importance, but changes in transportation routes and other circumstances have diverted traffic.

The bulk of my work this year lay about 12 miles up Dog Creek from the mouth, at a point where the creek first commences to cut its way down through the surrounding plateau and where the sides of the valley slope gently back from the stream and leave fairly wide stretches of meadow land along the stream.

At this point is situated a ranch owned by Mrs. Menier, the natural advantages in the situation of which render it an ideal spot for raising cattle. Good summer range is plentiful and the meadows along the creek are easily flooded by low dams and produce large quantities of hay.

The altitude of this point is about 3,000 feet above sea-level, and some idea of the fall of the creek from this point to the Fraser River can be gained when it is realized that the altitude of the Fraser at the mouth of Dog Creek, only 12 miles distant, is only 1,300 feet.

A large amount of tie-work and the survey of some five pieces of Crown land kept me in this vicinity from June 19th to July 23rd, during which time I was able to make my headquarters at Mrs. Menier's ranch and drive to and from the work.

The whole of this area is suitable only for stock-raising. It is too far from the railway to be profitable at present for dairying, and only those settlers who are able to include within their holdings meadows of a large enough area to provide them with sufficient hay for their cattle can hope for any measure of success, and such meadows only exist on Dog Creek and some small tributary streams, and are in most cases taken up.

The winters are generally long and in this locality cattle have to be fed for about four months.

On July 23rd I moved south to survey a pre-emption at Big Bar Lake and a lease at Magnesia Lake, both of which are situated west of the road from Clinton to Meadow Lake, on what is called the "Green Timber Plateau."

GREEN TIMBER PLATEAU.

This plateau lies at the foot of the eastern slope of the Marble Mountains at an elevation of about 3,600 feet above sea-level, and is dotted over with small lakes, many of which are saline. The only agricultural industries possible here are cattle-raising and dairying.

There are tracts of open grassy land scattered throughout the area which derive their moisture from the winter snowfall and which provide a fair amount of summer range, and it is worthy of note that this open grassy land is covered by quite a thick grass sod in marked contrast to the open bunch-grass ranges of the Chilcotin.

Most of the area is covered with a scrubby growth of jack-pine, and wherever this occurs the nature of the grass changes, and a thick matted growth of pine-grass unsuitable for pasture is found growing in the timber. This grass is of a much lighter colour than that found growing in the open, this being probably due to lack of sunlight, and is bitter except in the fall, when the frost has touched it.

Much of this area is strewn with boulders, some of which are very large and all are ice-worn, and all this area appears to be covered with the debris of some ancient glacial moraine.

The soil, which is of a light sandy loam, is mostly very shallow, and underlying much of the area is a layer of clay containing a large percentage of magnesite.

At one place near Meadow Lake is a deposit of carbonate of soda which is being mined successfully. I am told that this deposit is over 99 per cent. pure and that there are several

deposits of a like nature in the neighbourhood. The deposit above mentioned is conveyed to Chasm Station, on the Pacific Great Eastern Railway, by auto-truck and thence shipped to the Coast.

The southern portion of this plateau is watered by 57- and 59-Mile Creeks, which have their rise in the Marble Mountains, and the numerous lakes in this vicinity have been utilized as storage-reservoirs for the spring freshets, and thus a large quantity of water is conserved for use later in the summer.

On leaving Magnesia Lake on August 1st I proceeded to Canoe Creek to carry out an investigation of the position of certain surveys on the east side of the Fraser River between Canoe Creek and the Indian reserve opposite the mouth of Churn Creek.

FRASER RIVER IN THE VICINITY OF CANOE CREEK.

This area is of interest as being one of the few areas in this part of the country where stock can range all winter without extra feeding, and is of great value for this reason. This applies to the land both north and south of Canoe Creek and as far south as Big Bar, and comprises a strip of about 20 miles long and 1½ miles wide lying along the east bank of the Fraser River.

A description of that part of it which lies north of the mouth of Canoe Creek is practically descriptive of the whole area, and this is the portion in which my work lay.

It is bounded on the east by a vertical precipice about 300 feet high of basaltic formation, which renders fencing along this side unnecessary, and is bounded on the west by the Fraser River. The whole area is practically treeless and has a steep slope to the river, facing west or south-west. Only near the river does this slope flatten out into a most remarkable series of benches, which but for the absence of water would form an area of enormous productivity. Three springs about a mile apart rise at the foot of the precipice, but only in one case does this water reach the benches, the others being absorbed by seepage higher up the slope.

The benches are intersected by numerous deep ravines worn by spring freshets and occasional cloud-bursts. The snow hardly ever lies here in winter, and there is shelter for stock in the numerous ravines, even though the whole area is protected from the cold north-east winds which sweep down the valley of the Fraser at times during the winter.

A section cut through the bench by any of the ravines shows about a foot or more of soil composed of a very fine river-silt almost of the consistency of flour, and underlying this is gravel such as is found on any river-bed, and it would appear that these benches at one time formed the bed of the river and are now left high and dry by the cutting action of the ceaseless torrent.

All this area is covered with bunch-grass and wormwood and is singularly free from sage-brush, owing probably to the fact that it is just at too high an altitude for this plant to thrive, since farther south along the Fraser similar benches are covered with a dense growth of sage-brush which effectually prevents any other vegetation growing. The altitude of these benches averages 2,100 feet above sea-level.

This particular area is controlled by the British Columbia Cattle Company, which has a fine ranch on Canoe Creek, about 3 miles from the mouth, managed by L. C. Hannon.

From this point I proceeded to Big Bar Creek, farther south along the east bank of the Fraser River, and surveyed a small area of Crown land on which the new community hall has recently been built. This is a fairly well-settled piece of country and includes Big Bar Mountain, where, as the result of the unusually moist season, the settlers this year had some really good crops of grain.

From here I proceeded on August 13th to the vicinity of Lac la Hache.

LAC LA HACHE AREA.

This area lies about 20 miles east of the Menier Ranch at Dog Creek, but only a trail gives communication in this direction, as the intervening country is very rough, heavily timbered, and only partially explored.

That part of the Lac la Hache area in which I worked this season extends from the south end of Lac la Hache to the point where the Cariboo Road, descending from the 93-Mile Creek Plateau, enters the valley of Bridge Creek near the 100-Mile House.

The impression gained by the traveller along the Cariboo Road on entering this area from the south is a pleasing one, as the long stretches of the road from Clinton are flanked by apparently interminable forests of jack-pine, among which the only relief to the eye is provided by small vistas of swamp meadows which appear here and there along the route, and the change on entering the valley of Bridge Creek is a marked one.

Just before reaching the valley the jack-pine gives way to the more stately woods of Douglas fir, and as the road winds down off the plateau glimpses of aspen poplar and open pasture land give a refreshing feeling of entering a more fertile country.

The elevation of the valley lands in this area average from 3,000 feet above sea-level at the 100-Mile House to 2,800 feet at Lac la Hache, and include the valley of Little Bridge Creek, which joins Bridge Creek at the 100-Mile House, and the valley of 111-Mile Creek and all its tributary streams.

The Bridge Creek watershed is divided from the 111-Mile Creek watershed by a low ridge of fir-clad hills, but the general characteristics of one apply equally to the other.

The valleys in this vicinity are open or semi-open and contain several good lakes, notably Watson Lake and 108-Mile Lake on the watershed of Watson Creek, a tributary of 111-Mile Creek. The soil is a clay loam and is very productive; small clumps of aspen poplar occur in the valley lands, and the low hills which divide the valleys are everywhere crowned with a thick but stunted growth of Douglas fir.

This area is essentially a stock-raising one, but it is also one where mixed farming and dairying can be carried on successfully. Large crops of oats were raised here this year without irrigation and the hay-crops were unusually heavy.

This area is traversed by the Pacific Great Eastern Railway, with stations at Exeter, Tatton, and Lac la Hache. There is a post-office and well-equipped store, recently built, at the 100-Mile House and a post-office and store at Lac la Hache. The Cariboo Road also traverses the area, with several branch roads to outlying points.

I was in this area on and off from August 13th to November 4th, making correction surveys and surveying leases, and during this time made three expeditions out of the area, one of which was to Spring Lake on the 111-Mile Creek watershed, some 10 miles east of the south end of Lac la Hache; another was to Crystal Lake, which is reached from the 100-Mile House by way of Horse Lake and Roe Lake; and the third was to the 93-Mile Creek on the Cariboo Road.

Spring Lake.

The area I surveyed at Spring Lake is situated at about 3,000 feet above sea-level, and the owner of the ranch at which I stayed while doing this work, J. B. F. Nogues, had a splendid truck-garden where he was growing all the ordinary kinds of vegetables and where he had a fine crop of potatoes. It appears that his situation on the north side of Spring Lake favoured his operations, but this settler was warm in his praises of the soil, which appeared to be a heavy clay loam, and his ranch promises to be a good one when his road communication is better, a matter which is now being attended to.

Crystal Lake.

The Crystal Lake area, to which I only paid a flying visit this year, is a good dairying one, but with the disadvantage at present of not having good road connection with the railway; but the roads which are now being built towards this section will do much towards attracting settlers to an area which, from the point of view of soil and climate, is unique in this part of the country as being one where the rainfall is sufficient to raise crops without irrigation. Even now a certain amount of cream is shipped out of this area to Vancouver via Lone Butte Station, on the Pacific Great Eastern Railway, and if this can be profitable it goes to show that when conditions warrant the establishment of a creamery in the immediate area dairying will probably become the main industry.

93-Mile Creek.

The area in the vicinity of 93-Mile Creek deserves more notice than it has had hitherto. There are in this area within a short distance of the Cariboo Road large stretches of wild-hay meadows, some of which are now being taken up, and it is only a matter of time before a large area of the country lying east and west of the Cariboo Road between the 83- and 100-Mile Houses will be applied for.

This area is situated on an elevated plateau averaging about 3,600 feet above sea-level. It is covered with a dense growth of jack-pine, but there are large areas of wild-hay land lying in patches among the jack-pine, not easily found and only visited by riders scouring the country in search of strayed cattle.

A report on the Lac la Hache area would not be complete without mention of the excellent work which is now being done here in road-building by the Public Works Engineer, Major Lowe. The road from Exeter Station to Forest Grove has been converted into a good automobile-road and is being carried on towards Canim Lake; another fine road is being constructed from Lone Butte Station along the south side of Horse Lake, and settlers' needs and requirements are being sympathetically studied and met as far as is at all possible.

The improved services on the Pacific Great Eastern Railway are appreciated throughout the district, and the service now given on the railway, both as regards comfort in the way of sleeping accommodation and courteous service, as well as the very marked increase of reliability in the schedule, compares favourably with any branch-line service in the country.

HIGH BAR.

On November 5th I moved to the High Bar area, situated north of Lough Raymond Station, on the Pacific Great Eastern Railway, and made a tie for mapping purposes from Lot 26, Lillooet District, situated on the east bank of the Fraser River at High Bar, to Lot 4415, Lillooet District, situated on the mail route from Clinton to Jesmond.

Of the country traversed by the tie no particular mention need be made, as it is very mountainous and of no agricultural value; but mention may be made here of the Pollard Ranch at High Bar, of which Lot 26 forms a part. On this ranch, which is situated at an altitude of about 1,900 feet above sea-level on a bench 600 feet above the Fraser River, Charles Pollard raises alfalfa for seed; he also has a small orchard where he produces splendid apples. He suffers, however, from the fact that every pound of produce he raises has to be hauled over a mountain road which climbs from his ranch 2,500 feet to the top of the mountain in a series of switchbacks to connect with the main Clinton–Jesmond Road 8 miles north of Kelly Lake.

I completed my work here on November 14th and went north again to Canoe Creek to make some additions to the work done here earlier in the season. I completed this on November 21st and returned to Lillooet the following day.

GAME.

The area covered this year is not particularly abundant in game, but the increase of grouse throughout the district this year calls for comment, and is due, I believe, in a great measure to the bounty on owls and hawks, which has proved beneficial and should, in my opinion, be continued.

Deer are fairly plentiful and moose have been encountered in increasing numbers this year on Little Bridge Creek.

I have, etc.,
G. M. DOWNTON, B.C.L.S.

KAMLOOPS DISTRICT.

BY O. B. N. WILKIE.

VICTORIA, B.C., December 17th, 1923.

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

SIR,—Your instructions to perform certain surveys in the Kamloops District—namely, at Missezula Lake near Aspen Grove, in the North Thompson Valley near McMurphy, in the Otter Creek Valley near Wire Cache, some isolated surveys and tie-lines in the Upper Adams River Valley and in the vicinity of Momich and Humamilt Lakes, and the triangulation of Adams Lake—having now been completed, I have the honour to submit the report and description of the country covered.

MISSEZULA LAKE.

After organizing a small party at Merritt I moved the outfit by wagon-road some 40 miles to Shrimpton (or Price) Creek, where some tie-lines were measured and a parcel of land laid

out for settlement. The country in this vicinity is of a high elevation, being about 4,000 feet above sea-level, and, except for some wild-hay meadows adjacent to Price Creek, consists chiefly of timbered mountain pastures somewhat broken by rock bluffs and gorges.

From here we moved by wagon over a very rough road past Loon Lake to a camp on Price Creek situate about 1½ miles from Missezula Lake, into which Price Creek empties. The valley of Price (or Shrimpton) Creek at this point is nearly a quarter of a mile wide, with a dense growth of willow, poplar, and alder. Improvements have been made by the settlers and some good hay and small fruits were noticed. After completing our work here we moved to Missezula Lake by pack-horse and raft at Mr. Dillard's farm at the foot of the lake. There is a crude trail which follows down the east side of the lake, continuing down Sommers Creek some 7 miles to the Princeton Wagon-road, but as Mr. Dillard considered this trail too rough for pack-horses a raft had to be constructed to convey the outfit down the lake.

Missezula Lake (elevation 3,300 feet) is a deep lake about 3½ miles long and averages from a quarter to half a mile in width. The adjacent country, except at the ends, consists chiefly of steep mountain-side with rock bluffs and is covered with a thick growth of fir, pine, poplar, and willow; the east side is more open than the west, with some pasture land in places. At the south end considerable improvements have been made and a large area is under cultivation. The land is usually irrigated and seems to grow very good crops of hay, grain, potatoes, cabbage, small fruits, and alfalfa (two crops). The Government is now building a road up Sommers Creek to the lake, which will be a great benefit to the settlers. Some good fishing is to be had at certain seasons.

In general the country mentioned—namely, Price Creek, Loon Lake, and north end of Missezula Lake—except for the bottom areas, is best adapted for pasture land.

After completing a triangulation of Missezula Lake and some adjoining tie-lines we moved to Quilchena, on Nicola Lake, and from there on to McMurphy, in the North Thompson Valley.

At Quilchena some further ties were made. The country has been settled from an early date, being owned by large cattle-ranchers, and is principally open bunch-grass ranges typical of the Dry Belt.

McMURPHY, NORTH THOMPSON VALLEY.

McMurphy (elevation 1,900 feet) is a station on the Canadian National Railway about 100 miles up the North Thompson River from Kamloops, to which town it is also connected by road.

The land around this vicinity is mainly sandy clay benches, with a fairly heavy growth of fir, cedar, hemlock, poplar, willow, and alder. The climate is more humid than in the Dry Belt, although crops will do better with light irrigation. There are already a fair number of settlers in the neighbourhood, who have made considerable improvements considering that the land is not very easy to clear.

A wire suspension bridge (foot) gives the settlers on the north side of the river access to the railway-station on the south side.

Our work at McMurphy consisted of subdividing an expired timber licence into four parcels for settlement, and after completing this we proceeded 5 miles up the valley to Otter Creek through country, the mountain-sides of which have been burnt over, exposing the stones and boulders.

OTTER CREEK.

A tie-line was run from the North Thompson surveys over the intervening mountains, by way of the Otter Creek Valley, to the surveys in the Adams River Valley.

In this work we were materially assisted by a trail which starts from the south side of the Canadian National Railway bridge (at Mile 32) crossing the North Thompson River, and climbs over a ridge nearly 2,000 feet high and drops down to the valley of Otter Creek. This valley is about a quarter of a mile wide, sloping gently another quarter of a mile to the steeper mountain-sides. The north slope for some 6 miles has been burnt over, while the bottom of the valley and the south slope have a good growth of large fir, cedar, and spruce. The soil in the bottom is a black loam with a gravelly subsoil; several streams flow into Otter Creek from both sides. About 6 miles from the North Thompson the trail ascends through cedar, fir, hemlock, and balsam to the summit between the Adams and North Thompson Valleys, attaining an altitude of about 4,500 feet, although the real summit of the pass is about 600 feet below. The country is hard to get through on account of windfalls, devil's-club, snow-brush, and huckleberry-bushes,

the latter berries growing very profusely. The summit is approximately 9 miles from the North Thompson and 4 miles from the Adams River Valley. The trail follows down the west slope of Adams River Valley through many windfalls. The timber is principally balsam, spruce, and cedar, fire-killed in patches, until within a mile or so of Adams River, where the mountain-side is burnt clean. The trail as well as our tie-line joins the Adams River Road about 20 miles north from Adams Lake.

ADAMS RIVER VALLEY.

The road mentioned above is an old tote-road built and used to convey supplies over to the various lumber camps along the river. It commences at the head of the lake, crossing from the east to the west side of the river about 2 miles up, and continues for another 34 miles up the valley. The first 20 miles have been kept clear for wheel traffic by the Forest Branch, but the remainder is little more than a trail.

Adams River is a stream of considerable size, averaging 200 feet or more in width and having a volume of water that appeared to be very little less than that of the North Thompson River at McMurphy.

The land adjacent to the river has all been logged over some time ago and since then swept by fire, and in many places now the second-growth timber has attained quite a size. Between 10 and 20 miles from the head of the lake there is not any great extent of land suitable for agriculture. Along the first 10 miles from the lake a considerable area was laid out for settlement some ten years ago. There are now some four or five settlers in this vicinity, who have made valuable improvements in clearing and fencing. One of these settlers, Mr. Anderson, has several acres in bearing orchard, the quality of the fruit being very good.

The soil is a sandy clay loam and the land is generally easy to clear on account of having been burnt over. Most of the land requires irrigation, although a rank growth of timothy and clover will be found along the road which has had no attention in this respect. The valley at the lake is about a mile wide, consisting of bottom and bench land, but is considerably narrower in places farther up the river. The elevation of the valley runs from 1,400 to 1,800 feet.

Except for trails at Wallace Creek, where the Wire Cache Trail joins the road, and a trail which starts 6 miles from the head of the lake and goes over a divide to Barriere, there is no way out except by way of Adams Lake.

About 14 miles up the valley from the head of the lake we left the main road, crossing Adams River by means of a trapper's canoe to Mica Lake, from where a trapping-trail led us to Harbour Lake. The trail follows a burn for several miles, after which it is merely a blazed line over logs through the timber, which is principally fir, cedar, hemlock, and balsam, with a little white pine. There is no land fit for agriculture. The elevation of Harbour Lake is about 2,800 feet above sea-level.

After completing our work here, as well as some ties and a forest station in Adams River Valley, we moved to Momich River and Humamilt Lake.

MOMICH AND HUMAMILT LAKES.

Momich River, of which the Momich Lakes are enlargements, flows westerly into the east side of Adams Lake, about 6 miles from the head of the lake, it being the principal stream, apart from Adams River, to flow into that lake. The valley of the Momich is narrow and, aside from some camping-grounds, has very little level ground in it. The mountain-sides are very steep, with numerous rock bluffs. Large Momich Lake is about 2½ miles in length and about one-third in width, is very deep, and affords some excellent sport to the fisherman; in elevation it is about 100 feet above Adams Lake.

A trail from Adams Lake follows the Momich Valley to Cayenne Creek, joining there the trail from Seymour Arm. After making a traverse of Momich Lakes and River and laying out a forest-patrol station we went to Humamilt Lake by way of Cayenne Creek and Stukemaptum Lake and made a small survey. Upon completion of this work we returned to Adams Lake and commenced the triangulation of that lake from the head to the Dominion Belt line.

ADAMS LAKE TRIANGULATION.

Adams Lake may be reckoned as one of the large British Columbia lakes, having a total length of about 45 miles and averaging from three-quarters to 2½ miles in width. It lies about 8 miles north of Squilax, a station on the Canadian Pacific Railway between the Shuswap and

Little Shuswap Lakes, 45 miles from Kamloops. A ferry is operated by the Government at Squilax across the Shuswap River and from there a road 10 miles long leads to the foot of Adams Lake. There are no regular steamers on the lake, but launches and boats may be arranged for.

With the exception of some ranches at Squalm Bay and at the head and foot of the lake, the land along Adams Lake is mostly timbered mountain land broken by rocky bluffs. Occasionally gentle slopes and small timbered flats will be found. The soil is generally sandy, with a gravelly subsoil.

Logging operations are carried on at Brennan Creek, which employ a large number of men. Some prospecting also is being done near the foot of the lake.

Fishing and hunting are good. Deer, bear, cougar, and coyote will be found, as well as the fur-bearing animals, while numerous coveys of both willow and blue grouse were seen along the Adams River. Ducks and geese, too, are plentiful in lakes and sloughs. Several trappers have their lines through the surrounding country.

Before concluding I would like to state that during the season much valuable information and assistance was given me by the forestry officials in the various localities we were in, which assistance, needless to state, was the means of saving the party much time and trouble.

The weather this season was on the whole very favourable indeed. The early summer was perhaps wetter than usual, but beautiful weather was experienced during August and September, and I do not think that I remember such a mild, late fall.

I have, etc.,

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

VICINITY OF PRINCETON, YALE, KAMLOOPS, AND SIMILKAMEEN DISTRICTS.

BY P. W. GREGORY.

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

PRINCETON, B.C., December 6th, 1923.

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 work comprised the resurvey of a block of land in the neighbourhood of Myren Creek, Otter Valley, in so far as covered by applications in good standing, and land suitable for settlement, also the survey of any suitable land in the area immediately south of the town of Allenby.

I commenced operations on the latter section of the work at the end of May, and laid off eleven parcels deemed suitable for settlement, occupying an area of approximately 1,775 acres. Half of this area had been logged off. It is readily accessible, being traversed by the main road between Princeton and the Copper Mountain mining camp. Numerous rough connecting logging-roads thread their way across many of the lots, some leading down into Allenby. Your attention was called during my operations to the favourable location of Lot 2921 (S.), adjoining Allenby, and to the suitability of part of the lot as an addition to the Allenby Townsite, and of its higher slopes and benches for residential purposes. This aspect was enhanced by the finding of several generously flowing springs at the higher elevations on this lot capable of utilization for domestic purposes.

Additional surveys were carried out over this area in accordance with your subsequent instructions and a tract adaptable for residential purposes was eliminated from the original lot. A careful stadia survey was made sufficient to permit of the preparation of a topographical map showing contours at 10-foot intervals and all the main characteristics.

Allenby, the town adjoining, is the site of the concentrating plant of the Allenby Copper Company, a subsidiary company of the Granby Consolidated Mining, Smelting, and Power Company, Limited, which acquired the property in May, 1923, and proceeded to improve and prepare it for operation. At the present moment the works have been shut down, and as far as can be learned they will not be put into operation until next April. It is understood that this concern will give employment to about 400 men, distributed between the mill at Allenby and the mining camp at Copper Mountain, 7 miles distant. The construction of the mill, the installation of machinery and equipment, the development of the mine at Copper Mountain, and the erection of surface plant cost upwards of $3,000,000. A great part of this sum was spent in development-work at the mine and in ascertaining as nearly as possible the magnitude of the ore-bodies, the

grade of ore, and the best possible means of handling a large tonnage in the most efficient and economical manner. A tonnage sufficient for fifteen years' mining has been blocked out and the company controls a large area that is still unexplored. It possesses in all about 100 mineral claims, covering an area of approximately 3,500 acres. The mill at Allenby has a 2,000-ton daily capacity; the other buildings comprise about forty cottages for employees, bunk-houses, offices, stores, machine and other workshops, general store and school. Power is furnished from the hydro-electric plant of the Okanagan Light and Power Company, Limited, deriving its energy from Bonnington Falls. This latter company has established its sub-station at Allenby, from which it also supplies light and power to the town of Princeton, 3 miles away. A railway branch line 14 miles long, constructed at a cost of about $2,000,000 by the Kettle Valley Railway Company, leaves the main line at Princeton and connects with Allenby and Copper Mountain.

The lands blocked out in this vicinity may be described generally as bench lands; soil a light sandy loam; timber, fir and yellow pine, with scattered patches of poplar and willow and second-growth pine and fir.

At Myren Creek, in the Otter Valley, twenty-one parcels were laid out, comprising about 3,215 acres. These lands lie at an elevation of about 3,500 to 4,000 feet above sea-level and are rolling, well-watered lands, small creeks flowing across the majority of them. The soil is sandy loam, with patches of rich black vegetable loam. There is some fir and yellow-pine timber and much poplar, willow, and alder. There was a luxuriant growth of grasses and weeds on these lands at the time of survey, affording as rich feed for stock as I have seen anywhere. Good crops of timothy, vegetables, and strawberries were seen on one of the improved parcels surveyed. This area is easily accessible, being a mile or two only from the main wagon-road or from the Kettle Valley Railway, which both pass along the Otter Valley. In 1922 a sawmill was erected at Myren Creek, employing about eighty men. Lumber was shipped from it and made up into fruit-boxes for the Okanagan. Unfortunately the company went into liquidation late in the present year and operations have been suspended. There is an extensive area of timber land in the vicinity to be logged off, timber being fir and yellow pine. With the recent depletion of the yellow-pine area of the Okanagan and Nicola, there is an increasing demand for the yellow pine of this district, and it is fairly safe to predict that the mill at Myren Creek will again be brought into operation.

It is greatly to be regretted that so much of the yellow pine of this district has fallen a prey to the ravages of the pine-beetle; thousands of acres covered with dead yellow pine are now to be found. The invasion of this territory by this pest began about twelve years ago, and during the last two or three years the Provincial Government has had parties employed destroying it. The Princeton District is primarily a mining district, occupying a coal-basin of about 75 square miles. There are, generally speaking, four known workable seams of varying width, the thickest being about 20 feet. It has two operating coal-mines and many varied mineral resources, such as copper, gold, and iron ores, platinum, silver, lead, gypsum, etc. With these resources, abundant electric power, good transportation facilities (the Kettle Valley and Great Northern Railways), and its proximity to the progressive port of Vancouver, this district gives promise of becoming the mining and industrial section of the Interior.

Princton at present is the supply-point for several mining and logging camps and it usually affords a good market for local farm produce.

The climate is temperate, but having a fairly wide range between its extremes of temperature, from 100° F. in the shade above to 35° below zero. The highest temperatures are recorded during July and August and the lowest usually during January and February. The winter temperature ranges from about 40° above to 10° below, with occasional periods of extreme cold. There is a moderate rainfall during the spring and summer months, but not generally sufficient to ensure a good growth without irrigation. There was an exceptionally heavy rainfall during the months of May, June, July, and part of August of the present year and the crops of the district showed a marked improvement in consequence.

Summer frosts occur occasionally. Snow generally covers the ground during the months of December, January, February, and part of March. It is usually not very deep; in December probably not more than 6 to 12 inches, and during January and February not more than 18 to 36 inches.

I have, etc.,

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

VICINITY OF KASLO, KOOTENAY DISTRICT.

By H. D. Dawson.

Kaslo, B.C., November 2nd, 1923.

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

Sir,—I have the honour to submit herewith a report upon the work carried out by me during the 1923 season.

Under your instructions dated June 1st, I carried out certain work in the town of Ainsworth, consisting of re-establishing the south boundary of the South-east Quarter of Section 5, Township 1, upon part of which the townsite is laid out. This was originally surveyed in 1882, being one of the first surveys made in this part of the Kootenays, and during the intervening years most of the evidences of that work have been lost or destroyed owing to forest fires, the decay consequent upon the lapse of time, works carried out by residents and prospectors, etc. It was the wish of the Department to tie in this survey with the Bonita Mineral Claim, Lot 1683, surveyed in 1897, and with the Spokane Mineral Claim, Lot 212, surveyed in 1892, and in addition to locate the townsite subdivision with reference to the said south boundary of the quarter-section.

Ainsworth is a small town situated on the west shore of Kootenay Lake, about 7 miles north of its outlet through the West Arm, and at a point where the lake is over 2 miles wide and opposite the well-known Bluebell Mine, one of the oldest in the vicinity. The original attraction to this point was the presence of a number of hot springs close to the beach, but it was the mineral-deposits in and around Ainsworth which first attracted prospectors, miners, and a general population in large numbers, and it was from here that the earliest discoverers of the famous Slocan mineral-deposits outfitted, and Ainsworth has always depended upon the mining business for its support. Of later years, with the closing-down of most of the mines, the population has dwindled. Those left devote more attention to their gardens, and one man is developing a goat-raising business and said to be doing satisfactorily. Amongst the better-known Ainsworth mines are the No. 1, Highland, Spokane, Silver Hoard, Skyline, Krao, and in later years the Florence. There are a large number of references to this district in various reports issued by the Minister of Lands, the Minister of Mines, the Canadian Geological Survey, etc., and for a comprehensive and interesting report upon the geology and the mines one cannot do better than peruse that published by the last-mentioned Department as "Memoir 117: The Geology and Ore Deposits of the Ainsworth Mining Camp," by S. J. Schofield.

My work here was not of an extensive nature, and being soon completed my next duty was to consult with A. C. T. Sheppard, D.L.S., of the Dominion Geological Survey, who had been instructed to make a topographical survey of the recently dedicated Kokanee Park and the adjoining areas. The consultation was for the purpose of completing detailed arrangements by which the numerous Crown-granted mineral claims, mill-sites, surveyed timber licences, and land surveys in the district could be accurately located and tied in with his triangulation system, the geographical positions of the stations of which could be calculated upon completion of his work, when he had tied in to the Dominion Government astronomical pier situate at Procter, near the outlet of Kootenay Lake.

In the designated area a large number of surveys, principally of mineral claims, had been made upwards of twenty-five years ago and Crown grants had been issued to cover most of them, but for various reasons, chiefly the extremely difficult nature of the country in which to perform survey operations, with the consequent heavy expense, very few of the claims or groups had been tied in with former surveys or with other known points, so that the exact positions of the Crown-granted areas in practically every case was unknown, and, in fact, owing to the irregularity of the topography and the consequent difficulty the prospector had in accurately describing his location in words, even the approximate position of some of the claims was unknown. For instance, one group of claims was described as being "On the south side of the divide between Kootenay and Slocan Lakes"; this, in a strip of wild country 25 miles wide, with half a dozen ridges rising to 8,000 or 9,000 feet elevation, any one of which might be assumed to be the divide in question, presents a problem of some difficulty when it is desired to show the position of the claims on the map. In other cases claims had been surveyed but had never been Crown-granted, and had even been allowed to lapse, which caused some confusion owing to the original plottings

still remaining on the maps. In present-day practice certain departmental regulations are in force by which these difficulties are overcome.

Having arranged satisfactorily with Mr. Sheppard our line of procedure, I left Kaslo with two men on July 4th with the intention of making a start in the Enterprise Creek country. It was arranged that I should locate the groups of surveys, find the most suitable posts or other monuments, and flag them, so that Mr. Sheppard could, from his triangulation or camera stations, cut them in or locate them by means of the "three-point location" system, or cut them in when running his plane-table trail traversing. In parts where he had already or would have already completed his work it would devolve upon me to locate my flags by occupying his stations myself, or by means of the three-point location system, or by running tie traverses to connect with his system, or in any way most convenient or along the line of least resistance. It was thus necessary that I should give Mr. Sheppard accurate descriptions of my flagged points with relation to prominent topographical objects, cabins, mine-workings, etc., in those sections which I covered first, and Mr. Sheppard, on his part, would also give me accurate descriptions of his stations of any class, and also flag or cairn them prominently, in order that I might be able to pick them up if required.

Throughout the season Mr. Sheppard and his assistant, Mr. Macdonald, did all they could to facilitate the working of this agreement and to render what service they could. In this manner the Provincial Department was saved a very considerable expense and a heavy amount of duplication of expensive work was avoided.

My instructions were to continue this work northwards into the main Slocan Mining District, tying in with the triangulation stations erected some twelve to fourteen years ago, when the work shown on the Sandon Sheet, issued by the Dominion Department of Mines, Geological Survey, was being carried out.

As a result of our season's work every Crown-granted survey in the park, with possibly one exception, has been located and accurately tied in to the main triangulation system, together with two groups of timber-licence surveys and several mill-sites, together also with a considerable number of other surveys in the adjoining areas. The south boundary of a large railway grant—namely, Lot 819—surveyed twenty-six years ago, was to a certain extent re-established and tied in to the triangulation system; 10 miles of this boundary forms the north boundary of the new park. In addition, a group of surveys situated on the west side of the Slocan Lake was tied in, and finally two groups of mineral claims comprising one survey group of seven claims, situate some 5 miles from the City of Kaslo on True Blue Mountain, were located from existing surveys by triangulation independently of the main triangulation.

Mr. Sheppard completed the topographical survey of the park and adjoining areas, but found the season too short to permit him to complete the extension of the triangulation to the Dominion Government astronomical pier before mentioned, and which must be done before the geographical positions of the Provincial surveys can be calculated.

The Kokanee Park is a section of country 10 miles square, situated almost centrally in that portion of the Kootenays contained within and bounded by Kootenay Lake on the east, West Arm of Kootenay Lake on the south, Slocan Lake on the west, and the Kaslo-Nakusp Railway running in the valleys of Kaslo and Seaton Creeks on the north, measuring approximately 25 miles east and west and 30 miles north and south, and is therefore within a comparatively easy day's journey of the cities and towns of Nelson, Ainsworth, Kaslo, Sandon, New Denver, Silverton, and Slocan City.

These towns and the shores of these lakes are amongst the earliest settlements of the Kootenays, and have been for many years so well known that it would be unnecessary for me to occupy further space in describing them. But though so close, the actual park area itself is very little known even amongst the oldest timers and prospectors of the districts. Most of these will know two or three of the valleys of the main creeks and their basins, but their knowledge of the rest will be hazy and gained by hearsay only. In view of these facts, I consider that this report might deal in some detail with the topographical features of this small but very rough and intricate area, and be perhaps more appreciated by those about to make a holiday or a trip into the park, but which would possibly be tedious to one not so intimately interested.

The Kokanee Park has as its main attraction the Kokanee Glacier, said by some to cover 8 square miles, but which will probably be found upon actual calculation to be somewhat smaller, lying on the easterly and north-easterly slopes of what is known as Kokanee Mountain, a

serrated ridge about 4 miles long and reaching a height of 9,100 feet above sea-level, or 7,400 feet above the Kootenay and Slocan Lakes. Parallel to this ridge to the east, and attaining a height very nearly as great, is an extremely serrated saw-tooth ridge, on the easterly slope of which lies the Woodberry Glacier, the ice of which is cut into three main portions by jagged and needle-pointed spurs jutting out from the main ridge in an easterly direction. North-easterly again is another serrated ridge, on the north and easterly slopes of which is a smaller glacier known as the Cariboo Glacier. To the west of the Kokanee Mountain is the Lemon Mountain and ridges very nearly as high, but not so serrated, on the easterly slopes of which are several small glaciers, chief of which is the Lemon. All of these four ridges rise to between 8,700 and 9,100 feet, and in other portions of the park and adjoining areas are a considerable number of ridges, bearing to all points of the compass, averaging nearly 8,000 feet, with peaks some hundreds of feet higher. There are many pieces of glacial ice, the residuals of the huge ice-caps and glaciers which at one time covered this district.

In addition to the scenic beauty controlled by the glaciers, there are many other attractive features in this area, noticeably the numerous lakes lying at elevations ranging from 5,500 to 7,000 feet above sea-level. Many of these are of large size and of great depth, and chief mention may be made of the following:—

(1.) Kokanee, the largest and deepest actually in the park area, ¾ mile long, ¼ mile wide, and probably 400 feet deep, surrounded by precipitous cliffs and rock-slides, the elevation being about 6,500 feet.

(2.) Kaslo, ½ mile long, ¼ mile wide, elevation about 6,300 feet, surrounded by patches of alpine timber, grassy meadows, and rock-slides. This is situated near the head of the West Fork of Mansfield Creek.

(3.) Green or Twin Lakes, in the Joker or Mansfield basin near the head of the East Fork of Mansfield Creek, elevation about 6,000 feet.

(4.) Enterprise Lake, at foot of U and I basin, about ½ mile from the head of Enterprise Creek.

(5.) Lakes at head of Main Lemon Creek, in a glacial valley containing in all twenty-five lakes, varying in size from 50 feet to 100 yards in diameter.

(6.) Sunset, head of Klondike Creek, a tributary of Pontiac Creek, a tributary of Woodberry Creek.

(7.) Lake of Many Islands and two other lakes in the basin of the South Fork of Woodberry Creek, at elevations of 6,000 feet and over.

(8.) Wheeler's, 1 mile long, ½ mile wide, elevation 5,500 feet. This is farther down the South Fork of Woodberry Creek and out of the park area.

There are scattered over the area many other lakes, all with their own peculiar charms.

There are a great number of mountain basins, each with its own wild charm, a particularly fine one being that of the North Fork of Enterprise Creek at an elevation of about 7,000 feet. It is almost entirely surrounded by a ring of half a dozen peaks ranging around 8,000 feet in height, with only a narrow opening where the North Fork debouches. There are two cabins here, the upper one being habitable and in frequent occupation. It was in this basin and the adjoining country that we saw the greatest number of goat and deer, but by the signs it would seem as if the headwaters of the South Fork of Woodberry Creek were the favourite haunts of bear. The Pyman and the U and I basins at the head of the Enterprise Creek are also particularly fine, surrounded as they are by rugged peaks and steep rock-slides. Others which might be mentioned are the Miller, Sturgis, Joker, park at the base of Woodberry Glacier, Sunset, etc.

Throughout this area there are numerous opportunities for the development of water-power.

The ordinary species of commercial timber common in the Kootenays, consisting of fir, cedar, hemlock, tamarack, spruce, and white pine, grow well up to about 4,000 feet, and from that altitude to about 5,000 feet there are good belts of cedar, hemlock, and spruce. From 5,000 to 6,500 feet the timber is almost entirely alpine spruce and balsam, and above that the timber gradually becomes poorer and more stunted to about 7,500 feet, which is the upper limit. In certain sections the western larch or mountain-tamarack in the higher altitudes lend a touch of lighter colour to the prevailing dark green of the alpine timber and in the fall turns a vivid orange colour. The alpine spruce and balsam is said to be well adapted for pulp, and it is found that a large proportion of the area of standing timber is occupied by this type.

Geologically, the whole of the park is included in the area composed of the Nelson granite system of rocks, which is an immense intrusive granite-mass upheaved in Jurassic times as a batholith; that is, the intrusion did not break through to the surface at that time. It was during the cooling of this enormous mass that the solutions bearing the Slocan minerals segregated, and flowing through the fissures of the adjacent rocks precipitated their mineral content. During the years which have since passed this batholith has become unroofed owing to weathering and denudation of the earlier overlying rocks. It is extremely probable that many rich deposits were deposited in the roof-rocks and extended down into the granite itself. These upper deposits have, of course, been weathered away along with their surrounding rocks, but in the granite are still found a large number of high-grade leads, mostly of argentiferous galena and sphalerite—that is, sulphide of lead or of zinc containing values in silver—occasionally dry silver ores and gold-bearing quartz.

These deposits have been carefully searched for and many opened up, particularly in those areas which are above or not far from timber-line, and throughout the whole area prospectors have been busily engaged for longer or shorter periods, according to their success in finding mineral or their individual temperament and optimism. There has been considerable ore mined and shipped from various mines, notably the Molly Gibson, owned by the Consolidated Mining and Smelting Company of Canada, Limited. The following have also shipped from time to time: The Smuggler, Boomerang, Nolans, Barnett, King Solomon Mines on Woodberry Glacier, Jessie-Bluebird, Pontiac, Sunset, and others. Cabins in better or worse condition are frequently found, and almost every creek and tributary of any size has its trail, a few of which, unfortunately, are now blocked. There are in use a large number of very good trails, so that from all sides the centre of the park may be readily reached in a day's travel, and if desired the trip out may be made by a choice of routes. The following are open for pack-horses and connect with each other near the Kokanee Glacier:—

1. Kaslo via Zwickey and Mansfield Creek to the Index Mine, 15 miles by road; thence 6 miles farther by road, which, on account of unsafe bridges, may only be used as a pack-trail; thence 3 miles by pack-trail.

2. Slocan Lake points via Enterprise Landing and Enterprise Creek, 7 miles by road; thence 10 miles by trail.

3. Slocan City via Springer Creek to Arlington Mine by road; thence by pack-trail to Enterprise Creek Trail; thence 10 miles.

4. Slocan City to Lemon Creek, 5 miles by road; thence by trail up Lemon Creek, 20 miles.

5. Nelson to Duhamel (6-Mile) Creek, 6 miles by road; thence up Duhamel Creek by trail 12 miles to the Lemon Creek Trail; thence 9 miles.

In addition there are the following pack-trails up the creek-valleys, but they do not connect with each other:—

6 and 7. Sturgis and Cariboo Creeks, tributaries of Mansfield.

8. Woodberry, to mines situate at the base of the Woodberry Glacier.

9 and 10. Silver Spray and Scranton, tributaries of the Woodberry.

11. Coffee, to the base of the Kokanee Glacier.

12. Olsen, a tributary of the Coffee.

13. Kokanee, by road 11 miles to the Molly Gibson mill; thence by trail 3 miles to the Molly Gibson Mine and a parallel trail 3 miles to the Kokanee Lake.

14 and 15. North Fork and Boomerang, off Enterprise.

16. Upper Vevey (8-Mile).

17, 18, and 19. Silverton (4-Mile) and tributaries, Fennell and Granite, to points on or near the north boundary of the park.

Old trails, now blocked, but on which a small amount of work would put into shape for travel, are:—

20. Brown Creek, tributary of Mansfield.

21. Joker, East Fork of Mansfield.

22 and 23. Grant and Grafton, off Woodberry.

24 and 25. Pontiac and Sunset, off the Scranton.

26. Enterprise Creek, South Fork.

27. Crazy Jane (Lemon Creek, South Fork).

28 and 29. Barnett and Alpine, off Lemon.

Altogether it is seen, therefore, that there are twenty-nine trails in or very close to this comparatively small park area comprising 100 square miles. The journeys across country may be accomplished on foot; about one hour should be allowed for each mile of distance, travelling light. Most of these cross-country journeys would be up or down or across rock-slides, many of the individual blocks of which being of huge size, so that travelling is exceedingly arduous, and the labour is increased out of proportion if even only small packs are carried, much of the stepping having of necessity to be by balancing on the points or edges of the blocks forming the slides.

It is seen that there is a gap of 12 miles between the end of the road on Mansfield and the end of the road on Enterprise Creeks, at present bridged by pack-trail. This gap presents no particular difficulties for road-building. There would be comparatively very little rock-work and the grades would be 10 per cent. for 3 miles from the head of the Mansfield Creek Road to the flats below the Kokanee Glacier, and thence only a very slight rise to the summit of the pass over into the Enterprise Creek; thence on a down grade of about 8 per cent. for 8 miles. There is a desire that in the near future this road should be constructed in order to encourage motor tourist travel. When the roads on Kootenay Lake between Queen's Bay and Ainsworth and on Slocan Lake between Slocan City and Silverton are completed, then with this route across the glacial park completed, there would be a very splendid through route well worth the holiday-maker's time to negotiate.

The business community of the Kootenays have to face several patent facts which must be considered when the future outlook is discussed. First, the knowledge that mining, upon which the country first gained its prosperity, is an industry which must sooner or later come to an end, as the individual deposits are in turn worked out, although that will not be for a great number of years yet.

Secondly, the outlook for the lumbering industry is more hopeful. According to the excellent report published by the Commission of Conservation, Canada, entitled "Forests of British Columbia," by H. N. Whitford and R. D. Craig, 1918, it is found that 27 per cent. of the total Southern Kootenay area is classified as timber lands, not necessarily as commercially profitable timber lands at this time, but which might at some future time be exploited on a successful commercial basis, their minimum for calculation being land with not less than 1,000 board-feet per acre; and in addition to this there is an area amounting to 35 per cent. of the total area which has more or less been burnt off and is at present covered with young growth, and is capable of carrying saw-timber at some future time. About 1.2 per cent. of the total area, at present a portion of these timber lands, may be considered as possible agricultural lands; the balance of the timber lands may be considered as available for reafforestation and a source of perpetual wealth from successive stands of timber. So that with the gradual depletion of timber in other parts of the world and the improvement of local as well as distant markets, the lumbering industry may be considered to have a very hopeful future, particularly as the small amount of 1.2 per cent. of the area only would cease to become timber-bearing lands.

Thirdly, it is estimated that 9.5 per cent. of the total area is capable of being utilized for agricultural purposes, and on account of the mountainous nature of the region this is all much broken up and distributed in comparatively small sections, so that farming on a large scale is impracticable. The chief product at the present time is fruit, and the district is particularly proud of its apples and cherries, but on account of the lack of near-by markets, and the great distance away of what markets there are, this industry has been most disappointing.

There is then a fourth source of business—namely, that produced by the traveller and tourist, which even at the present time during the months of July, August, and September is producing a considerable amount of business. The district has several advantages to attract the tourist and holiday-maker, such as the temperate summer climate, magnificent mountain scenery, with its glaciers, lakes, and valleys; also the large lakes, in which fishing, boating, and swimming may be enjoyed and which cover an area of 375 square miles.

It is then becoming increasingly obvious to the business community that this feature should be improved from year to year, and it is with this in view that it is hoped that the Kokanee Park may be opened up for tourist automobile travel, and that these glaciers, which are among the most southerly on the North American Continent, may be enjoyed to a greater extent by visitors and tourists.

I have, etc.,

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

VICINITY OF SALMO, KOOTENAY DISTRICT.

BY BOYD C. AFFLECK.

FRUITVALE, B.C., December 13th, 1923.

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

SIR,—I have the honour to report on the season's survey operations as follows:—

The work consisted in the resurvey and subdivision of Lots 273, 275, and 276, Kootenay District, in the vicinity of Salmo. These lots, which have a combined area of approximately 2,500 acres, are expired timber leases, which it is intended to open up for settlement. In addition, a trip was made up Lost Creek to obtain a tie between two surveyed timber licences. The party commenced work on June 12th and completed it on September 29th. The camp was most of the time in Salmo, about a week being spent at Porcupine Creek, at Block 276, and about ten days at Jap Camp, Block 275. The trip to Lost Creek occupied three and a half days.

In general, the area surveyed consists of rich, level river-bottom land, which originally carried a very heavy growth of cedar, now thoroughly logged off. Stumps 4 to 6 feet in diameter at 6 feet above ground are quite common and occasional ones reach a diameter of 8 feet. Most of this area has been repeatedly burned over and in most cases the large stumps are merely charred shells. Where fires have not been very recent a dense second growth of cottonwood, willow, and alder is springing up rapidly. A remarkable feature of almost the entire area is the luxuriant growth of timothy, spreading, self-sown, from old logging-roads and covering many acres where the fires have sufficiently checked the undergrowth to allow it to start. In spite of the presence, throughout the season, of several herds of cattle, much of this timothy was so high and thick as to be difficult to travel through.

Another feature observed throughout this area of great importance to intending settlers is the fact that almost anywhere a good supply of excellent water may be obtained by simply driving a well-point down about 20 feet. This type of well is in extensive use in and around Salmo and is apparently just as successful at Jap Camp, 6 miles south.

Another unusual feature of the area surveyed is the almost entire absence of the usual bench lands lying between the river-bottom and the mountains. Here almost in every case the mountains, which are in general about a mile apart on each side of the valley, rise abruptly from the floor of the valley without any intermediate features.

The village of Salmo is centrally situated in regard to the area surveyed, which extends to an extreme of 6 miles northerly and 7 miles southerly along the Salmon River from Salmo. Salmo is a station on the Nelson & Fort Sheppard Railway, a branch of the Great Northern Railway, joining the main line at Spokane. Nelson is 26 miles from Salmo, which is one of the few points on this branch having a station with a resident agent. Salmo has a population of about 300, a modern two-roomed school, a church, hotel, three stores, and the large shingle-mill of the Kootenay Cedar Company. The village was much more populous when the Sheep Creek mines were actively working, as Salmo is their shipping-point. Owing to unsettled conditions during and since the war these valuable gold properties are practically all idle, although no one doubts their value and ultimate importance. Several farms adjoining the area surveyed are being operated and yield remarkable crops of hay and grain.

In addition to the railway, Salmo is served by the recently completed Nelson–Spokane Highway, which in this vicinity at least is a really good road, the first 3 miles southerly from Salmo, especially, reflecting great credit on the Public Works Department.

Although as yet only the Sheep Creek mines, 10 miles distant, have been largely productive, mineral has been found and staked in almost all directions from Salmo, and it is but reasonable to expect that some of these prospects will ship ore from Salmo in the future.

In general, the soil consists of deep, rich sandy loam, rich in humus, with gravel subsoil. The exceptionally heavy yield of timothy and other grasses in the vicinity seems to indicate that dairying would be a profitable enterprise on this area. On account of the low-lying nature of most of the land it is probable that tree-fruits and the more tender varieties of garden produce would suffer in some years from summer frosts, although none of these occurred this season. It is also probable, however, that with larger areas of land under cultivation, summer frosts may no longer occur in any year.

The precipitation in the vicinity of Salmo is sufficient in quantity for ordinary crops and fairly well distributed throughout the year, although usually July and August are so dry that the addition of irrigation-water is of great benefit to crops in the drier soils of the valley. Fortunately, four fair-sized creeks are available in the area surveyed for this purpose and they are probably large enough for small power requirements also. Snow usually comes about the middle of November, attains a depth of from 2 to 3 feet, and leaves about the end of March. As drifts are unknown, sleighing is usually very good throughout the winter, although occasional thaws frequently come near to spoiling it. The thermometer may for short periods reach 20° below zero, but only on very rare occasions. In summer the thermometer frequently registers in the nineties, but the nights are comfortably cool. Contrary to expectations, mosquitoes were quite scarce, although the summer was unusually rainy. The yellow wasps, however, did their utmost to make up for this deficiency, and when ensconced, as they frequently were, in a large dry stump on line, constituted quite a problem.

Game in the vicinity of Salmo consists chiefly of deer and bear, the former of which was very plentiful and were frequently seen by the party during the early part of the summer. Ruffed grouse and blue grouse are fairly plentiful. The Salmon and its tributary streams are well stocked with brook-trout, but at the more frequented fishing-places one has to be an expert to interest them. Lost Creek, on the other hand, where fishermen seldom go, presents less of a problem. Four trout were coaxed from it on one occasion by the chainman of the party, armed only with a bent pin and a piece of packing-cord.

Beaver are very numerous in the vicinity of Salmo, some operating fearlessly within sight of the town. On account of the abundance of food-supplies available for them and the opportunities afforded for their dams and ponds by the many sloughs and side-channels along the river, it would seem that here is a splendid chance to establish some successful fur-farms, almost the only problem being that of adequate fencing. In my detailed report I have indicated a number of blocks which are particularly well suited for this enterprise.

In my opinion the area surveyed offers to the prospective settler exceptional advantages in the way of accessibility, soil, water, and climate.

I have, etc.,

BOYD C. AFFLECK, B.C.L.S.

VICINITY OF CRANBROOK, KOOTENAY DISTRICT.

BY B. A. MOORHOUSE.

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

CRANBROOK, B.C., November 8th, 1923.

SIR,—I have the honour to submit the following report of survey-work done by me during the past season:—

In the district near Wasa two timber limits were divided into lots of approximately 80 and 160 acres each. The land is situated 3 miles south of Wasa, on the west side of the Kootenay River, at which point, on Lot 13057, a Government-aided ferry operated by cable gives free access to these lands for motors and wagons from the main highway on the east side of the river from Cranbrook to Wasa, which lies 1 mile to the east across meadow lands which are locally known as Bummer Flats.

At Wasa there is a good hotel, store, school, post-office, and station of the Kootenay Central Railway, where trains going north on Mondays and Thursdays connect with the Canadian Pacific Railway main line at Golden, and trains going south on Wednesdays and Saturdays connect with the Crowsnest Pass branch of the Canadian Pacific Railway for Cranbrook.

About 2 miles directly west of the lands is the old wagon-road from Cranbrook to Wasa, which is connected to each of the lots by old logging-roads now in need of repair.

The lands generally lie on rolling benches about 200 to 300 feet above the Kootenay River, which at this point is 2,500 feet above sea-level.

The merchantable timber has been taken off these lots about twelve years ago, leaving the small fir, pine, and tamarack up to 6 inches in diameter still standing; some of these trees, together with the underbrush, have been fire-killed, leaving park-like open spaces well cleared.

In other places a dense growth of new fir, pine, and tamarack has sprung up, but the cost of clearing the lands would not be very much, as the old stumps are becoming rotten and loose.

On all the lots there is sufficient standing timber suitable for the erection of log cabins, fences, etc., together with a sufficient supply of fuel for years to come.

The soil on the bench lands is light sandy loam, free from stones in many places, and black loam near the creeks and on the flat lands next the Kootenay River; these latter lands are covered with a dense growth of tall willows, alder, etc., but easily cleared, and capable of growing good crops of grain or hay, as irrigation, if required, is close at hand from the river.

Stock-raising would be suitable for the larger of these lots, as hay can be grown for winter feed and large tracts of range land lie to the west; the smaller lots are more suitable for poultry and vegetable raising, as a constant supply of fresh water running through them assures a domestic supply of water. They are also situated so that there is land high enough above flood-water of the Kootenay River and near enough to Wasa and Cranbrook, where market facilities for the produce can be found. At Wasa there is a large sawmill employing many men all the year.

Cranbrook, 20 miles to the south, has a population of nearly 4,000, and many farmers bring their hay, grain, and other produce much further distances to market there.

The flood-time of the Kootenay River is generally from June 1st to 15th; and very rapidly does the river rise—as much as 2 to 3 feet overnight, with a maximum of about 15 feet; though the rapidity of the flow is not very great, thus preventing the banks and soil from serious erosion.

On most of these lots fine building-sites are obtainable in view of the Rocky Mountains on the east and the Selkirk Mountains on the west, which, with the Kootenay River and its winding course through the beautifully wooded valley, are an added attraction for the resident; the proximity of schools, store, and railway also make these lands more acceptable as rural ranches.

Wild game, as deer, bear, and coyotes, etc., can be obtained by a few miles' trip up the hills to the east or west, whilst duck and chicken are to be had right at one's door. Fishing and boating on the river is also there.

TAMARACK CREEK AND SKOOKUMCHUCK LANDS.

From the lands just south of Wasa camp was moved 20 miles north along the west side of the Kootenay River to the mouth of Tamarack Creek, where a small rural settlement with a school called Larchwood is situated.

After leaving the lands previously described, connecting by old logging-roads with the Westside main road, Cranbrook to Wasa, for a couple of miles, the new Banff-Windermere Motor Highway is reached, just at the top of the slope from the Wasa Bridge over the Kootenay River.

This beautiful highway was followed for a few miles until the little settlement (very prosperous-looking) of Tata Creek is reached, where a school-house and an up-to-date motor-supply station with refreshment-house has been recently built, and which was greatly appreciated by the numerous tourists passing this season. There are a few other farmers settled here in close proximity to each other and their crops this season looked excellent, and as the motor-road was followed for about a dozen miles several more fine ranches with bountiful crops of hay and grain meet the eye of the tourists.

Just before reaching the confluence of Sheep Creek and the Kootenay River, the branch road to the north-west to Skookumchuck was taken for about 2 miles, when the station and village of that name is reached, with a store and post-office combined, together with a few deserted houses; the inhabitants have moved farther north and west to lands more productive and where labour in the woods can be more readily obtained.

Four miles north of Skookumchuck, along a very inferior wagon-road, is Tamarack Creek, which rises in a lake of the same name in the hills to the west, 2½ miles away. Here is found the Stuart-Cameron tie camp at the mouth of the creek and close to the railway, located in the old log buildings used by preceding lumber companies.

As the surrounding districts provide the need for a school, the Education Department has provided one in a log cabin, formerly the office of previous camps.

The small station of Torrent is situated 3 miles farther north, but the residents of Larchwood use Skookumchuck as their source for supplies and mail.

In the hills to the north and west are located several logging camps of the Crow's Nest Pass Lumber Company, and to the south and west are those of the Parkin Logging Company;

and connection with the main Kootenay Central Railway by spur track at Larchwood, and logging-railways at Torrent and about 3 miles south of Skookumchuck, make convenient shipping-points for the large number of logs, ties, pit-props, etc., which are daily shipped to the Prairies and British Columbia points.

To the north of Skookumchuck Creek some 3,000 acres were surveyed into fifteen lots as to be most suitable for settlement, and any rough lands too poor for cultivation were not surveyed. These blocks, comprising 900 acres, can be utilized for range. Seven lots north of Tamarack Creek were surveyed, of which three have been already alienated by settlers already living in the old camp buildings which were formerly used by the Crow's Nest Pass Lumber Company.

About three-quarters of a mile west of Larchwood School is a small lake of that name, and all the lands between Tamarack Lake and it, for a mile or more north and east, have been badly burnt over in 1919, and now are in a very blackened and barren condition, having only the bare burnt trunk of trees standing and very little foliage or green undergrowth present.

However, the addition of the charcoal to the sandy soil has been of benefit, as is shown by the absence of weeds and the luxuriant growth of volunteer timothy along the logging-trails.

If forest fires of this nature were followed by a systematic sowing of timothy and other grasses and the replanting of young trees, I feel certain that these would keep down and kill the pernicious fire and other weeds, making these devastated areas again of use within twelve months and also for the new timber in years to come.

Over the area of logged-off lands surveyed this season it was apparent that British Columbia does not follow the European or Eastern Canadian methods of demanding that logging companies shall burn up all the slash, do no damage to young timber, and replant a tree for every tree felled.

Forest fires would be much less prevalent if even the first of these conditions were complied with, and it should be made compulsory upon those who denude British Columbia of her best trees that all young growth should be well guarded from damage during logging operations, and especially when the period of burning of the slash is on.

Of the lots between Tamarack and Skookumchuck Creeks, five are adjoining water-supply and all are irrigable from the latter creek by gravitation.

Considerable level lands, easy to clear, are to be found on these lots, and sufficient serviceable timber for the building of cabins, fences, etc., together with a large fuel-supply, is present.

Pioneer settlers, like those at present on these and adjacent lands, would do well, and should be able to make a comfortable home and living from the land and the work available in the near-by camps and on the railway. The Skookumchuck Creek or River is a very rapidly flowing one, from 1 to 5 chains wide, and even in low water is not fordable. The Government bridge at Skookumchuck is the only wagon-way across, and with this in view eight lots were laid out, having one boundary of each the natural one of the river; thus no lots are cut into two parts by the unfordable river, and river-frontage is given to as many lots as is possible.

Of the twenty-odd lots surveyed to the south of the river, the best are the above mentioned with river-frontage and considerable level bench lands fairly free from stones and trees, mostly ready for the plough. Their river-bottom lands lie well above high-water mark and will make convenient home-sites near the water.

Of the other lots to the south, each has some level land suitable for cultivation, with scattered 6-inch diameter pine, fir, or tamarack, in some places fire-killed and rotting, and if water-supply could be brought from the Skookumchuck River and stored in the many natural lakes on the property until the time for irrigation, then crops would be assured and the lands made more profitable than if left to the cycle of dry and wet seasons.

Lands to the east of the Kootenay Central Railway were inspected and found to be too stony and waterless to warrant survey.

Many local residents, amongst whom a family of Canadian-Swiss, were awaiting the opening-up of the surveyed portions. They claim to be able to settle a family on each lot if a community water-supply was installed on the southern portion.

This Swiss family live on a pre-emption of their own, now Crown-granted, just to the west of these lands, and are successfully raising pedigree goats for their milk, cheese, and sale. The lands I surveyed are even more suitable for mixed farming than the Crown-granted land just referred to.

Summing up, with a small capital, a knowledge of bush farming, and a willingness to work and stick-to-itiveness, results can be obtained in this district which should give a family a comfortable living.

ELK RIVER LANDS.

Work was then commenced on the subdivision of lands situated on the right bank of the Elk River from its confluence with the Kootenay River to 5 miles eastward—approximately 2,000 acres in extent. These lands, having reverted to the Crown, are mostly all suitable for settlement, and many prospective future owners made inspection of the lots during the survey operations.

The elevation of the Elk River at its mouth (Kootenay River) is 2,400 feet above sea-level, and the first bench lands are approximately 2,640 feet and the top bench lands approximately 2,900 feet above sea-level.

The nearest lots to the Kootenay River are within 3 miles by good motor-road of the small town of Waldo, where there are splendid public and high schools, church, stores, lumber-mills, golf-links, and railway-stations, both Canadian Pacific Railway and Great Northern Railway of America. A daily train provides service both north and south each day to Fernie or to points in the United States.

Those lots farther up the Elk River are accessible by wagon along the old logging-roads (which are now requiring repair), either from Waldo or Elko, 8 miles to the north, along the main Fernie to United States highway, and then by a short branch road to the lots.

On the way to Elko the power-site of the East Kootenay Power Company is under development, at present employing 400 men, and there is also the proposed Wigwam pulp and paper mill under construction within 3 miles of the property. This latter work has recently been closed for a while for purposes not generally known.

There are outcrops of pure pipe-clay showing in the steep cliffs on some of the property, which may, if proved commercially profitable, provide a more local industry for the residents.

The Elk River has a very large watershed. It rises in the Rocky Mountains, some 100 miles to the north-east, and is a very rapid-flowing river, from 1 to 10 chains wide in places. Its high-water period is about the first weeks in June, when this river becomes a raging torrent and rises with great rapidity. Some of the river-bottom lands are flooded and at times erosions and flotsam do considerable damage.

The lands generally lie alongside the north bank of the river; eleven lots of fourteen surveyed having river-frontage, with some bench land on their northern and eastern boundaries.

Three of the lots comprise all bench lands which are suitable for stock-raising or hay, etc., in wet seasons, and which lots can be used in conjunction with a lot having river-frontage, where hay, grain, roots, and vegetables can be grown in abundance.

As evidence of this, there is one lot, No. 3, which has been owned for the last twenty-five years, and cropped in hay, grain, etc., successfully, and this year an excellent crop of wheat, oats, alfalfa, timothy, potatoes, corn, and other vegetables were harvested. So bountiful was the crop that twice the normal storage was required when the hay, etc., was stacked. This is probably the result of the regular weekly rain-showers which have occurred during each week of the months of June, July, and August; thus showing that with irrigation properly applied such crops would become an annual fact.

All other river lots are fairly similar to Lot No. 3, though still in the rough, requiring clearing of the light timber and dense undergrowth of rose and other bushes; some have stones to pick; others are fairly free from them.

Regarding the game in this district, fishing is good in the Elk and deer and chicken can be secured in the locality, but the better hunting-grounds are only a few miles north of the Canadian Pacific Railway at Elko, where most of British Columbia wild game are to be found.

The climate is ideal; not very much rain; fairly cold winters, but bright sunny weather prevailing most of the year.

Regarding lands suitable for future survey, there appears large areas to the south and west of the mouth of Gold Creek, lying with a southerly aspect and gentle slope under the waters of the creek for irrigation or other purposes.

I have, etc.,

B. A. MOORHOUSE, B.C.L.S.

UPPER KOOTENAY VALLEY, KOOTENAY DISTRICT.

BY H. E. WHYTE.

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

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

SIR,—I have the honour to submit the following report on lands surveyed in the Upper Kootenay River Valley, in the North-east Kootenay District, under your instructions dated May 15th, 1923:—

I left Victoria on May 19th with one man, proceeding to Golden, where I obtained the balance of my party. Pack-horses were procured at Leancoil, on the main line of the Canadian Pacific Railway, about 18 miles easterly from Golden. A two-day trip, totalling about 35 miles, along the pack-trail leading from Leancoil to Kootenay Crossing on the Banff–Windermere Road brought us to the commencement of the work.

My instructions were to survey Crown lands in the Upper Kootenay Valley into areas not exceeding 640 acres. The bottom land in this valley is about a half to a mile wide and had previously been surveyed, so that the lots surveyed by me lie in the foot-hills of the mountains which bound the valley. The valley is about 4,500 feet above sea-level and the mountain ranges on either side are about 4,000 to 5,000 feet above this again.

The areas surveyed are situated near the Upper Kootenay River, between the west boundary of the Kootenay Park and the southern limit of the Railway Belt. The average distance to Leancoil by a good pack-trail is about 35 miles and to the Kootenay Crossing on the Banff–Windermere Road about 10 miles. From Kootenay Crossing by wagon-road to Athalmer, in the Columbia Valley, is about 60 miles.

There is no mining development at present in the vicinity.

The soil, generally speaking, is loam with a clay subsoil, although stony in places; owing to the altitude summer frosts are prevalent and the farming possibilities are therefore not good.

The timber consists chiefly of jack-pine and spruce, but there is also some fir, balsam, and poplar, none of which timber is at present of any commercial value.

During the period of my stay there was a fall of rain once a week at least, quite often accompanied by thunder. From what information I can gather the snowfall during the winter would be from 2 to 3 feet.

Moose, bear (black and grizzly), white-tailed deer, beaver, mink, marten, lynx, coyote, and goat may be found in the valley. Trout are fairly plentiful in the Kootenay River and in a number of small lakes in the neighbourhood.

The total area surveyed consists of nine lots, amounting to 3,800 acres, and the new and retraced line consisted of 28½ miles.

I have, etc.,
H. E. WHYTE, B.C.L.S.

NEW WESTMINSTER DISTRICT.

BY M. W. HEWETT.

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

VANCOUVER, B.C., October 11th, 1923.

SIR,—I have the honour to submit the following report on lands surveyed by me during the past summer in New Westminster District:—

At the head of Okeover Arm, Malaspina Inlet, I made a tie between Lots 4317 and 2483, picking up on the way the south-west and south-east corners of T.L. 36320, and also tying to Okeover Geodetic Station, lying immediately to the north of Lot 2483.

I also made a tie between Indian Reserve No. 5 and Lot 4525 and re-established the water-front post on the north boundary of the Indian reserve, which, together with both its bearing trees, had been destroyed by a logging-road. I was unable to find the south-east corner post of Lot 3767, and found the post marked for the north-west corner of T.L. 36320, very evidently not in its original position and with no sign of bearing trees. The clearing on Lot 3767 seems to have overlapped its east boundary and obliterated it. I was, in consequence, forced to carry my tie on to the south-west corner of Lot 4525.

Leaving here, we moved on to Lot 920, camping about the middle of its frontage on the Strait of Georgia. This lot we cut into sixteen new lots of various sizes.

The surface of the lot is broken by rock-outcrops and is traversed by a mineralized zone, carrying zinc and copper, apparently on a limestone-granite contact. Two claims have already been surveyed on this, and others staked which have not yet been surveyed. The draws or valleys intervening between the rock-outcrops are of a good width, and consist of a sandy loam, very often stony, and in some places swampy. They average about the same as adjoining lots already under cultivation.

The lot has been logged and the central portion burnt; there is, however, a considerable quantity of rather rough fir left in the less accessible places and some cedar fit for shingle-bolts.

A wagon-road from Lund crosses and ends on the north part of the lot. The great need of the district seems to be the extension of this to Powell River, which affords a good market for any farm or garden produce that can be got to it. The water-front is too exposed to afford anchorage for gasolene-launches, though one or two small bays can be used for that purpose in the summer-time only. The Government telephone-line, with its accompanying trail, also crosses the lot.

Water-supply was good at the time of survey, in the earlier part of the summer; there are several small creeks crossing the lot, some of which, however, would probably be dry by fall.

I was unable to find any trace of Lot 2186. The ground covered by it was burnt very thoroughly, apparently about the time of the survey, and has since grown up with a very dense second-growth thicket, most of the original timber being wind-fallen. I imagine the late Mr. Unwin must have met with the same difficulty in 1914; it is hard otherwise to account for his leaving a 5-chain strip between this lot and his survey of Lots 4209 and 4210.

On completion of this survey we moved down to Agamemnon Channel, where we had three lots—Lots 2731, 3319, and 3320—to subdivide.

Here consideration of water-supply forced us to camp on Lot 2728, at the outlet of North Lake, for the northern part of the survey. Logging-roads for communication suggested Lot 4585, where there was water, but no camp-ground, except at some distance from the water-front, or a small bay on the north shore of Lot 2731, where there was good ground for camping, but not enough water for ourselves and the occupant, F. G. Eungblut. The southern part of the survey was made from a camp on Lot 4447.

The surface of these three lots is a good deal broken by outcrops of rock, and, except in one or two places, rises steeply from the water. The draws or valleys between the outcrops vary in size, there being, especially on the north side of Lot 2731, several swampy flats, originally covered with cedar, but now logged, which should when cleared raise excellent crops. Others are narrower and stony. The soil, however, whether swampy or stony, is above the average, consisting of yellow clay loam, with very little admixture of gravel.

Lot 2731 has been logged, Lot 3319 only in respect of the ground covered by Lots 4447 and 4448, and Lot 3320 not at all; the latter was, however, pretty completely burnt some twenty or thirty years ago and carries nothing much but second growth. All three lots suffered very much in the big wind-storm of two years ago, not only the first growth, but also large tracts of the second growth being very badly wind-slashed. This made hard surveying, especially for the surveyor, as in places it was impossible to travel the line while carrying the transit, and detours, often of some length, were necessary while moving from hub to hub.

The two chief drawbacks to this subdivision are lack of water (except in regard to lots fronting on either of the two lakes) and difficulty of access. In regard to the first, outside of the small creek at Mr. Eungblut's house, only two small creeks were seen, both of which empty into the north end of Ruby Lake. The small lake, which I tentatively named Ambrose Lake, has no visible overflow in the summer, but has evidently a storm or winter outlet into Ruby Lake. Ambrose Lake is 150 feet above sea-level and Ruby Lake 50 feet, with a rock ridge, or hog-back, between the two. The bottom and shores of Ruby Lake are almost entirely of rock, while Ambrose Lake is muddy and largely surrounded by cranberry-swamp, with an open meadow of considerable size at the south-east end.

In regard to access, there is an uncompleted and apparently abandoned logging-railway running from Mr. Eungblut's bay to the north end of Ruby Lake. This, with a system of old skid-roads from the same bay, will give access to most of Lot 2731.

A portion of the west part was logged down a steep 150-foot bank near the north-west corner, but I think its system of roads connects with the system to the north. Lots fronting on Ruby Lake, with the exception of the two at the north end, will have to depend on the lake for access. In this they will be no worse off than the other lots already surveyed on this lake. A road on a fair grade can be built across Lot 4447 to the south-west end of Ambrose Lake. Construction round the lake would be more difficult owing to the swampy nature of the ground and the fact that the rock runs in places to the edge of the lake.

Early in August I interrupted this survey to make the ties asked for at the head of Salmon Arm. Four days, considerably broken by bad weather, took us with our packs to timber-line, near the north-west corner of Lot 353. An examination made next day of the ground to be covered by the survey convinced me that I had underestimated both the time and the party necessary to complete this work, and I returned to Agamemnon Channel.

On completion of the survey in Agamemnon Channel we moved to the north-east end of Pender Harbour and surveyed a small lot on the unoccupied water-frontage to the east of Lot 3990. This lot is mostly very stony with a gravelly soil, but there are on the front some small patches of the shell soil characteristic of old Indian camp-grounds, and at the back some small open swamps.

The lot has been logged and recently burnt. Part of the burnt ground has been seeded with clover, which, considering the nature of the soil, showed a wonderful growth, partly to be accounted for by an underground flow of water. I also found on this lot a variety of elder that I have never before seen, with a light-blue, almost French-grey, berry.

There are three small springs on the lot—two on the water-front and one on the back. The lot is crossed by a trail leading from Lot 1025 to Lot 4284. No other ground fit for survey was found in this piece.

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

TOBA INLET AND VICINITY, RANGE 1, COAST DISTRICT.

BY JOHN DAVIDSON.

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

VANCOUVER, B.C., December 24th, 1923.

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

RAMSAY ARM.

The triangulation survey of North Passage and Pryce Channel carried out in 1921 was expanded to include Fanny Bay and extended to the head of Ramsay Arm. Here considerable difficulty was experienced in establishing stations along the shore, as the rugged mountains forming the boundaries of the arm terminate at the water's edge in steep bluffs or smooth sloping rock, on which it was impossible to work except with the assistance of ropes. A check base-line 45 chains in length was laid out on the flat at the mouth of the Quatam River, carefully measured, and connected to the main system of triangles.

Ramsay Arm lies between Bute and Toba Inlets, running parallel to the former, 2 to 3 miles east of it. It is, roughly, 7 miles long, has a uniform width of about 1 mile, and is of great depth.

Along both shores rugged mountain ranges rise abruptly from the sea to a height of from 4,000 to 6,000 feet. Their lower slopes support a good growth of fir, cedar, and hemlock, but bare rock cliffs and bluffs with a scanty growth of scrub timber cover the greater part of the mountain-sides, over which many small streams tumble tumultuously from their sources in the snow-capped peaks.

At the head of Ramsay Arm there is a small flat, from which a steep narrow draw rises over a low divide, across which there is an easy route to Bute Inlet at Fawn Bluff.

There is no large area of agricultural land on the shores of the arm, but small garden-patches were being successfully cultivated by various hand-loggers, who were the only people living on the arm.

The Indian reserve at the mouth of the Quatam River was unoccupied, but was visited during the summer by a few Indians, who came to harvest the large crop of wild berries there.

QUATAM RIVER VALLEY.

In the whole length of Ramsay Arm there is only one break in the mountain ranges, and that occurs on the east side about 2 miles up from the entrance, where the Quatam River enters from a deep, narrow U-shaped valley hemmed in by high mountains. This valley commences about 7 miles east of the beach and gradually increases in width from a narrow stream-bed to about half a mile at the mouth of the river.

The Quatam River is a clear stream 100 feet wide and between 2 and 3 feet deep at its mouth, where it occupies the south side of the valley, leaving a flat of about half a mile in width between it and the foot of the mountains to the north.

This flat, divided by old river-channels, is built up of boulders, gravel, and silt brought down by the river and is covered with a light layer of humus. It supports a good growth of spruce, with some large cottonwood, and along the river-banks and old channels a denser growth of berry-brush and small alder is found, while the sides of the valley are covered with tall fir, hemlock, and cedar of good quality.

Many deer and black bear were seen here and it appears to be a good trapping country.

FANNY BAY.

Fanny Bay is a small indentation 1½ miles deep by half a mile wide lying between Bute Inlet and Ramsay Arm. It terminates in a small flat, from which a well-timbered draw rises to the north over a low divide, separating it from Bute Inlet. The sides of the mountains bounding the bay are steep and rugged, with high cliffs and patches of bare rock showing amongst the timber. On the east shore some copper ore has been located.

TOBA INLET.

At the head of Toba Inlet a base-line 90 chains in length was successfully obtained along the north side of the tide-flats, and from it the triangulation survey of the inlet was expanded and run southerly to the entrance; thence westerly along Pryce Channel, connecting with the 1921 triangulation survey at Elizabeth Island, and to a triangulation survey in Waddington Channel made this season by the Dominion Government survey-ship.

From the junction of Pryce and Homfray Channels Toba Inlet penetrates in a north-easterly direction for about 24 miles into the mountains, which restrict it in width to about 1½ miles and tower above it some 6,000 feet.

A British Columbia land surveyor is so accustomed to beautiful scenes that they make little impression on him, but Toba Inlet deserves being mentioned as possessing a picturesque grandeur above the usual.

Looking up the inlet from Redonda Island, with Double and Channel Islands in the foreground, there is a vista of high rugged peaks, some rounded, some terminating in jagged saw-toothed edges of bare rock, all with large patches of snow showing up above and contrasting sharply with the sombre timber-clad slopes, which rise steeply from the blue waters of the inlet. Along close to the water the gnarled arbutus, with their umber limbs and scarlet berries, form a pleasing relief to the mass of deep greens of the coniferous trees.

Farther up the inlet the greater part of the mountain-sides is so steep as to prevent the accumulation of much soil, and consequently nothing but a very scattered growth of hardy scrub fir and cedar is found; but the flatter slopes are well timbered with tall fir and cedar of good quality.

About half-way up the inlet on the north shore lies Salmon Bay, the largest indentation on the inlet. Into it the Brem River flows, after draining a valley about 3 miles long and half a mile wide, formed by the confluence of two steep narrow draws leading down from opposite mountain ranges. The valley is rough but well timbered, and the stream, about 100 feet wide at its mouth, is a possible source of power.

The next most important valley and stream on the north shore is the Tahumming, or, as it is termed locally, "Graveyard Creek." This stream, like many of the smaller streams, issues

from a small lake at the foot of the glaciers and is fed by many tiny glacial streams during its swift tumble down the mountain-side. The well-timbered valley, about 6 miles long, is of the typical V shape, and the stream bends around amongst rock bluffs and through small boulder-strewn canyons which render it useless for driving logs. Its power possibilities have been investigated by the Water Branch.

On the south side of the inlet there are no deep valleys, but several fairly large streams tumble down the mountain-sides in a series of cascades to the sea; one of them, a stream of about 10 feet wide and 2 feet deep, falls directly into the sea from over a cliff about 100 feet high.

About 3 miles from the head of the inlet an old Indian trail follows over a low divide to Powell Lake, and about 5 miles down a deep narrow canyon shelters snow all the year round at a distance of 100 yards from the beach and about 60 feet above sea-level.

The whole head of the inlet is filled by a fine grey silt sand brought down by the river, forming tide-flats which extend for more than a mile from the edge of vegetation, and which so block the river-mouth that boats can only navigate the bars at near high tide.

The Toba River is a swift meandering stream 100 yards in width, flowing between well-defined banks, and navigable by small gas-boats for about 20 miles from its mouth. This summer a small stern-wheeler was operated by a logging company transporting its freight up-stream to the forks, 15 miles.

The Little Toba River drains a large area of timber-clad mountains to the south and meets the main Toba River about 10 miles from the sea. Five miles farther up-stream Filer Creek, or the North Fork, swells the volume of the main river, which has its source in a glacier some 30 miles farther to the east amongst some mountainous country, of which little definite information is known, but which, I am told, is separated from the Lillooet by a fairly accessible divide.

The main Toba Valley is a fertile flat about a mile in width, bounded by steep mountain ranges and divided by the Toba River, which follows a tortuous course between banks about 4 feet high, which it has been known to overflow. It is exceptionally well timbered with a heavy stand of tall spruce, cedar, and fir, which is readily logged into the Toba, one of a very few rivers on the Coast which can be successfully "driven."

A detailed report on the land subdivided for settlement for 5 miles down-stream from the Little Toba River mouth is included in the Report of the Minister of Lands, 1919. These lands were all taken up, improvements have been made, and the soil proved to be very productive. It is anticipated that when further areas in this valley are logged off and subdivided many people will be willing to settle on them, as the soil is similar to that already developed.

HOMFRAY CHANNEL.

A further extension was made down Homfray Channel from the entrance of Toba Inlet to Bohn Point, at the south side of Forbes Bay. From here it will be possible to establish the boundary between the New Westminster District and Range 1, Coast District.

Homfray Channel, 12 miles long by 1½ miles wide, separates Redonda Island from the Mainland and is a well-sheltered route for Coast steamships. Redonda Island is here a burnt-over rocky mountain-side of no agricultural or forest value. The Mainland shore, on the other hand, is well timbered and has several well-sheltered bays, of which Forbes Bay and Attwood Bay are the chief. Forbes Bay is the outlet for a large tract of timber land, the logging of which is now being proceeded with, and camps have been erected in the bay. Attwood Bay affords shelter to several families of hand-loggers, and many men are employed in logging operations being carried out on Brettle Point.

CALM CHANNEL, DREW PASS, DEER PASSAGE, SUTIL CHANNEL.

The 1921 survey was carried south from North Passage through Drew Pass and Calm Channel and east through Deer Passage, connecting with the Pryce Channel triangulation survey. It was also carried south through Sutil Channel, connected to the 1920 triangulation stations on Hill Island and Middle Island, and extended to the west to tie to existing surveys in Evans Bay.

From the Sutil Channel stations a tie was made to Cliff Point Station of the Geodetic Survey of Canada, and a ray read from it to "Valdes" Station, G.S.C., on Discovery Mountain. Last

year a similar tie was made from Nodales Channel to "Tucker" Station, so that all of the triangulation surveys carried out since 1919 in this district are now connected to the Geodetic Survey of Canada.

PRYCE CHANNEL.

Pryce Channel, connecting Calm Channel with Toba Inlet and Homfray Channel, separates the Redonda Islands from the Mainland. The north shore of Redonda Island is steep, rocky, and covered with a scattered growth of scrub timber. A limestone-quarry has been opened up adjacent to a group of mineral claims, carrying good showings of iron ore.

The greater part of the Mainland shore is taken up by a high, barren, fire-swept mountain ridge; but near the east end of the channel there is a small sloping draw on which a pre-emptor has managed to cultivate a small garden and orchard while following the usual occupation of hand-logger.

DEER PASSAGE.

Deer Passage, 4 miles long and 1½ miles wide, is situated between Raza and Redonda Islands. Raza Island is a rough, rugged mountain-top rising 3,000 feet above the sea and occupying an area of about 6 square miles. Most of the timber has been logged off and burnt over, but sufficient is left standing to give employment to several hand-loggers.

Redonda Bay, formerly known as Deceit Bay, is the most important port of call for steamers in this district and up to 1921 was a busy salmon-canning place. A shingle-mill is now operated here, and a logging-railway has been built from the beach, up over a very steep divide and for about 3 miles beyond, down towards Ellis Lake. At the top of this divide the loaded cars of logs are taken over from the locomotive and lowered by cable to the beach.

CALM CHANNEL AND DREW PASS.

The channel between Read Island and Rendezvous Islands is called Drew Pass, and that between Rendezvous Islands and the Mainland is known as Calm Channel. Rendezvous Islands are a group of three small timber-clad islands, the lower of which is uninhabited. On the upper island considerable clearing has been done on two pre-emptions and good fruit and vegetables grown. A school and a plant for manufacturing dogfish-oil and fertilizer occupy the middle island. This plant gives employment to five or six men, in addition to the fishermen engaged in catching the dogfish, which they sell by the ton.

READ ISLAND.

The shore forming the boundary of Drew Pass is rough and rocky, with timber-clad slopes. There is no agricultural land or settlement until Evans Bay is reached. This deep bay, with its many arms, is surrounded by low-lying land, which has been subdivided into home-sites, on which the settlers have made considerable improvements. There is still a large amount of timber to be logged off, which, although not of a first-class quality, is handy to the water and can be profitably logged.

The land subdivided this season lies within a mile of the south end of the island and detailed reports on each lot have been filed.

SUTIL CHANNEL.

Sutil Channel lies between Read Island and Cortes Island. The upper portion of Cortes Island is a long headland of rugged rocks, with a scattered growth of scrub timber, and with neither sheltered bays nor water until near Von Donop Creek, where there is a small area of land and good water suitable for a home-site.

The Penn Islands are four small islands situated in the middle of Sutil Channel, protecting its waters from the southerly gales. They are rocky, rough, and fairly low, and are covered with a light growth of small fir, cedar, jack-pine, and arbutus. In some places there are a few small patches of soil, and water was found on the two larger islands.

GENERAL.

Throughout the coast-line surveyed all existing surveys were found and tied on to, and where the original posts were badly decayed or had been burnt out new posts and B.T.'s were set. In all, seventy existing surveys were tied to.

An almost complete record of the position and height of the mountain ranges bordering the channels was obtained and the position of all streams was carefully noted.

Channel Island and Double Island at the entrance to Toba Inlet, Elizabeth Island in Pryce Channel, the Penn Islands, a group of four in Sutil Channel, Jane Island in Carrington Bay, and an unnamed island a mile farther north were surveyed and a note made of the position of all reefs seen.

In Surge Narrows, Lot 271, Sayward District, was surveyed to define the boundaries of a timber licence, and on Read Island portions of expired T.L. 37502 and of the vacant Crown land to the north were subdivided into lots for home-sites.

During the season 155 miles of shore-line were surveyed by triangulation, 12 miles of shore traverse in surveying islands, and 18 miles of boundary and tie lines were run.

In triangulation-work 497 new stations were erected, of which 179 were permanently marked by drilling holes in solid rock and inserting either an iron post or a wooden plug; or, as in a few cases, stations were marked by driving a 4-foot length if iron pipe into the ground.

A motor-launch, a rowboat with an outboard engine, and two other rowboats were used in the work and a record kept of the mileage covered by them. This totalled 3,426 miles.

ACCESS.

From Vancouver the Union Steamship Company maintains a line of steamers, which call three times a week at Redonda Bay and once a week at Homfray Channel, Toba Inlet (the head), Read Island, and Rendezvous Island. The journey takes from twelve to fourteen hours and costs about $6 for fare.

The most important post-office and store is at Redonda Bay, another post-office and store is at Church House, and another post-office at Read Island. Schools are at Read Island and Rendezvous Island.

INDUSTRIES.

Logging camps are in operation at Forbes Bay in Homfray Channel; Brettle Point in Toba Inlet; on Toba River; on Deer Passage; at Redonda Bay; and in Evans Bay on Read Island. These camps provide employment for a large number of men and should offer a good market for all locally grown produce, as well as take a large amount of the fish which are readily caught in these waters. This season there were more salmon than usual in Toba Inlet, but as no buyers came up from Vancouver only sufficient fish as would serve local needs was taken.

FARMING.

On Cortes Island more land has been cleared than in any other part of the district covered. Here several clearings of 20 acres or more are cultivated and many sheep are raised.

The Toba Valley offers the only large area of agricultural land, as the greater part of the district, even when logged, is unsuited for any agricultural purpose.

CLIMATE.

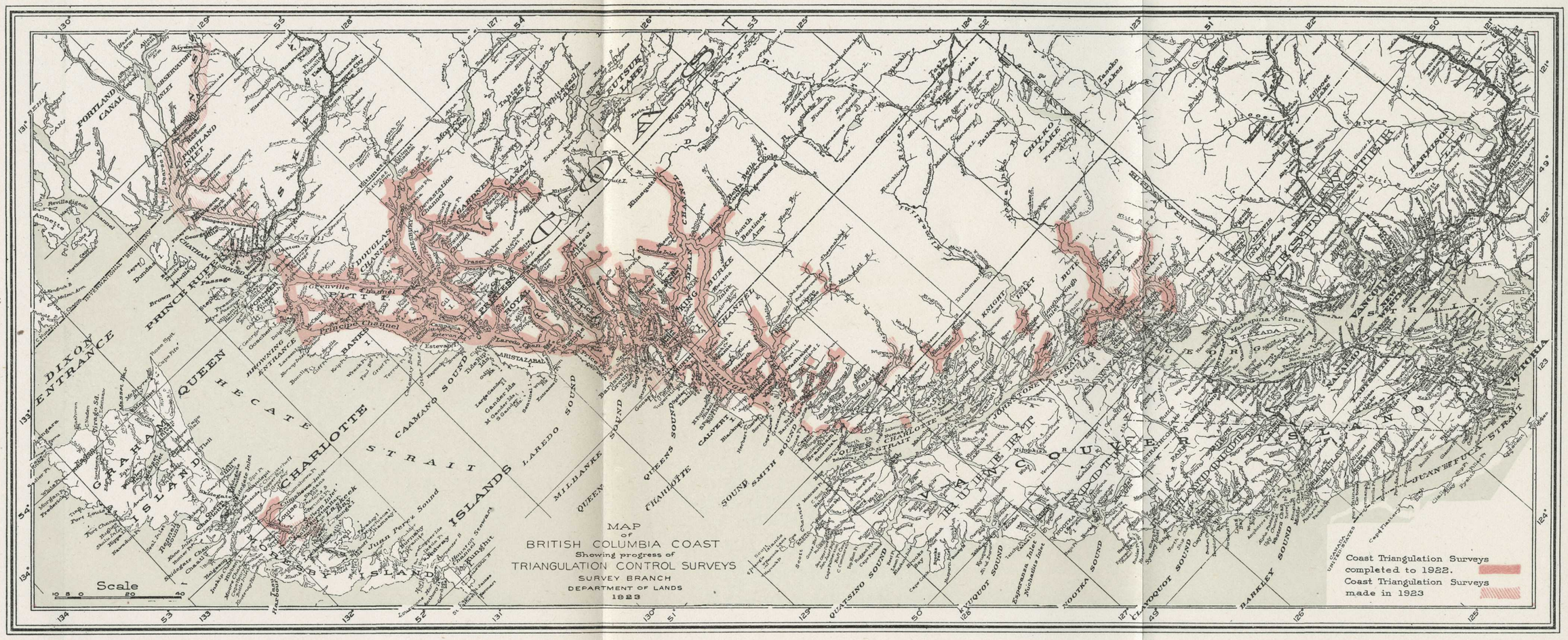
The typical Coast climate, with an annual rainfall of 90 inches, prevails. This summer and autumn were exceptionally free from rain, only four really wet days being experienced from June till November.

GAME.

There are many deer and black bear up the Quatam Valley; but few deer and no bear were met with elsewhere. Grouse were scarce, while porcupines seemed to be numerous.

I have, etc.,

JOHN DAVIDSON, B.C.L.S.


MAP
of
BRITISH COLUMBIA COAST
Showing progress of
TRIANGULATION CONTROL SURVEYS
SURVEY BRANCH
DEPARTMENT OF LANDS
1923
Scale
Coast Triangulation Surveys completed to 1922.
Coast Triangulation Surveys made in 1923
PRINCE RUPERT
DIXON ENTRANCE
HECATE STRAIT
QUEEN CHARLOTTE ISLANDS
GRAHAM ISLAND
CHARLOTTE ISLAND
MORESBY ISLAND
VANCOUVER ISLAND
PORTLAND CANAL
DOUGLAS CHANNEL
GARDNER CANAL
CAAMANO SOUND
LAREDO SOUND
MILBANKE SOUND
QUEENS SOUND
SMITH SOUND
QUATSINO SOUND
NOOTKA SOUND
BARKLEY SOUND
JUAN DE FUCA STRAIT
KNIGHT INLET
BUTE INLET
JOHNSTONE STRAIT
QUATSINO
ALERT BAY
VICTORIA
NANAIMO
CAMPBELL RIVER
PORT HARDY
PRINCE RUPERT
MASSET
SKIDEGATE
QUEEN CHARLOTTE
PORT CLEMENTS
TASU
SANDSPIT
PORT ESSINGTON
KITIMAT
OCEAN FALLS
BELLA COOLA
BELLA BELLA
ALERT BAY
PORT HARDY
CAMPBELL RIVER
NANAIMO
VICTORIA
SOOKE
PORT ALBERNI
TOFINO
UCLUELET
ZEBALLOS
GOLD RIVER
TAHSIS
GOLD STREAM
HARRISON LAKE
CHILKO LAKE
TAKLA LAKE
TREMBLEUR L.
FRANCOIS L.
OOTSUR LAKE
TATLA LAKE
TRAITOR'S COVE
Dundas I.
Pitt I.
Banks I.
Calvert I.
Campania I.
Aristazabal I.
Princess Royal I.
Gil I.
Swindle I.
Hunter I.
Moresby I.
Lyell I.
Kunghit I.
Langara I.
Graham I.
Dixon Entrance
Hecate Strait
Queen Charlotte Strait
Queen Charlotte Sound
Laredo Sound
Caamano Sound
Milbanke Sound
Fitzhugh Sound
Smith Sound
Queens Sound
Quatsino Sound
Nootka Sound
Barkley Sound
Juan de Fuca Strait
Knight Inlet
Bute Inlet
Johnstone Strait
Portland Canal
Douglas Channel
Gardner Canal
Observatory Inlet
Portland Inlet
Princess Royal Channel
Principe Channel
Whale Channel
Grenville Channel
Otter Channel
Browning Entrance
Chatham Sound
Tasu Sound
Skidegate Inlet
Juan Perez Sound
Houston Stewart Channel
Parry Passage
Seymour Inlet
Belize Inlet
Kingcome Inlet
Queen Charlotte Strait
Broughton Strait
Quatsino Sound
Esperanza Inlet
Nootka Sound
Clayoquot Sound
Barkley Sound
Juan de Fuca Strait
Strait of Georgia
Malaspina Strait
Jervis Inlet
Toba Inlet
Bute Inlet
Knight Inlet
Dean Channel
Burke Channel
King Channel
Fisher Channel
Mathieson Channel
Seaforth Channel
Fraser River
Nechako River
Chilko River
Taseko Lakes
Tatla Lake
Francois Lake
Ootsur Lake
Whitesail Lake
Morice Lake
Babine Lake
Takla Lake
Trembleur L.
Stuart Lake
Fraser Lake
Nechako Reservoir
Ootsa Lake
Eutsuk Lake
Tahtsa Lake
Whitesail Lake
Kitimat
Terrace
Prince Rupert
Port Simpson
Masset
Skidegate
Queen Charlotte
Port Clements
Tasu
Sandspit
Port Essington
Ocean Falls
Bella Coola
Bella Bella
Alert Bay
Port Hardy
Campbell River
Nanaimo
Victoria
Sooke
Port Alberni
Tofino
Ucluelet
Zeballos
Gold River
Tahsis
Gold Stream
Harrison Lake
Chilko Lake
Takla Lake
Trembleur L.
Francois L.
Ootsur Lake
Tatla Lake
Traitor's Cove
Quatsino
Alert Bay
Victoria
Nanaimo
Campbell River
Port Hardy
Prince Rupert
Masset
Skidegate
Queen Charlotte
Port Clements
Tasu
Sandspit
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Trembleur L.
Francois L.
Ootsur Lake
Tatla Lake
Traitor's Cove

RANGE 1, COAST DISTRICT.

BY H. H. ROBERTS.

VANCOUVER, B.C., December 1st, 1923.

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

SIR,—I have the honour to submit the following report in connection with surveys made by me in Range 1, Coast District, which consisted of the triangulation of Topaz Harbour, Sunderland Channel, portion of Wellbore Channel, Kingcome Inlet, Wakeman Sound, portion of Knight Inlet, and miscellaneous surveys in those vicinities:—

SUBDIVISION OF TIMBER LEASE 1, TOPAZ HARBOUR.

The season's work commenced at Topaz Harbour with the subdivision of expired Timber Lease 1 into three parcels, to which lot numbers 1837, 1838, and 1839 were assigned. These lots have an average area of 140 acres. The survey of Lot 1840, which covers 60 acres of land lying between the timber lease and Lot 442, was included in our work. The merchantable timber on these parcels has been either logged or burnt. There is practically no rock outcropping on Lot 1840, but from 20 to 40 per cent. of the surface of the other parcels is rocky. Each parcel contains land that can be brought under cultivation. The soil is a red loam from 12 to 24 inches in depth on subsoil of gravel or hard-pan. The general slope is to the south.

Topaz Harbour, a continuation easterly of Sunderland Channel, is about 5 miles long in a north-easterly direction and nearly a mile wide, gradually narrowing to a width of half a mile at the head.

On the north side of the harbour is Jackson Bay, which extends about 1½ miles in a northerly direction. It is reported that there is a considerable area of land suitable for settlement in vicinity of Lapan Lake, which is 1½ miles westerly and accessible by trail from Jackson Bay Post-office.

Extensive logging operations are being carried on in this vicinity. The Wilson-Brady Company is logging its timber holdings at Read Bay by means of a railway, and two other operators are working on Heyden Lake, which is separated from Topaz Harbour by a low divide a third of a mile long. The logs are drawn over the divide to salt water by means of skid-roads and donkey-engines.

TRIANGULATION SURVEYS.

Where circumstances permitted, your instructions for triangulation surveys were closely followed.

On base-lines stakes were driven with their sides on the line at intervals generally of 50 links. Nails were set in the sides of these stakes to support the chain. Stakes marking the extremities of each tape-length were braced and wooden slats for marking purposes were fixed to them. Base-lines were chained with a 500-link tape during calm and cloudy weather. Precautions were taken to determine the errors of the chain due to variation from the Dominion standard, temperature, slope, and sag. The tension of the tape was kept uniform by means of a spring-balance.

Material on the ground, such as driftwood and small trees, was utilized in construction of beacons. For long lines, or where the station was to be occupied more than once, a tripod beacon was put up. This beacon generally consisted of a short pointed mast nailed to three legs made of peeled poles of about 4 inches diameter. The legs were put up at such a height that the instrument could be set up underneath and care was taken that the legs would not interfere with the observation of other stations. The mast, having been nailed to the legs, was made vertical and set approximately over a portion of the ground or rock suitable for a station; then the legs were braced and the lower ends weighted down by large stones or wedged to cracks in the rock. Finally, the mark for the station was set vertically below the point of the mast by intersection with the transit in two positions at right angles to each other. The operation just described was found much simpler than the reverse one of setting up a tripod beacon over a station already in place.

For short lines and stations for tying to survey corners the beacon was a pointed vertical pole held in position by three braces, with the ends secured by horizontal pieces weighted with rocks.

Stations on rocks were marked by iron posts in drill-holes or by a cross chiselled in the rock; while in soft ground iron pipes were used. Wherever possible the main stations were referenced by means of bearing trees.

Topography was taken chiefly by transit and stadia or by application of the "three-point problem." For topographical purposes a sextant would have proved very useful.

WELLBORE AND SUNDERLAND CHANNELS.

The triangulation of these channels was based on a line measured along foreshore of Lots 1837 and 1838 in Topaz Harbour. As a check on the work a base-line was also measured near the westerly end of Hardwicke Island. The Dominion Geodetic Station on Mount Spencer, on east side of Jackson Bay, was tied in to the triangulation.

Wellbore and Sunderland Channels separate Hardwicke Island from the Mainland. The former is 4 miles long and has an average width of one-third of a mile. At Carterer Point, where the channel narrows to a width of a quarter of a mile, the tidal currents are very strong.

A tie survey took us into Forward Harbour, which is situated on the easterly side of Wellbore Channel. At the entrance the harbour is only 800 feet wide, but it widens out to a width of about half a mile. It extends 3 miles in an easterly direction and has good anchorage.

Sunderland Channel is about 1¼ miles wide and extends 8 miles in a north-easterly direction. York and Clarence Islands at the westerly entrance to the channel, Seymour and Poyntz Islets in mid-channel, and Murray Island at entrance to Topaz Harbour were included in our work. All these islands, with the exception of York Island, are very small. York Island, almost circular in shape, with a diameter of about one-third of a mile, lies at a distance of half a mile off the westerly end of Hardwicke Island and is covered with groves of alder and jack-pine and scattered fir.

With the survey of Lot 1846 on westernmost point of Hardwicke Island, our work in vicinity of Sunderland Channel was completed. This lot has frontage on both Sunderland Channel and Johnstone Strait. In the bay on southerly boundary of the lot there is a good home-site, gravel beach, and good shelter for boats. The soil is a red loam on gravel subsoil, but the greater portion of this area is of a rocky nature.

JOHNSTONE STRAIT.

The work in this vicinity consisted of the tying-in of surveys on Hardwicke Island to surveys near Salmon River, Vancouver Island.

Johnstone Strait extends from Chatham Point to Beaver Cove, a distance of about 50 miles, and separates Vancouver Island from the Mainland. Its breadth varies from 1 to 2 miles. This channel is the route usually taken by coastwise shipping. Fairly strong tidal currents occur in this strait. In the neighbourhood of Port Khusan, owing to tide-rips and races at certain times of the tide, we found the crossing of this channel a hazardous undertaking with a small launch.

The southerly shore of Johnstone Strait is a series of mountain ranges rising abruptly to a height of 2,000 to 5,000 feet. Behind the mountains there are wide valleys containing large areas of timber lands. Some of the land in these valleys can be developed agriculturally when the timber has been logged. It has been reported that the valley of the Salmon River contains a tract about 30 miles long and from 1 to 3 miles wide that will eventually be available for settlement. Some of the logged-off lands have already been taken up, and it has been proved that ordinary garden and farm crops can be grown successfully.

TIE SURVEYS, TRIBUNE CHANNEL, SIMOON AND MACKENZIE SOUNDS.

Tribune Channel, separating Gilford Island from the Mainland, is 22 miles long and varies in width from 1 to 2 miles.

Ties were made between surveys in vicinity of Wahkana Bay on Gilford Island and Kwatsi Bay on the Mainland, the work being done partly by shore traverse and partly by triangulation. Smoke from a forest fire at the entrance to Thompson Sound caused much inconvenience and delay during these operations.

Simoon Sound, an indentation of the Mainland near the junction of Tribune and Sutlej Channels and having an average width of two-thirds of a mile, extends 1½ miles in a north-easterly direction, and then makes a sudden turn to the west, maintaining this general direction for about 3 miles to the head, where only a narrow neck about 2 chains wide separates this

sound from Shawl Bay in Sutlej Channel. The plan of the peninsula (known as the Wishart Peninsula) formed by the meanderings of Simoon Sound is a good illustration of the manner in which many of the islands on the Coast may have originated. The most conspicuous natural features in this sound are the steep cliffs known as "Deep Sea Bluff" at its easterly entrance, which colonies of sea-gulls use as nesting-grounds; and Bald Mountain, an isolated granite dome 2,925 feet high, which, according to Indian lore, is an extinct volcano. Timber licences situated on the slopes of this mountain were tied to during the season.

The journey from Simoon Sound to Mackenzie Sound is by way of Sutlej Channel and narrow passages between Kinnaird Island, Watson Island, and the Mainland. In this sound, which is about 6 miles long and rather narrow, ties were made to Lots 613 and 784.

KINGCOME INLET TRIANGULATION.

On this work a base-line nearly 50 chains in length was measured on the marsh at the head of Kingcome Inlet and a check-base 55 chains long was obtained at the head of Wakeman Sound.

Kingcome Inlet is nearly 20 miles long and its general direction is east and west. The northerly shore is bordered by mountains of over 5,000 feet elevation, but the range on the southerly shore is slightly lower. The Kingcome Mountains, 5,600 feet high, tower over the head of the inlet. Wakeman Sound, a tributary channel on the northerly shore of the inlet, extends 5 miles northerly.

The delta lands at the mouths of Kingcome and Wakeman Rivers, which drain the valleys at the heads of these channels, comprise the largest flat areas in this part of the Coast. Elsewhere the amount of agricultural land is small. Garden and farm produce is grown successfully near the mouth of the Kingcome River. The timber lands in Kingcome River Valley are held chiefly by the Powell River Company, which has been carrying on logging operations for some years.

At Charles Creek, midway on the northerly shore of the inlet, the Preston Packing Company is operating a cannery and general store.

KNIGHT INLET TRIANGULATION.

Knight Inlet is one of the most extensive inlets on the Coast. It extends from Queen Charlotte Sound, 40 miles in an easterly direction, to Glendale Cove, and from there northerly about 30 miles. The Klinaklini River flows into the head after cutting its way through the mountains from the Interior Plateau. A maze of islands, of which Cracroft, Turnour, and Harbledown are the largest, are situated in or near the entrance to the inlet. Both shores of the inlet are bordered by mountains ranging from 1,000 to 7,000 feet elevation. In passing up the inlet the westerly portion is generally timbered and the elevations of the enclosing mountains are at first lower, but beyond Glendale Cove the timbered areas are not so extensive and the mountains rise up to great heights, in places almost perpendicularly from salt water.

At Glendale Cove, one of the few harbours on Knight Inlet, a broad valley opens up to the south, in which are situated Martin, Tom Brown, and Glendale Lakes. The lands surrounding these lakes carry considerable timber. Another timbered valley is situate about 3 miles east of Glendale Cove, extending across country to the head of Loughborough Inlet. As yet no logging operations on a large scale have been carried on in Knight Inlet. There is a post-office, store, and cannery at the cove.

About three weeks at the end of the season were spent on triangulation of portion of inlet in vicinity of Glendale Cove. A base-line 54 chains long was obtained near the head of Glendale Cove and by extension was connected with the main triangulation system on the inlet.

GENERAL.

In the area covered by this report the climate is somewhat mild, the mean annual temperature varying from 45° to 50° F. The rainfall varies from 70 to 110 inches, and it has been estimated that 70 per cent. falls in the autumn and winter months and the balance in the spring and summer. Very little rain fell during the survey season, only two days being lost through rain. The climate is very favourable to forest-development and the logging of timbered lands

is the principal industry. The logs are put together in booms or rafts and towed down to the mills in Vancouver and vicinity.

Large steamers use the main channels on their way to northern ports and smaller steamers give access to the inner channels, adjusting their points of call to suit the requirements of settlers and the logging and fishing industries.

I have, etc.,
H. H. ROBERTS, B.C.L.S.

COAST TRIANGULATION, RANGES 2 AND 3, COAST DISTRICT.

BY J. T. UNDERHILL.

VANCOUVER, B.C., December 29th, 1923.

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 Ranges 2 and 3, Coast District, which consisted of various stretches of Coast triangulation, together with one lot survey for the Department of Marine and Fisheries. The triangulation covered the easterly part of Seymour Inlet, with Frederick Sound and Salmon Arm; Kwakshua Channel, lying between Calvert and Hecate Islands; the Bardswell Group, with ties to Goose Island and Hunter Channel; Finlayson Channel, Tolmie Channel, Meyers Passage, Oscar Passage, and Jackson Passage. The lot surveyed for the Department of Marine and Fisheries in Schooner Pass, Rivers Inlet, was for purposes of a patrol station in that area.

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, 551 triangulation stations were occupied and 156 monuments placed. Four geodetic stations were also tied in. This season, particularly in the Bardswell Group, a great deal more stadia-work was done, but care was taken in all cases to have this type of work controlled, in so far as possible, by definite points fixed by triangulation.

SEYMOUR INLET, FREDERICK SOUND, AND SALMON ARM.

The work done in Seymour Inlet proper consisted of that portion lying to the east of Warner Bay. This body of water is bordered by steep rocky mountain-sides more or less of an even height from Warner Bay to the vicinity of Maunsell Bay, but increasing in height and ruggedness from the latter point to the head of the inlet. Glacial evidence is abundant, and it would appear that this inlet, together with those in the close vicinity, are the results of glaciers working westerly to the Pacific. Belize Inlet probably at one time was connected to Seymour Inlet in the vicinity of Maunsell Bay, the present low-lying divide being the result, at a later date, of slides from the hills on either side. Eclipse Narrows was also gouged out at the same time, permitting the movement of ice down Salmon Arm and into Seymour Inlet.

Generally speaking, the shores of Seymour Inlet are well timbered with cedar, hemlock, spruce, and balsam, except where broken here and there by rock bluffs and gulches. Hand-logging was in progress at a number of points this summer, but more extensive operations are limited to a few areas owing to the roughness of the country. Warner Bay area, being less broken by ridges and with moderately easy access to timber areas to the south, will probably be logged by power in the near future.

The agricultural possibilities of this part of Seymour Inlet are negligible. Only small areas of comparatively level land occur and they are very much shut in by the mountain ranges. What soil there is is extremely variable in depth, running from a few feet to rock outcropping a short distance away. Some of the more level portions consist of a shallow depth of muskeg and gravel caught in depressions of the underlying rock.

Few indications of mineral were seen in this area. The mineral claims on the south shore opposite Wigwam Bay are capped with magnetite and produced a very marked local attraction on the compass. A similar local attraction of approximately the same intensity was noticed in the vicinity of Warner Bay, but no exposed showing of iron was seen.

Frederick Sound, with its branch, Salmon Arm, are connected to Seymour Inlet by a narrow neck of water known as "Eclipse Narrows."

Frederick Arm proper is very steep and precipitous on its westerly shore, with numerous rock bluffs and slides. Its easterly shore slopes more gently to the water and is fairly well timbered throughout. Salmon Arm is bordered by moderately steep mountain-sides, flattening out somewhat at its head into a well-timbered valley.

Any one accustomed to working on tidal waters is immediately struck by the small range of the tides in the Seymour Inlet area. This is due to the narrow entrance of the inlet so restricting the flow of tides that the waters within cannot keep pace with the rise and fall of the open ocean. This also causes heavy tidal rapids at the narrows, which should not be navigated except at or near slack water, particulars of which are given in "B.C. Coast Tide Tables."

Owing to the above conditions the tidal flow in Seymour Inlet is not so strong as in most of the coastal inlets, except in the vicinity of the narrows themselves, where it is exaggerated.

Apparently the narrows also tend to restrict the marine life of the inlet. It suffers both as regards variety and size when compared to the marine life of the ocean so closely adjacent.

KWAKSHUA CHANNEL.

This body of water, separating Calvert and Hecate Islands, is shaped, roughly, in the form of an inverted T. The stroke of the T, running in an easterly and westerly direction, very nearly connects Fitzhugh Sound with the Pacific Ocean to the west, while the body of the T runs northerly into Hakai Channel. The east and west reach of the channel is bordered on the Calvert Island side by rough broken mountain-sides, decreasing in height and roughness and approaching sea-level as you proceed westerly. Mount Buxton, the highest peak of Calvert Island, falls off steeply towards the easterly end of Kwakshua and runs out in an ever-lowering shoulder towards the west. While this shore is generally well fringed with timber of poor quality, large areas of comparatively open ground, consisting of muskeg with stunted wind-swept vegetation, can be seen immediately behind. The Hecate Island shore is lower lying, with the same general falling-off in height to the west. It is moderately timbered for its easterly 4 miles, but runs out in the west to almost bare rock hummocks with a very light covering of scattered stunted pine and hemlock.

Both shores bordering the north and south reach of Kwakshua are much-broken rocky knolls, sparsely timbered with poor-quality hemlock, cedar, and pine.

The land bordering Kwakshua is devoid of agricultural possibilities and apparently possesses no mineral resources whatever.

The channel appears to be free for navigation, except at its junction with Hakai. Here a number of reefs and rocks have to be avoided; the majority, however, usually break in the continual swells coming in from the open Pacific. The tides are normal, flowing in and out from Fitzhugh Sound and Hakai Pass and meeting at the bend of the channel.

Owing to its very closeness to the open ocean the marine life is more prolific than in the more remote inner channels, but yet is undoubtedly less than in the open waters a few miles away.

Besides the work in the channel itself, a tie was made down the west coast of Calvert Island to Lot 897. Also a few triangles, mainly for topographical purposes, were laid out in the vicinity of Welcome Harbour to place the small islands at the south-westerly extreme of Hakai Pass.

The tie to Lot 897 followed the foreshore in the main, but owing to the increasing roughness in the vicinity of this lot had to be taken inland. This stretch of coast, commencing with beautiful sand beaches separated by narrow fangs of rock, becomes more and more broken, till the beaches disappear and a forbidding stretch of broken rock cliffs continue southerly as far as the work was carried. Behind the shore the country is comparatively open, being very sparsely covered with stunted pine, cedar, and hemlock. It rises gradually eastward in a series of rolling hillocks covered with only sufficient soil to support the scant vegetation.

The work at the south-west end of Hakai covered a small area of small islands, besides giving a definition of the north-west corner of Calvert Island. This shore is similar to that covered by the northerly portion of the traverse to Lot 897.

BARDSWELL GROUP.

This group of islands, lying south of Seaforth Channel and between Milbanke Sound and Lama Pass, is probably by far the most interesting group on our Coast. The islands are divided roughly into four sections by three main channels—namely, Hecate Channel, Joassa Channel, and Gale Creek—running in a general northerly direction. These three waterways are connected laterally at their southern ends by several narrow channels running between the numerous small islands. At their northern ends they are connected by Seaforth Channel. From a point of greatest elevation of just over 1,000 feet in the vicinity of the junction of Hecate and Seaforth Channels the land falls away in a southerly and westerly direction, the islands becoming smaller and more numerous and gradually running out to bare rocks and reefs at sea-level.

Hecate Channel, the largest and most easterly of the three north-and-south waterways, is fairly accurately shown on existing charts. It affords an excellent passage for fishing-boats running out to Goose Island, being in the main free from obstructions as far as navigation is concerned. Two lagoons run off from this channel, both penetrating into Campbell Island. The first, a small lagoon nearly opposite Cundale Bay, can only be entered at high tide. The second, of considerable size, runs off just south of Matilda Island. The entrance, being narrow and blocked by islets, is subject to tide-races. Inside the lagoon opens out into two basins connected by a neck of water.

Joassa Channel, composed of Rait and Boddy Creeks, is roughly shaped like the letter "Y" inverted, the body of the Y connecting through northerly to Seaforth Channel. The easterly branch of the Y connects south of Horsfall Island with Hecate Channel, while the westerly branch runs out into Thompson Basin. The channel is almost blocked by small islands at the junction of the two branches.

This waterway is only possible for small boats, being very narrow in places and obstructed at other points by reefs. One small inlet near its northerly end projects into Horsfall Island.

Gale Creek, the most westerly waterway, is only passable at high-water slack. It consists of a central lagoon of fair size, with narrow waterways connecting Seaforth Channel to the north and Thompson Basin to the south. Tidal rapids occur in both of these narrow parts of the channel. Offshoots from the main central lagoon run off to the east and south-west; two of these side lagoons being well stocked with oysters. Gale Creek is nearly connected to the west by a large lagoon running in easterly just south of Sound Point and to the narrow inlet continuing easterly from the head of Anchor Bay.

From Anchor Bay south-easterly to Plumper Channel the area is a maze of small islands separated by narrow tortuous channels fronted on the seaward side by bare rocks and reefs. To describe same in detail would be a stupendous task, and only by consulting plans of this season's surveys can an accurate knowledge of the lay of the land be obtained.

The Bardswell Group is generally well timbered with cedar, yellow cedar, hemlock, spruce, and pine of small size and poor quality. No great depth of soil occurs, the ridges being rocky, with a light covering of gravel, while in the depressions the ground is inclined to be swampy and verging on muskeg. For the most part the underbrush is not thick, but patches of dense salal are encountered here and there, more particularly towards the ocean-front. Fresh water, strange to say, is more abundant in the lower-lying islands of the westerly half than in the more formed valleys of the easterly portion, probably being due to springs and not to natural run-off.

The possible mineral resources of these islands could not be determined without a proper investigation. While showings were seen in places, the scope of this work did not permit of their further examination, and without this, conclusions are apt to be misleading.

The marine life throughout this area is most interesting, in variety and numbers excelling any other portion of the Coast. Coral-growth, usually found only in deeper water or washed up on surf-exposed parts of the shore, may be seen in many of the interior lagoons. This group is also blessed with at least three oyster-beds.

To describe the intricacies of the tidal changes is impossible without a plan before you. However, by noting the variations of width of channel, etc., any one accustomed to this Coast can arrive at a very close approximation of actual conditions without being present.

Given summer weather similar to the last two years, few places on our Coast can approach this group of islands as a potential summer resort for those fond of boating. One can spend days among the maze of sheltered waterways, or, if he so desires, can enjoy the ocean swells of the open Pacific.

FINLAYSON CHANNEL.

This channel, being a portion of the inside course for steamship-travel up and down the Coast, is generally well known and needs little description. It runs almost due north from the north-east corner of Milbanke Sound a distance of approximately 28 miles to its junction with Sheep Passage. At its southern end it has an average width of about 3 miles, but narrows down to half this at its northern extremity. Both shores are generally well timbered with cedar, hemlock, and spruce of fair quality and rise moderately steeply to the mountain ranges behind. A few small areas of level land are situated at the head of some of the bays, and while apparently suitable for agricultural purposes, the lack of any close market tends to destroy their present value.

A few indications of possible mineral resources, such as copper-leaching and iron-cappings, can be seen here and there on the shores of the channel, but as these have doubtless already been looked into, it is unlikely they portend any commercial bodies of ore. Outcrops of limestone generally more or less iron-stained occur at several points, being most noticeable on the south-east corner of Sarah Island.

Finlayson Channel is free from danger to navigation, but subject to moderately strong tidal currents, particularly the ebb. The flow of the outrunning tide is noticeable throughout its entire length, and tide-rips are common in the vicinity of Jane Island and at its junction with Milbanke Sound. The marine life is typical of inside coastal waters.

OSCAR AND JACKSON PASSAGES.

Oscar Passage, running in an easterly direction, connects Finlayson and Mathieson Channels and is approximately 6 miles in length, with an average width of under a mile. It is free of reefs, except close inshore, and, like Finlayson Channel, has a perceptible tidal current, particularly during the ebb. A considerable portion of the tidal flow from Mathieson Channel finds egress to Milbanke Sound via this passage.

Its shores are moderately well timbered throughout, being better favoured in the vicinity of its middle length, at which part both shores have been partially logged. The timber is of poor quality at both ends of the channel. No level areas of any extent occur, the shores sloping back quickly to the surrounding hills.

Jackson Passage, about 7 miles long and varying from half a mile to a few chains in width, runs in a south-easterly direction and also connects Finlayson and Mathieson Channels. It is used by small boats wishing to avoid Milbanke Sound, but is impassable for large craft, being nearly choked at its eastern end. Both shores are well timbered throughout with cedar, hemlock, and spruce, but, except for a small area on the north shore and scattered hand-logging, the timber has not been touched.

A few small scattered areas of comparatively level land might ultimately be suitable for pre-emptions, the land rising more gently to the neighbouring hills than is common on this part of the Coast.

This summer, after many years of disuse, the old cannery building at the west end of Jackson Pass was used to put up dry-salted salmon for export to Japan.

TOLMIE CHANNEL.

Tolmie Channel, with its extension, Klemtu Pass, might almost be called a branch of Finlayson Channel, being split from the latter by Cone, Jane, and Sarah Islands. From its junction with Finlayson Channel at the south end of Klemtu Pass it runs in a northerly direction for approximately 22 miles, varying from a quarter to nearly 2 miles in width. It is connected around the north end of Sarah Island to Finlayson Channel by means of Heikish Narrows. Tolmie Channel, being a portion of the main inside steamship route, is well known to those passing up and down the Coast. Its shores are well timbered and rise moderately steeply to the ridges behind.

On the western shore two large bights protrude into Princess Royal Island. The more southerly, opposite Separation Point, twists and turns for a distance of, roughly, 5 miles, and appears to approach the low valley at the eastern end of Bloomfield Lake opening into Laredo Inlet. The other, known as "Cougar Bay," is some 3 miles farther north and is defined by the timber surveys which it borders.

Hand-logging has been carried on in various parts of the channel, but during this summer the only active operations were in the bay opposite Separation Point. Some of the more level areas of land may ultimately be taken up as pre-emptions, but are more likely to be utilized for homes of those engaged in fishing or hand-logging during their periods of unemployment.

Scarcely any indications of mineral were noticed, but outcroppings of limestone discoloured by iron-stain occur at the north end of the channel on both shores.

China Hat, the Indian settlement in Klemtu Pass behind Cone Island, affords winter shelter for a number of Indians engaged in fishing and hand-logging during the summer months. The village is almost deserted from June to September, and during that period is a most uncertain port of call in so far as steamship service is concerned.

The tidal flow in Tolmie Channel is quite perceptible, more especially in the vicinity of Separation Point and behind Jane and Cone Islands. The ebb runs out of Tolmie for some time after apparent slack in Finlayson Channel. Being ultimately connected to the open sea in no less than three directions, the tidal currents in Tolmie Channel vary considerably during the full period of any one tide.

The marine life is typical of inside coastal waters.

MEYERS PASSAGE.

This body of water connecting Tolmie Channel to Laredo Sound forms the north boundary of Swindle Island. From Separation Point at its junction with Tolmie Channel it runs southerly for a distance of slightly over 4 miles, and then turns sharply to the west for a further 8 miles to Laredo Sound. It varies much in width, ranging from over 1½ miles at its northern end, contracting to a few chains in width just west of the elbow, and broadening out again towards its western end to approximately half a mile.

For seine-boats and such-like travelling between Laredo Channel and points to the south of Milbanke Sound this passage provides an inside course, whereby the exposed waters rounding Price Island may be avoided in stormy weather. It is risky for larger vessels on account of the shallow depth of water in the narrows just to the west of the turn. They could not use this passage at half-tides or less, but, owing to the big range of tides in this latitude, could probably pass through safely at or near full tide.

Both shores of this channel are well timbered and not unduly steep, except for the spur of Swindle Island running out to Separation Point. The timber, while fair in the vicinity of Tolmie Channel, gradually gets poorer in quality and smaller to the west, being of little present commercial value in the vicinity of Laredo Sound. One hand-logger was working this summer on the shores of the narrows.

Some of the land bordering this channel might be of agricultural value in the future, but suffers in common with most of the Northern Coast in having no handy market and the probability of too much precipitation during wet summers.

Like most of the surrounding channels, the shores of this waterway have showings of mineral, but seemingly no commercial bodies of ore behind them.

The tidal flow in this channel is noticeable, particularly at the narrows. At this point the current probably varies from 2 to 4 knots, depending on the range of the tide.

Marine life, both animal and vegetable, is more prolific west of the elbow than to the east, due to the nearness of the ocean. The narrows themselves are nearly blocked by kelp during the summer months.

WEATHER.

The weather this season was extremely good, little or no rain falling during the summer months. While in Seymour Inlet, particularly in Frederick Sound, which is very much shut in from the western exposure, rain-clouds could be noticed gathering in the hills, while to the west apparently the weather was clear. I judge, therefore, that this particular locality is more subject to wet weather than the other portions of Seymour Inlet. On the Coast north of Queen Charlotte Sound the weather seemed to be more or less uniform throughout the inner channels, giving evidence of being colder and possibly subject to more precipitation than on the Pacific shores, which are undoubtedly influenced by the Japan Current. This could be noticed during the occasional stormy spells, when, looking to the west, a more or less clear sky could be seen. A great deal of this Coast, if the weather should be like the two previous summers, would make

an ideal summer resort for those fond of boating. It is doubtful if the summer season is long enough to mature all crops that normally grow in these latitudes, but many of these islands and waterways are interesting to travel among and through, and the weather is quite sufficiently warm to be glad of sea-breezes. It would seem that possibly in the near future some of the steamship companies plying up the Coast would find it profitable to locate a summer hotel somewhere on this strip of Coast for tourist traffic. At present a great deal is made of the mountain scenery of British Columbia, and the contrast of a summer resort on the open Pacific would undoubtedly appeal to a great many people from the Prairies and other inland points.

GAME.

Game in the vicinity of Seymour Inlet was very scarce, and outside of trout, in practically all the streams fished in, no game was seen. Many of the hand-loggers in the inlet stated that deer were fairly plentiful, but their numbers were being reduced by wolves.

A certain amount of trapping is carried on here during the winter months. The Coast covered north of Queen Charlotte Sound is abundantly stocked with deer, ducks, snipe, and other sea-birds, and also a few flock of geese, which apparently were breeding locally. In all the larger creeks trout were found, as in also most of the lakes from which they were fed. In this connection the Bardswell Group might be particularly mentioned. Besides having all the previously mentioned game, they have at least three oyster-lagoons.

Throughout all these inner channels, and even on the westerly exposed shores, trapping is apparently carried on during the winter months, as evidenced by the great number of deadfalls seen. Mink seem to be particularly plentiful. The amount of trapping varies naturally with the market price of fur, and since 1920 seems to have fallen away with the falling-off in price.

I have, etc.,

JAMES T. UNDERHILL, B.C.L.S.

NORTHERN COAST, RANGES 4 AND 5, COAST DISTRICT.

BY P. M. MONCKTON.

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

TERRACE, B.C., November 1st, 1923.

SIR,—I have the honour to submit the following report on surveys carried out during the season, which consisted of various connections scattered along the Coast between Prince Rupert and Ocean Falls; the major part being ties between fourteen stations set by the Geodetic Survey of Canada and the Coast triangulation system of the Provincial Government. For this purpose the launch "Ala" was chartered in Prince Rupert.

Operations were commenced at Jap Inlet, Porcher Island, with an amending survey of Lots 1288 and 6784, on the latter of which a very creditable amount of work has been done by the pre-emptor, Harry Wright. This done, a triangulation of Chatham Sound was carried out, tying in the Geodetic Stations "Stephens," "Bell," and "Kennedy," also some land surveys and hydrographic stations. During June we also tied in the geodetic points near Prince Rupert—one, "Oldfield," on Kaien Island, immediately back of the town; the other, called "Rupert," on the Mainland, about 5 miles east of Prince Rupert. A good deal of time was lost on this work owing to the prevalence of fog on the mountain-tops; those peaks nearest the Hecate Strait being the worst in this respect. During the second week of July and the first week in August Mr. Wright's triangulation was extended to the head of Kitkatla Inlet, and from this ties were made to the Geodetic Stations "Oval," "Goschen," and "Egeria."

On August 7th we moved down Granville Channel as far as Kyngeal Inlet, of which a running survey was made. The name of this inlet as spelt is rather a tongue-twister to the uninitiated; in fact, it is very difficult to induce even those who should know to attempt it. We once surprised an old-timer into pronouncing it; the result sounded something like "Quesnel," but after this *faux pas* he evaded the difficulty by referring to it as "that inlet near Klewnuggit." The unsurveyed arms of Klewnuggit Inlet were mapped at the same time, and after a pause at Lowe Inlet for provisions the journey was continued to Rivers Bight, on Princess Royal Island. This is a large body of water with two arms and covers a surface of about 1,500 acres. Access

can be had only through a narrow, canyon-like opening not over 100 feet wide, outside which there is shallow water, with rocks and kelp. Except at the slack water this channel is not navigable, forming a very violent rapid with a fall of 8 feet either inside or outside, according to whether it be high or low water in Whale Channel. The slack water occurs three hours after high and low water outside and the rise and fall in the inlet is about a foot. No trace could be found of Lot 1265, reputed to be half a mile up the river at the head of the East Arm, though three days were spent searching for it. From here on August 13th we felt our way through a dense fog to Swanson Bay, calling en route at Butedale to take on gasolene at the oil-station now maintained there by the Imperial Oil Company. At Swanson Bay a tie was made to the Geodetic Station "Swanson" on the summit of a rugged peak some 3,848 feet above the sea-level, lying immediately back of the pulp-mill.

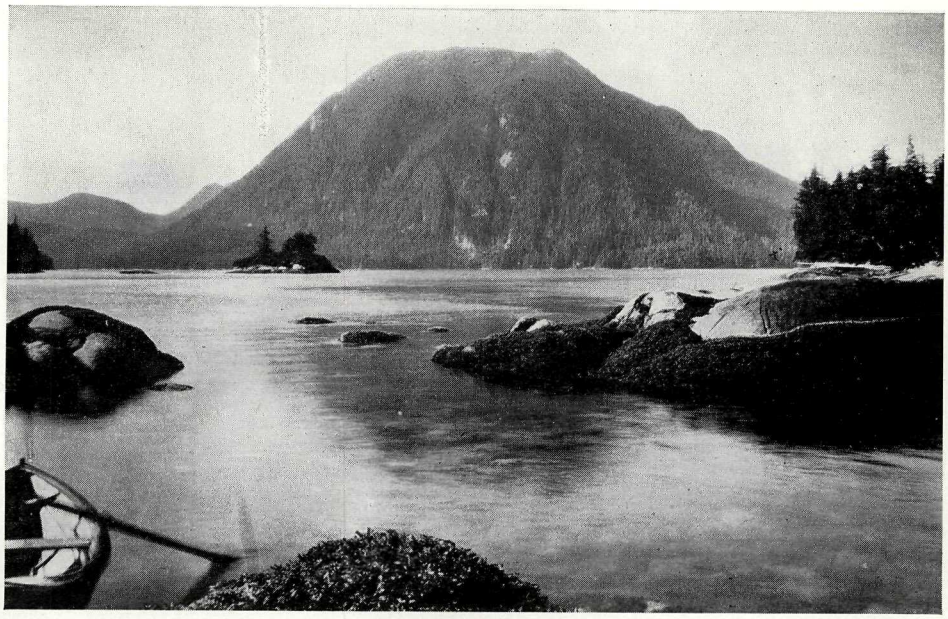
August 18th was taken up by the journey to Klicksoatli Harbour, on Denny Island, where a tie was made to the Station "Denny." At Bella Bella, near this point, there is a large cannery and another Imperial Oil Company supply-station, of which advantage was taken. A move was next made via Gunboat and Johnson Channels to make the tie to "Roscoe" Geodetic Station. Bad weather lost some time here. This station is the highest encountered, 4,025 feet, reached by a trail which resembles a ladder for the first hour of the climb. On the 28th we left this vicinity and went through Return Channel, Seaforth Channel, Mary Pass, and Canoe Pass to Mathieson Channel, anchoring in Tom Bay. In this snug harbour we were weather-bound for a few days. Monuments were then set along Mathieson Channel, Mussel Inlet, and Sheep Passage and a tie was made to Lot 308 in Griffin Pass.

We reached Swanson Bay on September 8th and replenished the lockers. On the 11th we ran northwards, calling again at Butedale for oil, and anchored at Goat Cove, in Ursula Channel, continuing the next day to Danube Bay, on the north shore of Verney Passage. Here an investigation was carried out of the overlapping of an old Crown grant by two more recently surveyed timber limits.

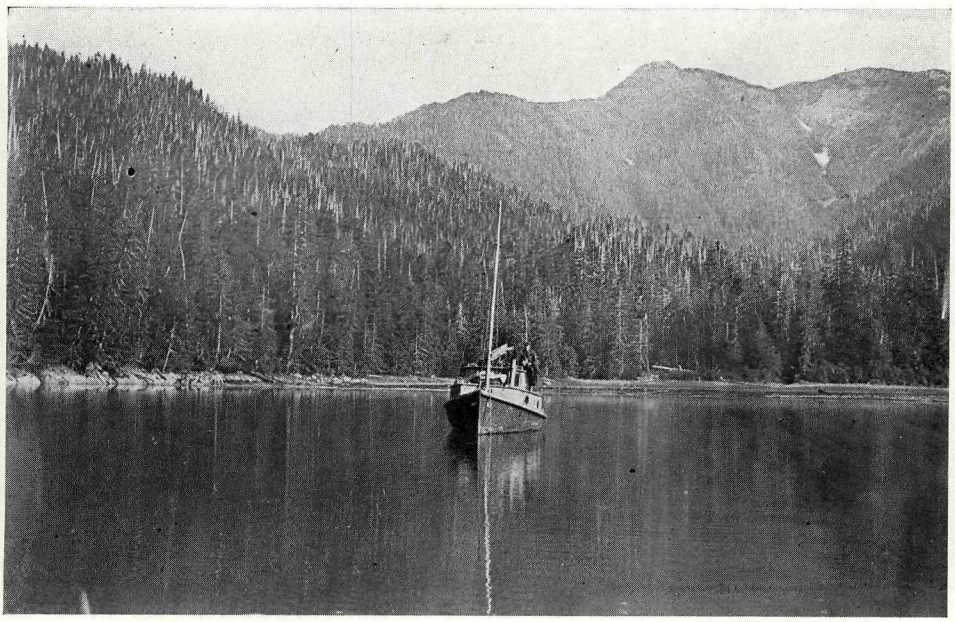
On the 20th the stage was all set for the ascent to the Geodetic Station called "Barnard," about which we had heard rather fearsome stories from members of that survey. The Admiralty chart shows its height to be 4,500 feet, in addition to which we knew that we had to climb over one intervening ridge and then descend a considerable distance before tackling the main peak; this intervening ridge being credited with 4,300 feet on the chart. Accordingly, about dawn, at 6 a.m. by our own daylight-saving time, we left the beach. At 8 a.m. we reached the first ridge, which proved to be, by the aneroid, but 2,950 feet, whence the trail falls to 2,580 feet, and rises gently to the station, which we reached by 9 a.m., the elevation here being by calculation 3,184 feet. Angles being read, we were again at salt water in time for a late lunch.

As a contrast to this, on the other hand, "Campania" proved to be farther back and higher than anticipated; this station is on the very rough, rocky island which bears the same name, nearly all of it bare of timber. The equinoctial gales made their appearance while we were here, and in the company of several halibut-boats we lay storm-bound in a fine harbour on Otter Channel. There was a decided improvement in the weather on the 29th, the wind veering to the south-west, and a course was laid up Principe Channel, taking care to avoid Brodie Rock, on which the "Algerine" was wrecked two weeks later. This rock lies in Nepean Sound, about a mile off Pitt Island, and only uncovers at low tide. Passing through the very rocky Ala Passage, Stations 855 and 888 were erected and anchorage reached near the foot of the Geodetic trail, which leads up to their Station "Pitt," which was tied in the next day.

Lot 191 on Pitt Island was found and connected to Mr. Wright's survey of Petrel Channel and a return to Jap Inlet effected on October 2nd. On the west shore of this inlet we laid out some acre lots suitable for fishermen's homes. Quite a few have bought acreage from Jack Murray, who adjoins, and before Christmas of this year it is expected that more families will be in residence. The shores of Jap Inlet ought to make the most attractive settlement on Porcher Island, being the nearest to Prince Rupert and safe all-weather anchorage for gasolene-boats. Should this subdivision be taken up well, it is the intention of other owners to subdivide in similar fashion, and it is quite within the bounds of possibility that in two years from now Jap will have 200 people adjacent to it. At present there are about twenty-five. The season's work was brought to an end by reading the closing angles on "Bell," near Welcome Harbour, after an annoying delay caused by rain.



Looking north across Return Channel at its eastern end.



Klewnuggit Inlet.

CLIMATE.

All the Coast region is notable for its even temperature, seldom exceeding 80° in summer or falling below 25° in the winter. Rainfall varies considerably, being highest at Swanson Bay, which receives about 300 inches per annum; the lowest at Prince Rupert, about 90 inches. Doubtless some of the outer flat islands, like Banks, Estevan, or Zayas, get even less. Snowfall is light near the Hecate Strait; heavy at the heads of the inlets and on the inside passage. The behaviour of the barometer was, and remains, a mystery to us.

GAME.

Coast deer are plentiful everywhere. Goat are common on the Mainland and Pitt Island. Bear are found in most places and wolves very numerous.

TIMBER.

Timber varies with localities. The chief varieties are the red cedar, Sitka spruce, and western hemlock. In addition, the following are found but are not in much demand: Yew, cypress, jack-pine, balsam, cottonwood, and many lesser species.

FISHING.

Fishing is one of the chief industries. The deep-sea fishermen use gasolene-boats varying from 40 feet in length upwards and carrying three men or more. The smaller of these boats fish in the Hecate Strait or inside channels, while larger ones go out to sea. At Prince Rupert there are several companies which buy halibut, and at Butedale the New England Fish Company also purchases it.

The sockeye salmon are caught mostly by gill-nets near the mouth of the Skeena, other varieties being caught by trolling from small launches or by drag or purse seines near the mouths of different large creeks. Prices range from 1½ cents for humpbacks to 45 cents for sockeyes.

The year 1923 was a record one for the canneries, a very large pack being put up. An aeroplane was used for patrolling and is reported to have done unusually good work.

MINERALS.

Except for the Belmont Mine at Surf Inlet, there is nothing of importance on this section of the Coast. Here and there are prospects, many of questionable value. Messrs. Patterson and Walgren are taking out small quantities of high-grade ore on Welcome Harbour.

AGRICULTURE.

The Coast north of 51° cannot be considered as an agricultural country. Much money and labour has been spent on the land of Banks and Porcher Islands. Were there a good market something might be hoped for. Many of the islands would support stock for nine months of the year, as there is much wild grass and little snow or frost, but wolves would be troublesome. Garden-truck does well, where a small patch has been cleared and fertilized year after year with seaweed and kelp, growing such things as rhubarb, cabbage, and other plants requiring plenty of moisture. The best garden we saw was that of Canon Rushbrook at Jap Inlet. There is no opening to-day for the pure agriculturist, but for the man who will work at fishing or logging in the summer, these islands, with their wealth of game, fish, firewood, etc., offer a living free from care and worry with the minimum of effort.

COMMUNICATION.

Most people own their own launches. Porcher Island is served in addition by the mail-boat, the "Asawalgat," owned and operated by Captain W. H. Miller, which makes bi-monthly trips to Prince Rupert, the fare being $2. This calls at Jap Inlet, Refuge Bay, and Welcome Harbour.

The inside passages form a fine system of water highways and are the only means of travel, roads being absent.

Steamers ply the Coast, calling at many points in the area covered in this report, and will often set down or pick up passengers from rowboats.

I have, etc.,

P. M. MONCKTON, B.C.L.S.

COAST TRIANGULATION, RANGE 5, COAST, AND CASSIAR DISTRICTS.

By A. E. Wright.

Prince Rupert, B.C., November 18th, 1923.

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 extend from Port Simpson to the mouth of the Nass River and include all inlets and channels on the landward side between these points. Part of the Nass River was also triangulated, affording a tie between the surveys in the vicinity of Aiyansh and the main body of the Coast triangulation.

Before the location of Prince Rupert Port Simpson was the centre of settlement of the North Coast. It still has a population of seventy-five whites and 500 Indians, and has two churches, three schools, a hospital, and large Indian village. It is connected by telephone and telegraph with Prince Rupert. The Union Steamship boats call twice a week in summer and weekly in winter. The harbour is partly exposed to north-westerly winds.

Part of the shores of the north end of Chatham Sound were triangulated and connections made to the Geodetic Stations of Griffin, on the mountain behind Port Simpson, and that on the summit of North Dundas Island.

The northern portion of Chatham Sound is about 10 miles wide and is bounded on the east by Finlayson, Birnie, Kate, Compton, and Somerville Islands, with bold rocky shores on all but Finlayson Island. North Dundas Island bounds it on the west, leaving a stretch of about 10 miles to Wales Island on the north.

The highest peaks of Dundas Island are less than 1,500 feet high, and from the nature of the vegetation I should judge that the climate is drier than on the Mainland, with less snowfall.

Wark Canal extends from the east shores of Chatham Sound in a south-easterly direction for about 40 miles to within 7 miles of the Skeena River at Skeena City. Its entrance, a quarter of a mile wide, is between Kate and Compton Islands. Both shores are fairly well timbered, with exceptionally good timber up all the large creeks. At 9 miles from the head the North Arm branches off, holding a general north-eastward course for about 10 miles. The mountains are very steep and rocky on both shores of the North Arm, but the main channel and South Arm have much gentler slopes.

Near the head of the North Arm of Wark Canal there is a good water-power. There is a 285-foot direct fall, with a total fall of 315 feet in a horizontal distance of 800 feet. The estimated horse-power is 10,000.

Canoe Pass separates Kate Island from the Tsimpsean Peninsula. It is navigable for gas-boats and affords a short cut from Wark Canal and Paradise Pass to Port Simpson and the south, which is particularly advantageous during the winter when the Nass wind is blowing.

Compton Island is separated from the Mainland by Paradise Pass, which is not navigable except by gas-boats. About a mile north of Wark Canal Union Bay empties into Paradise Pass. This inlet is 5 miles long and half a mile wide, and at its head there is a large stream emptying from Union Lake. There is a fall of 400 feet between the lake and salt water.

Somerville Island is a steep mountainous island about 12 miles north of Port Simpson. It forms part of the east shore of Portland Inlet and is separated from the Mainland by Steamer Pass. It is 10 miles long and 3 wide. At its northern end Somerville Bay affords the only safe anchorage between Port Simpson and the Nass River. There is some good spruce and hemlock along a short stretch of Steamer Pass, but, while completely timbered, most of it is of use for pulp only.

Khutzeymateen Inlet.

About half-way along Steamer Pass Khutzeymateen Inlet bears away in a general south-easterly direction for nearly 20 miles. Its average width is three-quarters of a mile and for the first 8 miles the shores are steep and not particularly well timbered. Beyond this there is a good stand of timber on the slopes, particularly at the head of the inlet. Khutzeymateen River, which flows into the head of the inlet, is also well timbered for several miles.

KWINAMASS BAY.

Kwinamass Bay is a shallow bay at the northern end of Steamer Pass. It is of no use as an anchorage as it is almost completely dry at low water. At the head are extensive tidal grass-flats through which the Kwinamass River flows. This is a large glacier-fed stream with an excellent stand of timber on its banks and up the mountain-sides.

Nasoga Gulf is an open bay bearing north-east and is 6 miles long and averages a mile in width. Its southern end opens into a bight of Portland Inlet, north of Somerville Island, into which Steamer Pass and Kwinamass Bay also open. The northern end of Nasoga Gulf is deep almost to the shore, with a valley a mile wide and 3 miles long extending to Iceberg Bay at the mouth of the Nass River. This valley has its height of land almost at Nasoga Gulf, in a bank of mud and gravel about 100 feet high, which fronts the head of Nasoga Gulf. The bank appears to be of glacial origin.

PORTLAND INLET.

Portland Inlet is a wide strait branching off from the north-east portion of Chatham Sound. It is from 3 to 4 miles wide and 30 miles long. The west shore of Portland Inlet consists of Wales and Pearse Islands, separated by Wales Pass, connecting Portland Inlet and Pearse Canal. The International Boundary runs up the middle of Pearse and Portland Canals. There is some fair timber on both these islands, but for the most part it is scrubby and wind-shaken. At its northern end it divides into three branches. To the north-west Portland Canal extends at first north-west and then north for 60 miles, and to the north Observatory Inlet, with its two branches, Hastings Arm and Alice Arm, extends northward for 46 miles. Easterly is the mouth of the Nass River, sometimes called Nass Bay.

CLIMATE.

As one proceeds northward from Prince Rupert the precipitation decreases from about 90 inches to 60 inches at the mouth of the Nass River, though at the head of Wark Canal and Khutzeymateen Inlet the indications are that the average precipitation would be nearer 120 inches. The snowfall, however, is in inverse ratio, becoming greater as one proceeds north.

TIMBER.

There are some patches of good spruce and hemlock on Wark Canal, but the largest stand of good timber on the Northern Coast is on the Kwinamass and Khutzeymateen Rivers, where the amount of timber warrants logging on a large scale. The only mill now operating on the Northern Coast at Georgetown on Big Bay, Chatham Sound, is altogether supplied by hand-loggers.

GAME.

There is very little game on the Northern Coast north of Prince Rupert; a few scattered deer are seen, but there are no goat on the Coast north of Pitt Island. Dundas Island has no large game.

INDUSTRIES.

Wales Island Cannery on Pearse Canal and Somerville Cannery on the Mainland opposite the north end of Somerville Island were both operated this year, although the former closed down about the end of the sockeye season. Kumeon Cannery on the Mainland just south of Khutzeymateen Inlet was used only as a collecting-station for the Mill Bay Cannery.

NASS RIVER.

Nass Bay is 1½ miles wide and 6½ deep, with Iceberg Bay branching off to the south-west. There are extensive tide-flats at the head of Iceberg Bay, but the flats drop off very suddenly into deep water, affording very insecure anchorage. Apart from Iceberg Bay, Nass Bay is shallow, with many shifting mud-bars, and steamers can only call at the Mill Bay and Nass Harbour Canneries at high tide.

Nass Harbour Cannery is on a small bay called Nass Harbour, on the south shore of Nass Bay, about 5 miles from Portland Inlet, and Mill Bay is about the same distance on the north shore. On the south shore, where Nass Bay merges with Portland Inlet, is Arrandale Cannery, and half a mile farther up is the ruined cannery of Port Nelson. The two former canneries

have each a store and post-office and have weekly boat sailings throughout the year. Arrandale has a store, post-office, and a Customs officer and two weekly sailings.

KINCOLITH.

On the north shore of the entrance opposite Arrandale, and occupying an extensive flat, is the Indian village of Kincolith, with a population of 300. This village was the first mission established on the Nass River. It is now the largest village on the river and has telephone and electric light.

On the north shore, at Graveyard Point, 2 miles above Kincolith, are the ruins of the first Hudson's Bay post on the Northern Coast. It was established in 1832 and two years later removed to Port Simpson on account of its inaccessibility during the winter and owing to the lack of anchorage for sailing-vessels.

NASS RIVER.

About 7 miles above Arrandale the river proper commences. At this point it has a width of about 1½ miles and occupies the whole of the valley, with steep timbered mountain-slopes on either side. The river-channel is continually changing and is from 200 to 400 yards wide. The rest of the bottom is filled with mud and sand bars, uncovering at low water, with here and there a large snag. A few years ago it was possible to take large steamers up the river as far as Fishery Bay, but at low water it is now impossible for a boat drawing 4½ feet to get through even when following the channel. The river takes a general east-and-west direction for 15 miles above Arrandale, where the valley then swings north-easterly and holds this general direction to Aiyansh.

Fishery Bay, on the north bank, 17 miles above Arrandale, is the centre of the oolachan fishery, and at Red Cliff, 6 miles below, is a smaller village occupied by the Port Simpson Indians in the oolachan season. The oolachan, or candle-fish, is a small herring-like fish, very oily. It comes up the Nass River in great shoals in March and April. They are caught with nets, boiled down, and the extracted fat is packed in gasolene-tins and sold or traded to the Queen Charlotte and Interior Indians. In the old days the grease was taken over what was known as the Grease Trail from Aiyansh to Hazelton via the Cranberry and Kispiox Valleys, but it is now shipped through Prince Rupert by train.

Opposite Red Cliff are the ruins of the old village of Nass Tumtum.

The large village of Greenville, with a population of 250, is also on the north shore, 21 miles above Arrandale. This was originally a Methodist Mission, but was taken over by the Anglicans a few years ago. Greenville was almost totally destroyed by fire two years ago and is now being rebuilt. Across the river, on the same reserve, are several old villages which must at one time have contained a large population.

Above Nass Tumtum the valley is not wholly occupied by the river. There are numerous low islands separated by sloughs. These islands are mostly timbered with cottonwood and spruce, with thick underbrush of dogwood and willow. These islands are generally covered with water during the summer and fall freshets.

The effect of the spring tides can be noticed 31 miles above Arrandale. On the tidal portion the channel is fairly constant. As one ascends the river, however, the fall becomes greater and the channel is constantly changing; old channels become sloughs and gradually fill up and new channels are cut through the islands. Most of the bars are here covered with drift-logs. The current is about 5 miles per hour on the average.

Immediately below the canyon on the south shore of the river, at a distance of 43 miles above Arrandale, is the old village of Gwinaha, now in the process of removal bodily to a new site on the north bank at the lower end of the canyon. Old Gwinaha was very badly treated by the fall floods in 1916, and all the houses except one are being torn down and re-erected at the new site above all danger of floods.

LAVA PLAIN.

The canyon has for its southern bank the northern extremity of the Nass lava-bed. At this point it is about 30 feet thick and the underlying rocks can be seen in places. This bed forms the south bank of the river from Seaxe River to Gwinaha, a distance of 4½ miles, though above the canyon the river has formed several alluvial islands on which is a good growth of cottonwood and spruce.

The lava plain occupies an area of about 20 square miles and in places seems not to have moved since cooling, as portions several acres in extent are seen with the original smooth pavement. The greater part of the surface has been broken and upended, giving the impression of a vast bed of clinkers. These parts are very difficult to cross and are full of holes into which a small-sized house could be put, giving the appearance of large, collapsed bubbles. They are probably formed by the movement of the partly hardened lava over an uneven substratum.

The Indians give the age of the lava plain as seven generations, or 150 years, but it would seem to have a much greater age. Along the northern edge of the plain a fringe of timber has grown up, varying in width from 50 to 300 feet. It must have taken several times 150 years to form the soil which would support these trees. Thirty-seven years ago, when the original survey of Amatal Reserve was made, bearing trees were cut of cottonwoods then given as 6 links in diameter. The amount of growth can easily be seen on the faces of these cuts, and it is now 6 inches in that time. Outside the fringe of timber mentioned above the lava plain is barren, with the exception of a solitary scrubby spruce here and there.

Six miles above the canyon on the north bank is the old village of Aiyansh, now also in the process of removal to a new site on the same bank at Kitlakdamiks, about 2 miles farther up the river. In this case the recurrent floods are also the cause of removal and all the better houses are being removed. The new village, now also called Aiyansh, already has telephone and electric light, an eloquent testimony to the example and training of the early missionaries, to the able administration of the Indian Department, and to the adaptability of the Indians themselves.

Half-way between old and new Aiyansh, on the south shore of the river, is Priestley's store and post-office. Before the war there was a considerable white population around Aiyansh. It has again increased to about fifteen families with thirty members. These are mostly settled in the triangle between the Nass and Seaxe Rivers. A school is being built and the telegraph-office has been removed from the north bank of the river to the neighbourhood of the post-office, in an effort to concentrate the white population as much as possible.

TRANSPORTATION.

In the summer there is a bi-weekly and in winter a monthly mail service from Mill Bay to Aiyansh. As far as the canyon the river is navigable by a 7-mile gas-boat at any stage of the river when unfrozen. In high water the mail, etc., is landed below the canyon and portaged for a couple of miles, to be loaded into another boat. In the winter the mails are transported by dog-team. Navigation opens toward the end of April and closes towards the end of November.

A motor-road constructed from Gwinaha to Aiyansh, a distance of 6 miles along the north bank of the river, would be of great advantage to both the Indians and the white settlers. Such road would be easy to construct, as a great part would be through gravel flats timbered with second-growth poplar. It would be necessary to build a cable-ferry in connection with the road if it is to be of any value to the white settlers.

CLIMATE.

At the mouth of the Nass the precipitation is about 60 inches, while at Aiyansh it is only 30 inches. Both the rainfall and snowfall are considerably less than at the corresponding points on the Skeena River. Summer frosts are unknown until one reaches the vicinity of Cranberry River, about 25 miles above Aiyansh, where the general climate approximates that of the Bulkley Valley.

The total snowfall at Aiyansh is around 90 inches, but as most of it is blown away there is never much on the ground at one time. While the winter temperature seldom goes below 20° below zero, the steady north wind, which blows for weeks at a time in fine weather, makes it seem much colder.

GAME.

There are no deer on the part of the Nass triangulated, though goat are found on the mountain-side and can frequently be seen from boats on the river. Ducks and geese are plentiful in the fall and winter, and willow-grouse were very numerous this year, no doubt due to the dry spring and early summer. Both grizzlies and black bear are found, though not very numerous.

TIMBER.

There is an excellent growth of spruce, hemlock, and cottonwood all along the river, as there have been practically no fires for many years. On the river flat and islands cottonwood and spruce grow to 6 feet in diameter, while on the mountain-sides the timber is mostly hemlock, with a considerable sprinkling of spruce. There is no cedar below the canyon. The undergrowth is very thick, consisting of dogwood, willow, and alder. There seems no reason why the river could not be driven.

INDUSTRIES.

Outside the oolachan and salmon fisheries there are no industries. The Indians preserve their own oolachan-grease and nearly all work in the canneries in the summer. They scatter in the fall, each family to their own portion of the river, and put up their own dried salmon. They grow most of their own vegetables, but there is little attempt to cultivate during the summer.

The white settlers about Aiyansh grow enough for their own use and probably sell a considerable amount to the Indians. I am informed by Mr. Collison, the Indian Agent, that both corn and tomatoes ripen at Aiyansh.

At present the freight rate from Mill Bay to Aiyansh up the river is 2½ cents per pound, with half that rate for down-river freight. This applies to the spring and early fall only, as it is impossible to get any large amount of freight above the canyon in high water on account of the portage. Small shipments of beef are sometimes made to Anyox.

There is no mining on the Lower Nass and no claims in the course of development, though there are a certain number of claims about the headwaters of the Kinscoosh and Shiteen Rivers, flowing into the Nass a short distance above Aiyansh. These claims are reached from Alice Arm.

There is also a certain amount of development going on about Kitsumgallum Lake about halfway between Aiyansh and Terrace.

I have, etc.,
A. E. WRIGHT, B.C.L.S.

MORESBY ISLAND TRIANGULATION CONTROL SURVEYS.

BY W. J. H. HOLMES.

VICTORIA, B.C., January 24th, 1924.

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

SIR,—I have the honour to submit the following report upon my work during the past season on the Queen Charlotte Islands:—

The work consisted of carrying a system of triangulation from Lot 315, Moresby Island, southerly along Selwyn, Dana, and Logan Inlets and Darwin Sound, picking up existing surveys en route and defining the shore-line for the purpose of making a correct map of the area and showing all surveyed lands in their proper positions thereon.

The system of triangles was necessarily carried outside of these inlets and included stations on Reef and Titul Islands in Hecate Strait. Most of the triangulation points were permanently marked by a ¾-inch iron pin about 8 inches long set in Portland cement in a 4-inch hole drilled in solid rock, the pins being stamped with the regulation letters and the number of the station, so that future surveys in the vicinity may be tied to these points, thus enabling them to be placed in their correct position on the map.

The shore-line was defined and tangential shots taken to all islands and rocks for mapping purposes. All existing surveys were tied in and connections made with all old survey posts that could be found, this involving many short traverses of various lengths.

GENERAL DESCRIPTION OF COUNTRY.

To the casual eye there is a marked difference in the main physical characteristics of the two principal islands of the Queen Charlotte Group. Graham Island, which lies to the north of Moresby, is flat and low-lying over its eastern half, with a range of mountains up to 5,000

feet in height running north and south through its western half. Moresby Island is entirely mountainous, with the exception of the north-east corner between Skidegate and Cumshewa Inlets, and is a southerly continuation of the Graham Island Range.

The eastern coast of Graham Island is continuous and without a harbour, whilst the east coast of Moresby is deeply indented with numerous inlets and bays, with many harbours for boats of all sizes, and is a maze of islands, large and small. Soundings taken in many of these inlets show a depth of water up to 130 and even 150 fathoms, which may seem remarkable when it is noted that outside in the main Hecate Strait the water is only 10 to 50 fathoms deep.

SETTLEMENTS.

The two principal settlements in the Queen Charlotte Islands are Masset and its vicinity at the north end of Graham Island and Queen Charlotte at the south end in Skidegate inlet. Queen Charlotte is a place of about 100 inhabitants, with school-house, church, post-office, hotel, three or four stores, and a good hospital, and is linked up with the outside world by wireless. It is the headquarters for those interested in the mining, logging, and fishing industries in this part of the islands. The only agriculture is in the nature of small tracts cleared in the vicinity of homes and on which vegetables of all kinds are grown to perfection, as well as small fruits. About 8 miles from Queen Charlotte, in the north-east corner of Moresby Island, at what is called the "Sandspit" at the entrance to Skidegate Inlet, is a strip of good agricultural land on which are distributed about twenty families. The farmers here are making a success of mixed farming, together with the raising of cattle for beef.

The S.S. "Prince John" of the Canadian National Railways makes the round trip between Prince Rupert and Vancouver every two weeks and calls in at Queen Charlotte and at the Sandspit every week; that is to say, on both her north- and south-bound trips.

About 3 miles east of Queen Charlotte is situated the old Indian village of Skidegate, the largest Indian village on the Queen Charlotte Islands and the principal home of the Haida Tribe, who have always been regarded as being of all the Coast natives the most advanced in the Indian arts, such as canoe-building, basket-work, wood-carvings, and carvings in black slate. Their canoes were the most gracefully built and undoubtedly the most seaworthy on the Coast; but these arts are rapidly dying out and to-day a canoe is rarely seen, but in their place the harbour is full of motor-boats, large and small. The native now engages in every manner of work wherever he can get it, but his principal occupation still is fishing, and during the canning season he is away perhaps hundreds of miles in his motor-boat with his whole family. The women and children will be employed in a cannery whilst the men devote their time to fishing.

INLETS.

The northern half of the east coast of Moresby Island is deeply cut by five principal inlets —Cumshewa, Selwyn, Dana, Logan, and Richardson—all lying east and west parallel to one another. Their topographical character is similar; from deep water the mountains rising on all sides, sometimes on a gentle slope from the shore and getting more abrupt with altitude. The shores are abrupt and rocky, partly low bluffs dropping at once into deep water and partly steep beaches of large boulders. Gravel or sand beaches are rare in the inlets, but there are a few small ones. The country is all heavily timbered with spruce, hemlock, and cedar, and here and there logging operations are going on on a small scale and there are small occasional patches of logged-off ground.

Selwyn Inlet is south of Cumshewa Inlet and lies between Louise Island on the north and Talunkwan Island on the south. It is connected with Cumshewa Inlet by a narrow passage west of Louise Island, but this passage can be used only by small boats and is dry at low tide. Selwyn Inlet is connected also with Dana Inlet to the south by a passage west of Talunkwan Island, this passage being about 500 feet wide and the water 30 or 40 feet deep.

Thurston Harbour is an indentation on the north side of Talunkwan Island and is a splendid landlocked harbour which can be safely entered by boats of any size, the water being over 100 feet deep, with a gravel bottom and sand and clay mixture affording good anchorage. This harbour is the headquarters for the Queen Charlotte Island operations of the Whalen pulp and paper mills of Swanson Bay. During the late war there was here a sawmill in operation cutting spruce for use in the manufacture of aeroplanes, but the mill is now dismantled and there remains only the wharf and store with post-office and office buildings, now in use by the

Whalen Pulp and Paper Mills Company. There is also a small wireless station capable of communicating with Prince Rupert.

The Whalen Company has five logging camps in the district—two in Cumshewa Inlet and others in Breaker Bay, Louise Narrows, and Beresford Arm—and from these camps all logs are towed in booms by small tugs to Thurston Harbour, where they are built into Davis rafts preparatory to being towed across Hecate Strait to the company's pulp and paper mill at Swanson Bay.

At Pacofi, at the western end or head of Selwyn Inlet, is a fish-oil reduction plant owned and operated prior to the war by a German company, but which is now idle.

Dana Inlet is the next south of Selwyn Inlet and lies between Talunkwan Island on the north and on the south a long narrow peninsula jutting out from the main island of Moresby. Its length is about 8 miles and is from 1 to 1½ miles wide. Its general appearance is similar to that of Selwyn Inlet, with mountains on either side rising to various altitudes, from 1,000 to 3,000 feet, and all heavily timbered. There are, however, no harbours that would give protection to a small boat until you get to the head of the inlet.

Logan Inlet is south of Dana and lies north of Tanoo Island. Its length and breadth are about the same as of Dana Inlet, but at its western end it turns southerly, and, widening out, loses its identity in what is known as Darwin Sound. Here again all the country is very mountainous and heavily timbered with spruce, hemlock, and cedar. No logging has been done here, except a little by hand-loggers and which is almost unnoticeable. There is no safe harbour for a small boat until you leave Logan Inlet and get into Darwin Sound.

Darwin Sound lies northerly and southerly in its length and is all that stretch of water between Moresby and Lyell Islands. Its length is, roughly, about 12 miles, with a width of from 1 to 3 miles, and its shores are very irregular, with many bays and inlets affording splendid shelter for small boats. In general appearance the country is, as already described, very mountainous and all heavily timbered.

Lockeport is a small harbour in the north-west corner of Darwin Sound, and here is a small salmon-cannery capable of putting out about 1,500 cases a day, owned and operated by W. C. Splan. Besides the cannery and its office buildings, there is a store and post-office and a few shacks—nothing more; so the place can hardly be described as a settlement. The Canadian National S.S. "Prince John" calls here weekly on her way either to Vancouver or to Prince Rupert.

VEGETATION AND AGRICULTURAL POSSIBILITIES.

Over the whole of Moresby and its adjacent islands is a heavy growth of a mixture of spruce, hemlock, and cedar, under which usually lies a grid of old fallen timber (cedar lasts for centuries lying on the ground under certain conditions), through which grows a tangle of either salal or devil's-club or a mixture of both. To get through the country it is a case of fighting one's way; you cannot walk in the ordinary sense. The size of the spruce is usually anything from 1 to 8 feet diameter, and occasionally even 12 feet. The hemlock grows to 5 and 6 feet diameter and the cedar about the same. All is green and I saw no evidence of fire.

In a few places where the ground has been exposed to the sun's rays by reason of logging operations a thick growth of salmon-berry, huckleberry, and blackberry has sprung up. I saw in one place such a growth 10 to 15 feet high and so thick that it was a real difficulty to break one's way through.

Owing to the mountainous nature of Moresby Island I can see no great future to it agriculturally, but the island will become settled and homes will be built by those engaged in mining, logging, and fishing, and around these homes will be cleared plats of great or small extent, growing all varieties of vegetables and small fruits, as well as small orchards of apples, plums, and pears.

CLIMATE.

The climate of Moresby Island is mild, with no extremes of heat or cold, and ranges between 80° in summer to 10° or 15° above zero in the winter. The Queen Charlotte Islands have a wide reputation for heavy rainfall, but from my observations during the past summer I think the rainfall probably very variable according to locality. For instance, the rainfall on the west coast is no doubt very much greater than on the east coast, because of the dividing mountain range. The woods are always damp, even wet after several weeks of sunshine, by

reason of the sun's rays not being able to penetrate the heavy foliage. During the past summer on the east coast of Moresby the weather was particularly fine; May, June, July, August, and September were all fine months, with very little rain and no fog. Indeed, it was almost continuous bright sunshine. And bearing in mind that the past summer was an exceptional one all over the British Columbia Coast, I am yet of the opinion that the rainfall on the east coast of Moresby cannot average over 80 to 100 inches per annum. This is purely a guess, for I have no statistics.

MINERALS.

Gold, platinum, silver, copper, iron, and coal have been found on the Queen Charlotte Islands and large areas on Graham Island are covered by oil locations. A small amount of drilling has been done and some tests made of the possibilities of profitably handling the oil-bearing shales. Gold and platinum are found in the beach sands of the east coast of Graham Island and some of these claims are being worked in a small way. Gold-quartz showings have been discovered on the west coast of Moresby Island and on Shuttle Island in Darwin Sound, about 7 miles south of Lockeport, and placer gold on the beach of this small island. Gold and silver have been found also at the head of Sewell Inlet and on the north side of Cumshewa Inlet. A certain amount of development-work has been done on some of the gold-quartz showings, but as far as I could learn none has been advanced very far beyond the prospecting stage.

Large copper-deposits have been discovered in the vicinity of Jedway carrying values in gold and silver, and on some of the properties considerable development-work has been done, notably on what is known as the Ikeda Mines, from which several hundred tons of the ore have been shipped.

At Lockeport is an immense deposit of low-grade copper ore, chalcopyrite and bornite, the bornite containing a little platinum and also small values in gold and silver.

There are enormous deposits of iron ore (magnetite) on Moresby Island, ideally located for mining and transportation, so that iron production on a large scale may be looked forward to as one of the great industrial possibilities of this island. One of the largest discoveries is on what is known as the Iron Duke Group on the north side of Louise Island, with a proved vein of magnetite 75 feet in width of solid ore. Another large discovery is near Jedway.

GAME.

There is comparatively little game on the Queen Charlotte Islands. At one time there were a few deer on Graham Island, but these have long since been killed off. Black bear are very numerous on all the islands. I saw a few grouse, but these birds appear to be scarce, except perhaps in certain localities. Geese and wild duck of all the North Pacific varieties are very numerous, especially in the fall and winter months.

I have, etc.,
W. J. H. HOLMES, B.C.L.S.

NORTHERN VANCOUVER ISLAND, RUPERT DISTRICT.

BY L. S. COKELY.

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

COURTENAY, B.C., November 13th, 1923.

SIR,—My work the first part of this season consisted of the correction of certain surveys in the vicinity of Port Hardy, on the north-east coast of Vancouver Island. At this point the island narrows down to a width of about 10 miles across to Quatsino Sound. The Provincial Government is engaged in constructing a wagon-road here from Port Hardy to Coal Harbour on Quatsino Sound, which on account of the frequent boat service up the east coast will be a great convenience not only to the settlers on this portion of the west coast, but also to the inhabitants of Port Alice on the South-east Arm of Quatsino Sound, where the Whalen Pulp Company has a large pulp-mill. There are four boats a week from Vancouver to Port Hardy and only a tri-monthly service up the west coast from Victoria. Also the trip up the east coast is to be preferred, as nearly the entire trip is through sheltered waters, while most of the trip up the west coast is in the open sea.

The entire northerly portion of the island is heavily timbered with hemlock, red and yellow cedar, spruce, and balsam. Quatsino Sound is the northerly limit of the fir belt on the island. Throughout the whole area there is a dense undergrowth of salal, wineberry, salmon-berry, and other brush. Much of the timber is suitable only for pulp-wood, but for that purpose it is second to none. Some of the largest American magazines are made from the product of the Port Alice mill. On account of the prosperous condition of the lumber industry this year much logging was in evidence.

With the heavy growth of timber and undergrowth the land is exceptionally hard to clear and the cost may be anywhere up to $400 per acre. When placed in shape the land is fertile and with the abundance of rain throughout the season crops are assured. There are no extensive farming operations carried on, but on the small patches the various settlers have under cultivation roots, berries, and other small fruits appear to do very well. Large crops of hay are produced, but difficulty is experienced some seasons in properly curing the hay on account of adverse weather conditions. In the locality in which I was located a ready market for all produce raised was obtained in the near-by camps.

The country is very sparsely settled; eight or ten years ago, when I spent the season in the same vicinity, there were several times the present population. But many enlisted; others obtained their Crown grants and moved away; others abandoned their pre-emptions on account of the difficulty in clearing land and the lack of wagon-roads. There are no roads except the one mentioned above. Government pack-trails have been constructed to various localities, and on account of the nature of the country these have cost more than wagon-roads do in most parts of the Province. Both trails and roads are expensive to keep up, and those trails to localities where there is no longer settlement can only be traversed on foot, as they are blocked by windfalls and overgrown with brush.

There are no prominent physical characteristics; the country is comparatively low and rolling; in many places the surface is too broken to permit cultivation. There are no well-defined ridges and no mountain-peaks. After leaving the trails one has to be on his guard to avoid getting lost, as there are no landmarks visible and rarely can one see 50 yards ahead.

Deer and grouse constitute about all the game and both are fairly plentiful. Panther are trapped occasionally. Trout are plentiful in the streams.

This district will be settled slowly on account of the difficulties to be contended with, but its proximity to the Coast should assure settlement later.

I have, etc.,

LEROY S. COKELY, B.C.L.S., D.L.S.

CONTROL SURVEYS, RANGES 4 AND 5, COAST DISTRICT.

BY F. C. SWANNELL.

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

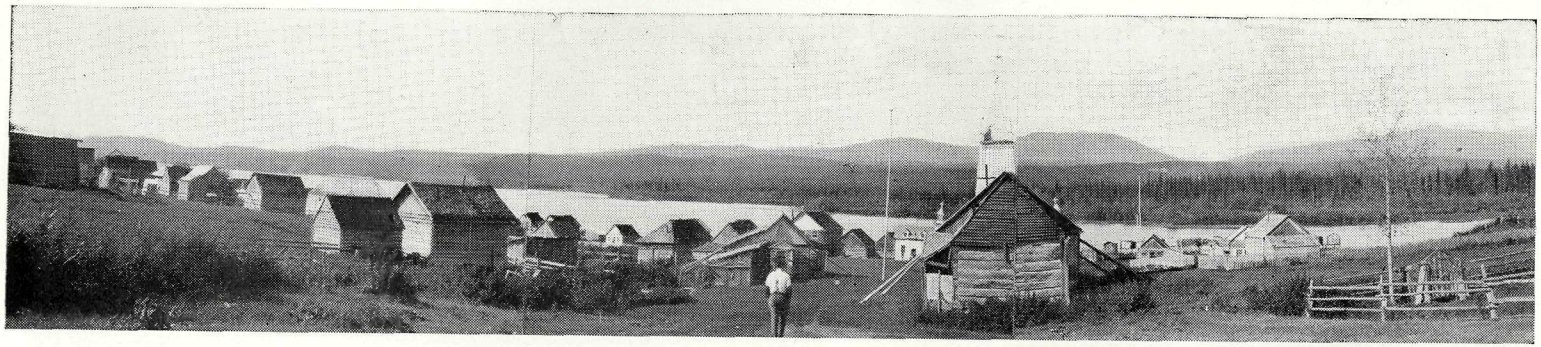
VICTORIA, B.C., January 2nd, 1924.

SIR,—I have the honour to submit the following report on work done during the season of 1923 to complete the topographical map of the lake region tributary to Ootsa Lake:—

We explored the large tract of practically unknown country encircled by the wonderful waterway system aptly called by the Ootsa Lake settlers the "Great Circle." As bounding the area explored, a brief description of this will be of value.

THE "CIRCLE" OR OOTSA–WHITESAIL–EUTSUK–TETACHUCK WATER ROUTE.

A detailed description of the lakes and rivers composing this circle has been given in previous reports, so that a summary here will suffice. Ootsa Lake Post-office to Whitesail Lake, 45 miles; up Whitesail Lake, 14 miles; thence by portage 1 mile to Eutsuk Lake (altitude 2,815 feet). Going 40 miles down Eutsuk Lake, the outlet, really the head of the Nechako River, leads into Tetachuck Lake. We are now 100 miles along our route from our starting-point. Tetachuck Lake (2,790 feet) drains into Euchu Lake (2,660 feet), which is only separated by one short riffle from Natalkuz Lake, from the eastern end of which the Nechako issues as a noble river 140 yards wide. By turning, however, up the North-west Arm of Natalkus Lake we reach Ootsa Lake again by two short rivers and the intervening Intahtah Lake. The total



The Indian village at Fort Babine, on Babine Lake.

A pre-emption near Stuart Lake.

length of the trip is a little under 200 miles. It involves only the portage between Whitesail and Eutsuk Lakes and several portages along Tetachuck River to avoid the falls and rock-strewn rapids. There are no other dangerous points, except a short canyon or chute at the outlet of Eutsuk Lake and a few sharp turns and log-jams on Whitesail River.

GENERAL DESCRIPTION OF AREA WITHIN THE "CIRCLE."

The area included is some 1,300 square miles. The outstanding feature topographically is the mountain system which divides the area roughly in half, extending north and south between the westerly end of Ootsa and east end of Eutsuk Lakes. This system is made up of four main mountain masses—Mount Wells (6,915 feet), bordering on Ootsa Lake; Michel and Chef Mountains in the interior; and Eutsuk Mountain, reaching to the east end of the lake of the same name. Between each mountain mass lies a lake depression, these lakes feeding the Chelaslie River. The high peaks (Chef is 6,800 feet) rise from alpine plateaus forming a belt 10 miles wide, which gradually breaks down into the rolling jack-pine country, which makes up by far the greater part of the remainder of the area. A lake depression running south-easterly lies 5 to 12 miles east of the mountains holding the Ghaitezli and Caribou Lakes. Between this depression and Ootsa Lake lie rolling timbered hills, burnt over on the Ootsa Lake side. The plateau of Eutsuk Mountain tails out easterly into a long hill-spur extending to the north of Tetachuck Lake. The country westward from the main mountain system may be divided into two areas—the rolling timbered hills bordering Sinclair and Whitesail Lakes and the St. Thomas Lake Valley depression from St. Thomas Bay to Sand Cabin Bay, Eutsuk Lake. A detailed description, area by area, will now be given following the trail routes.

BELLA COOLA TRAIL—OOTSA TO CHELASLIE LAKES.

The main Bella Coola Trail fording at the foot of Ootsa Lake runs southerly 6 miles to One Eye Lake, where is an Indian settlement of a dozen souls, who keep a few head of horses and cattle. At this point the St. Thomas Trail branches off to the right; the main Bella Coola Trail striking south-west to Chelaslie Lake; another trail following the meadows down One Eye Creek to Chelaslie River. Leaving One Eye Lake, the main trail runs through jack-pine poles for 1½ miles and then follows a chain of good meadows; in all, 2 miles long, varying in width from 50 yards to ¼ mile. They produce excellent hay and at the time of our visit the grasses were nearly waist-high. The side-hills bordering the meadows afford good feed, but the belt is narrow on either hand, being gravelly jack-pine country. The trail now crosses worthless jack-pine country until it descends the hill escarpment bordering Chelaslie River. This escarpment extends to Euchu Lake. Its slopes are open and grassy, but behind lie gravelly jack-pine benches.

CHELASLIE VALLEY.

From Chelaslie Lake a trail was followed up the river north-westerly for 4 miles to the One Eye–Tetachuck Trail crossing. On the left bank of the river for 2 miles is a grassy escarpment, the bench behind being timbered with jack-pine. Along the right bank the valley is flat, wet, and marshy for 4 miles, its width varying from ¼ to 1 mile. Most of the land is marshy willow bottom of no value, with a few small swampy meadows near the river-mouth and 30 acres of drier land at the western extremity. The land is gravelly, producing poor grasses and scrub willow. A chain of meadows 200 yards to ¼ mile in width extend along One Eye Creek, with thick jack-pine on either side. At One Eye Lake itself about 10 acres of meadow has been fenced off by the Indians and some timothy grown with fair success.

CHELASLIE RIVER TO TETACHUCK LAKE.

An excellent little meadow on the left bank of the river at the trail crossing afforded a very desirable camp-site and feeding-ground for the pack-horses. From here to Tetachuck Lake the trail runs for 10 miles through rolling timbered country; the last 5 miles rendered very desolate and the trail almost impassable by a forest fire in 1922.

INDIAN TRAIL—ONE EYE LAKE TO ST. THOMAS BAY.

The direction is generally westerly for 7 miles through one good stand of spruce tie-timber. At Mile 7 about 1½ sections of small meadows and willow-swamp lie to the north, intersected by spruce-timbered hog-backed ridges. The trail itself follows a creek through another string

of swamp and willow-brush meadows for 1½ miles. The largest meadow, about 50 acres, carries coarse grasses of poor food value and water-sedges. Two miles farther the Chelaslie River is forded. One and a half miles up-stream from the trail crossing are 500 to 600 acres of meadow, but they are of little value, being covered with short willow scrub; the few open patches being wet and marshy most of the year.

CHELASLIE RIVER TO MICHEL CREEK.

Five miles south-west of the crossing Michel Creek is reached. While camped here we cruised to the north and at 1½ miles found the South Fork of the Chelaslie in a deep canyon, into which the river drops in a 100-foot fall. The canyon is 400 feet deep at its deepest point, the walls being a curious continuous basaltic formation. Following up the river westerly at 5 miles above the canyon, some 300 acres of swamp meadow were found. A mile farther the river swings southerly to its head in Justa Lake. The trail follows Michel Creek up for 5 miles, the few small swampy meadows along its course giving sufficient feed for our small pack-train. Approaching the headwaters the country becomes semi-open, the jack-pine and balsam growing scrubby. Finally, after passing Justa Lake, the country is pronouncedly alpine, the trail following the depression south of Chef Mountain.

THE MOUNTAIN PLATEAU.

We are now in typical timber-line country dotted with swampy meadows and open grassy patches. West of Chef Mountain, at an elevation of from 5,000 to 5,700 feet, the plateau is entirely open. At lower elevations there are clumps of thick scrubby mountain-balsam. Mountain grasses and herbaceous flowers such as Indian paint-brush grow abundantly, affording excellent feed for the many caribou. Six miles west of Chef Peak the plateau ends abruptly in a rim-rock escarpment extending 10 miles N. 30° W. The rim-rock is 50 to 200 feet in height and nearly unbroken. The trail drops steeply down a draw, descending into high timbered country and finally reaching the string of meadows in the St. Thomas Lake Valley at altitude 3,000 feet.

ST. THOMAS LAKE VALLEY.

We found one large meadow 1½ miles by ¼ mile and numerous small ones. They were of poor quality, however, all being swampy and most of them brushy. From St. Thomas Lake to Eutsuk Lake the country is heavily timbered with spruce, balsam, and jack-pine. The stand is fairly thick, the trees running up to 20 inches in diameter. There is a small meadow, where a few horses can be fed, close to the mouth of St. Thomas Creek.

RIM-ROCK TO SAND CABIN BAY.

At Mile 46 on the main trail a branch turns off in a small but good meadow and runs 10 miles south to Sand Cabin Bay. Two and a half miles from Sand Cabin is a small swampy lake lying in about a section of meadow and willow bottom. North of Sand Cabin Bay are large grass meadows 2 miles east and west by ½ mile wide, affording good horse-feed. Unfortunately, however, they are at the same level as Eutsuk Lake, being separated by a low sand ridge, and at high water form a shallow lagoon.

LAKE REGION EAST OF THE MOUNTAIN PLATEAU.

Returning from the St. Thomas Lake country to the mountain plateau, where we could take our pack-train anywhere at will, we dropped down from the plateau and cut trail through clean jack-pine country to Ghaitezli Lake and followed a string of lakes south-easterly to Caribou Lake. At the head of this lake is a belt of willow-swamp, with a few meadows, extending 2 miles and averaging ¼ mile in width. A good meadow with excellent grass was also found at the foot of Ghaitezli Lake; and another, also affording excellent feed, at the mouth of Uduck Creek. From here an Indian pack-trail was followed back to Ootsa Lake. The only meadows along this route being one, about a mile long, 3 miles from Caribou Lake, and another 3 miles farther on. Both were marshy. The country generally was thickly timbered with jack-pine and spruce of fair quality, except a large windfall area extending 5 miles each side of the trail on the hills sloping to Ootsa Lake.

AGRICULTURAL POSSIBILITIES.

The amount of first-class farming land in the area embraced by the "Circle" is negligible, but from the point of view of range and grazing possibilities the country offers better prospects. At present access is difficult and it is questionable whether profitable use could be made of the range lands. It is reported that attempts to winter stock in the vicinity of Chelaslie Lake were a failure. It would seem to be out of the question to winter cattle anywhere in the area, and the areas of meadow land suitable for stock in summer are small, scattered, and very far from existing settlements. The meadow-hay is of poor quality and, to use the words of our packer, "just enough to feed a few cayuses if they don't come too often." It was noticed that even in many of the better-looking meadows our horses did not seem to relish or thrive on the feed. Of interest is the possibility of using the high mountain-plateau country for sheep-raising; the luxurious herbaceous growth and short grasses above timber-line being, I am assured, excellent feed for sheep. It is reported that as recently as fifteen years ago many hundreds of caribou wintered in this area. There is some 200 square miles of semi-open alpine country, but the difficulty of getting sheep in and out and the presence of wolves and foxes would at present seem to militate against any use of this range for some years to come.

GAME.

The area is a trapping preserve of the Cheslatta Indians. Caribou are still numerous, but sadly depleted in number by reckless slaughter by the Indians in the late fall. Beaver are fairly plentiful in all the lakes and rivers. There are many deer near the larger lakes and moose are beginning to come in. A few bear were seen, two huge black timber-wolves once came within a hundred yards of camp, and foxes are fairly plentiful. Grouse and ptarmigan were numerous and water-fowl frequent most of the lakes.

TIMBER.

The forest-cover is mostly jack-pine, with some spruce. The trees were small, except close to the large lakes of the "Circle." Not far west of One Eye Lake is a good stand of jack-pine and spruce pole and tie timber. Near the St. Thomas Lakes is a good stand of balsam, spruce, and jack-pine. The best and largest area of timber clothes the hills south of Whitesail Lake. This has previously been reported upon.

CLIMATE.

In the mountain-plateau region the summer is short, the snow lasting into May and reappearing in September. Our Indian packer said the snowfall in the jack-pine country and lake region was heavy, 6 feet being common. This was verified by the trap-line blazes. Much of the high bare plateau is wind-swept, but frightfully cold in winter. The weather in the summer months is usually fine, although the rainfall is much heavier towards St. Thomas Bay, where the influence of the Coast Mountains is felt. Very dense fogs often occur on the high plateau, especially near Chef Mountain. Indians report that frequently they are caught by them and have to camp wherever they may be. The highest temperature recorded was 90° in the shade during a hot spell early in July. The minimum was 32° F. at timber-line, Chef Mountain, August 3rd. Thunder-storms were occasional.

TROITSA AND BLANKET LAKES.

To complete a gap in last year's topographical map a triangulation survey was made of this string of lakes, which extends far into the heart of the Coast Range. Troitsa Lake lies between Tahtsa and Whitesail Lake and is reached by 2¾ miles of trail leaving the Tahtsa River at a point opposite Huckleberry Mountain. It is a purely mountain lake, its water greenish-blue with glacial silt. A little over 10 miles long and barely a mile wide at its widest, it lies south-westerly between high mountains, which become more rugged and glacier-bearing to the west. There is no land along the lake. The south shore carries considerable timber—pine and spruce mainly at the outlet, balsam becoming predominant farther into the Coast Range.

By portaging we got a canoe into the lakes beyond, the stream entering Troitsa Lake at the west being broken by fallls and in canyon for ¼ mile of its course. The first lake entered, 125 feet above Troitsa Lake, is rather over a mile long and lies directly under a steep, craggy slide-swept mountain. At its western end is a large flat composed of glacier drift and silt

deposited by the torrent draining a transverse valley cutting in from the north. Going up a shallow stream for 100 yards, we entered a second but smaller lake, lying at practically the same level as the first, under a high mountain. In shape it is an irregular crescent, the convex side formed by the large flat or delta before mentioned. We followed its inlet, a rapid stream 30 feet wide and 1½ deep, up for 300 yards, reaching a round tarn ¼ mile in diameter. Crossing the tarn and continuing up-stream, we reached a large lake, avoiding bad water by a ¼-mile portage. This lake, which I have christened Seel Lake, lies at altitude 3,200 feet, or 200 feet above Troitsa Lake. It is 3 miles long and walled in by high mountains, except at its head, where the feeding stream has built a wide delta of open swamp land. A mile up-stream the mountains pinch in and the valley soon heading in a narrow pass. This pass, which probably crosses to the headwaters of Gamsby River (North Fork of Kitlope), we had no time to explore.

McCUISH (OR LITTLE WHITESAIL) PASS.

This was explored as being the last of the known passes leading through the Coast Range to the Kitlope and Kimsquit Rivers. Proceeding to the west end of Little Whitesail Lake, we followed up a large glacier creek white with glacial silt. For a mile this runs through meadows and willow bottoms and is then joined in a tangle of willows, bars, and cross-channels by a torrent entering from the north, which flows out from under the snout of a tongue glacier at altitude 4,200 feet. Crossing the broken country between the two creeks, we again reached the main torrent where it forks about 2¼ miles from Little Whitesail Lake. Pushing up the narrow gorge, at altitude 3,640 feet we reached the summit of the pass, 3½ miles from the lake. The scenery was sublime. Directly ahead, and 250 feet below us, lay a large basin traversed by a torrent heading abruptly in huge glaciers spreading 1½ miles wide over and across the mountain summits. This large flat basin, a square mile in area, is open alpine meadow and scattered large balsam, but is subject to overflow. The torrent is 20 feet wide and 2 feet deep in a wide boulder-strewn flood-bed. Leaving the basin at altitude 3,100 feet, it goes into canyon, receives a torrent nearly as large as itself coming from under a tongue glacier ½ mile to the south, and the combined stream, which I have called Sias Creek, rapidly descends in a slide-swept V valley running south-west. Two miles farther it enters a box canyon, and about 5 miles from the summit Sias Creek enters the Gamsby (North Fork of Kitlope) Valley. The altitude here is reported as 1,600 feet above sea-level.

While my assistant, A. C. Pollard, B.C.L.S., was making the triangulation and traverse control for the map of the St. Thomas Lake country, I, with one man, took a canoe overland from Ootsa to Cheslatta Lake, and thence to and down the Nechako, up the Stuart River, and into Stuart, Trembleur, Takla, and Babine Lakes. This was done in connection with the triangulation of part of Takla Lake to complete the survey of the 55th parallel and the triangulation of Morrison Lake. I mention this trip to point out the wonderful system of natural waterways in the Northern Interior. We travelled altogether 1,800 miles by canoe in the course of executing various scattered surveys between Whitesail Lake and Takla and Babine Lakes. The only portages were 13 miles by wagon from Ootsa to Cheslatta Lakes, 250 yards at the falls of Cheslatta River, and 9 miles by wagon between Stuart and Babine Lakes. The only really bad water was in the two canyons on the Upper Nechako, 20 and 23 miles above Fort Fraser, although, of course, care had to be exercised at several other rapids on the Nechako, as a Peterboro canoe does not handle well in strong water.

I have, etc.,

F. C. SWANNELL, B.C.L.S.

CONTROL SURVEYS, RANGE 3, COAST DISTRICT.

BY R. P. BISHOP.

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

VICTORIA, B.C., January, 1924.

SIR,—I have the honour to report on my season's work for 1923. Before commencing on the main summer's work I made a short trip to the head of Bute Inlet to read angles from Mount Rodney on to stations set on the mountains near Chilko Lake the previous year. This part of the country has been already described by John Davidson in last year's report.

The main work of the season consisted in connecting the surveys based on the line of the 53rd parallel and Mr. Swannell's survey of the Eutsuk Lake neighbourhood with the Coast

triangulation of North Bentinck Arm. This latter is in turn connected with the astronomical station established some years ago by the Dominion Government near the Bella Coola Telegraph-office, and also with the main stations of the Geodetic Survey of Canada lying farther to the west.

The completion of this triangulation ties a large surveyed area in the Interior of the Province to the "North American datum," and so determines with sufficient accuracy for all practical purposes the geographical positions of a large number of places which were previously only approximately known. The "North American datum" is determined from a large number of latitude and longitude observations throughout the continent which are connected by triangulation, and positions based on it are free from the effects of "local attraction of gravity" which exercised such a disturbing effect on individual astronomical observations, especially in the mountainous districts of British Columbia.

The work was executed by utilizing a portion of the 53rd parallel as a base and triangulating in either direction. The triangulation points were marked by large stone cairns which will serve as a framework when a topographical survey is eventually made of the country. The programme was carried out without any serious hitches and completed just before the final fall of snow on the higher peaks. Most of the angles were read by a 5-inch Berger transit theodolite with verniers cut to 30 inches, eight repetitions being taken for each angle and the horizon closed as a check at each station. At certain stations a 7-inch Cooke micrometer direction instrument was used, which, being fitted with a large telescope, was very useful for long shots. On this style of work, however, I am of opinion that the disadvantages of a micrometer instrument outweigh the advantages, especially if it is a direction instrument and cannot be used for repeating, although the latter is now generally referred to in text-books as the standard instrument for long-distance work, probably because the stations in the larger geodetic surveys are marked by light at night and are all consequently visible at the same time. Cairns on very distant hills are, however, in this neighbourhood generally only visible under certain conditions of light and shade, often when others in the opposite direction are invisible, so that with a repeating instrument the angle can be snapped more readily than with one of the direction type.

My instructions were to avoid taking topography in detail, but to make sufficient notes to supply corrections to existing maps where necessary. The main corrections required were along the divide between the Bella Coola and Dean Rivers, particularly at the heads of the Noosgulch, Saloomt, and Necleetsconnay Rivers, where the country has never been mapped.

As I reported on the country in the neighbourhood of the 53rd parallel in 1913 and very few alterations have since taken place there, my report will be short. I will confine myself mainly to remarks on the summer-trails country, which has not been reported on since 1875, and to the Bella Coola Valley.

On the completion of the season's work I had an opportunity to investigate the position of Sir Alexander Mackenzie's most westerly observation station, where the great explorer painted on a rock the famous words which have been so often quoted in histories of Canada and of the Coast. There have been a variety of opinions expressed as to the position of this point, and as the matter is of great historical interest, from a national as well as a local point of view, it is made the subject of a separate report. A certain amount of information collected regarding Mackenzie's route in the Interior north of the Bella Coola Valley is included later in this report.

BELLA COOLA AND DISTRICT—MAIN PHYSICAL FEATURES.

The North Bentinck Arm, into which the Bella Coola River flows, possesses most of the characteristics common to the inlets of the British Columbia Coast. The sides are steep and rocky and the water very deep, shoaling rapidly at the head, where there is a typical tide-flat backed by the usual forest. The valley is merely a continuation of the inlet, which has been filled in the course of ages with silt brought down by the river. Both in the inlet and the valley the rocks bear the marks of glacial action to a remarkable extent and are often wonderfully furrowed, though at the same time smooth and polished.

As one leaves the islands of the Coast archipelago the hills become higher and the climate drier, but the hills are, generally speaking, lower and less rugged than those bordering the inlet farther to the south. As one proceeds up the valley beyond the head of the inlet, it becomes evident that the valley itself is a dividing line between two different types of country. To the

south the mountains of the Coast Range are extremely jagged; the valleys are narrow; the range as a whole is broad and difficult to travel through, so that routes between the Coast and the Interior are few and difficult.

To the north the mountains are somewhat lower and the Coast inlets penetrate them more deeply, almost reaching the back of the range. Access is easier everywhere, as, although many of the peaks are high and broken, the valleys are broader and more accessible; many of the higher mountains, such as Tutettsul and Cedajos, being completely separated from the main range. North of the valley pack-horses can be taken almost everywhere, with a little cutting, especially in the high plateau of the Northern Interior inside the range. They can also be taken down to salt water at Bella Coola and, with some difficulty, at Kimsquit.

The fact that in the north of the Province certain inlets reach the inner "contact" of the Coast Range and so provide water transport to this important zone of probable mineralization has long been regarded by geologists as of extreme importance, a fact borne out by recent developments in that part of the world. The comparative nearness of the heads of the inlets to the inside edge of the range in the neighbourhood now under report facilitates general access to the Interior as well as to the mineralized zone, and will probably prove an important factor in the eventual development of the district, both from the point of view of development of mineral and pulp resources.

East of the Coast Range lies the Northern Interior Plateau, here at its highest, and consequently more suitable for grazing than for agricultural purposes, as it lies almost entirely above the 3,000-foot contour-line. The late Dr. Dawson, of the Geological Survey of Canada, was of opinion that agriculture in the Northern Interior could not be carried on at a higher altitude, except in a few specially favoured localities, and his opinion, given nearly fifty years ago, seems to have been borne out by recent experience. The plateau is hereabouts broken by three lesser ranges—the Itcha, Ilgachuz, and Tsitsutl—which, according to Dr. Dawson, mark the site of three great vents, from which in Teritary times a large part of the basalt which has flooded all this region must have been derived. The Tsitsutl, locally known as the "Rainbow range of mountains," was visited twice this season and will be referred to later.

The fact that the Coast Range to the south is, for a long distance, broad and difficult to penetrate accounts for the constant use of the Bella Coola Valley, from time immemorial, as a main route of travel between the Coast and the Interior. This route was evidently widely known at the time of Sir Alexander Mackenzie's visit in 1793 and was followed by the explorer as soon as the great difficulty of reaching the Pacific by way of the Fraser became apparent. The Interior Indians here seem to have been on fairly good terms with the Coast tribes, who are of course quite a different race, and the use of the ancient route continues to the present time, as a large part of the population come down to trade as soon as the summer trail is open in the spring. I think, however, that the Indians from this part of the Interior never journeyed up and down the Coast to any extent, in which they differ from the Lillooets farther to the south, who travelled up and down the Coast from Howe Sound to Bute Inlet.

From a geographical point of view it is a somewhat interesting fact that, although the Bella Coola was largely used as a route to the Coast, its watershed at no point touches that of the Fraser, which drains the greater portion of the Northern Interior Plateau. The Bella Coola basin is hemmed in by those of the Dean to the north and the Klinaklini to the south. The Fraser watershed, however, approaches to within about 12 miles of the actual coast-line at the head of Dean Channel, where there is, I am told, a good pass between Kimsquit and the Tesla Lake country. This pass is also one of the ancient routes to the Interior and was formerly used by the Ootsa Lake Indians to bring their supply of salmon from the Coast.

DETAILS OF THE TRIP.

Having given some idea of the main physical characteristics of the country, I will give some details of my trip in the Interior and refer to the Bella Coola Valley again later on.

The triangulation was commenced by locating a station on a mountain above the cannery on the south shore of Bentinck Arm. From the mountain a good view can be obtained of the stations on the shore-line and clear lines of sight to the head of the Necleetsconnay River and for some distance up the Bella Coola Valley. As there is no pack-trail up the Necleetsconnay Valley I decided to work around to the head of the valley from the east, as there appeared to be a good chance of using horses in that direction.

As soon as the business of getting a pack-train together and fitting out stores was completed, I took the outfit by truck as far as Canoe Crossing, some 25 miles up the valley, John Creswell following in charge of the pack-train. Here Mr. Hoage, who had looked after my stores in 1913, very kindly placed at my disposal a cabin which proved very useful for storing our supplies.

Summer Trail.—The old summer trail to Ulgatcho climbs the northern slope of the valley above Canoe Crossing, whence the summit over which the trail goes is visible far beyond timber-line some 5,000 feet above the river. This portion of the trail is now not so frequently used as the Burnt Bridge Trail, which leaves the main valley some 6 miles farther up-stream and joins the other branch of the trail at Fish Lake. During the course of the summer we heard some very good accounts of this trail, so on the journey out my packers decided to try it, but were by no means favourably impressed and much preferred the older route.

Mackenzie's Trail.—The Burnt Bridge Trail lies to the west of the Burnt Bridge Creek, but being a comparatively recent affair is not correctly shown on most maps; the trail shown on the east side of the creek is, I believe, the old foot-trail of which Sir Alexander Mackenzie wrote so feelingly in 1793. The language he uses on this occasion contrasts so strongly with the matter-of-fact tone in which he usually expresses himself that it may be as well to quote him. He says: "The fatigue of ascending these precipices I shall not attempt to describe, and it was past 5 when we arrived at a spot where we could get water, and in such an extremity of weariness that it was with great pain any of us could crawl about to gather wood for the necessary purpose of making a fire." Mackenzie had, of course, been climbing with a pack on his back. He continues: "Nor was it possible to be in this situation without contemplating the wonders of it. Such was the depth of the precipices below and the height of the mountains above, with the rude and wild magnificence of the scenery around, that I shall not attempt to describe such an astonishing and awful combination of objects; of which, indeed, no description can convey an adequate idea. Even at this place, which is, as it were, only the first step towards gaining the summit of the mountains, the climate was very sensibly changed."

I have never been over this part of the old trail, which has long been abandoned. Capoose, an Indian of Abuntlet Lake, tells me that there are still two old men alive who can remember when it was in use, and that it touches a small lake locally known as Caribou Lake, lying on the "Capoose Summer Trail" east of Fish Lake. This is probably the "pond" passed by Mackenzie on July 17th and referred to by Dr. Dawson as Sikatapa Lake. From this point, according to Dr. Dawson, the old trail goes northerly over the Tsitsutl and joins the summer trail at Tonaybunkut or Long Lake. The old trail was quite visible on the extreme summit of the mountains, where we crossed it in travelling easterly over the range. Beyond Long Lake Dr. Dawson traces Mackenzie's route to Ulgatcho; then past Ulghak (Eliguk), Tsacha, and Cluskus Lakes, and on to the Fraser by way of the Blackwater. Dr. Dawson came down the summer trail from Long Lake in 1876, apparently as far as Fish Lake, and finding it impossible at that time to descend into the Bella Coola Valley with horses, struck easterly towards Abuntlet Lake.

Summer Trail.—After leaving Canoe Crossing we camped at the first available feed on timber-line, a short distance from the valley, but far above it. A cairn was set on the summit of the mountain to the north, whence angles were read later on to the station above Bella Coola, as well as on those marking remainder of the season's work. From this point one gets a good idea of the difference in the types of the country lying north and south of the Bella Coola Valley. As the peaks to the south are very nice to look at, but, I believe, hard to move around amongst, I should imagine that in the event of this part of the country being reserved for the purposes of a national park it would be as well to add to the area some of the more accessible country to the north, which has also a peculiar beauty of its own.

From the summit above Canoe Crossing we moved to Fish Lake, which, although close to the Bella Coola Valley, drains northerly into the Dean River. Horse-feed is very scarce, especially late in the year, as well-travelled trails go in four directions. Proceeding northerly a few miles along the summer trail, we made a cache near a meadow called "Tsiboute," taking flying trips westerly to the head of the Necleetsconnay and easterly to the far side of the Tsitsutl Range. I will refer briefly to each.

The Necleetsconnay.—An old trail, the eastern end of which has been cleaned up for use as a trapping-trail, extends westerly from the summer trail to the headwaters of the Necleetsconnay. It leaves the summer trail about 200 yards south of a large cache which has been built

on its westerly side. There are one or two wet places on the Necleetsconnay Trail, so that it is as well not to load pack-animals too heavily. Feed is fairly plentiful, but dry camping-places are not easy to find, as the ground is fairly swampy and, owing to the increasing precipitation, gets more so as one approaches the Coast Range. Before crossing the Noosgulch River the trail passes immediately to the north of an isolated mountain of remarkable beauty called "Tutettsul." The snow on the summit is continually breaking away in the form of avalanches, which are a wonderful sight when viewed from a safe distance, and are said by the Indians to portend rain. After crossing the Noosgulch the trail rises above timber-line, and after crossing some large meadows reaches the head of this river, which has its source in two small lakes named "Talkaazoone," which lie at the foot of a wonderfully symmetrical conical peak named "Pyramid Mountain" on the map drawn last year by Mr. Hodsden, of the Water Rights Branch. A few hundred yards north of the lake, and about 100 feet above it, is the divide between the Bella Coola and Dean watersheds, while that bounding the drainage areas of the Necleetsconnay lies about a mile farther to the west. Horses can be taken a little way in either direction, until the undergrowth gets too thick. We are now in the mountains and there are signs that the winter snowfall, which rapidly increases as one goes west, is here very great indeed.

At the head of the Necleetsconnay, after a couple of days' manœuvring, we succeeded in finding a peak which would command a view in either direction, towards Bella Coola and the 53rd parallel. My Indian deserves great credit for finding this, as the only suitable peak was inconspicuous and hard to settle on. As soon as the business was settled, however, he decided to quit, as his ideas on the subject of Government jobs had considerably modified since he worked for me some ten years previously. He considered that talking archæology for eight hours a day was more remunerative and less exhausting than survey-work.

Tsitsutl.—After returning to the cache, where we found the pack-train had arrived with a second load from the crossing, accompanied by M. Caspersen, N. Merkle, and J. Blaney, the local constable, I left the pack-train to relay stores up the trail and took a flying trip east across the mountains accompanied by Merkle, our Indian starting us on the way. The mountains, locally known as the "Rainbows," are shown on Dr. Dawson's map as the "Tsitsutl," meaning painted mountains, a name given for similar reasons to the range north-west of Trembleur Lake. Those now reported on consist of several isolated groups, but I understand that the name "Tsitsutl" is here used by the Indians to signify the culminating peak which lies a few miles west of the Dean River.

For some miles after reaching timber-line we took a somewhat roundabout route along the edge of what is apparently an ancient crater, marked by a gigantic wall still standing for several miles. At the far end of this wall one crosses a trail leading southerly from Long Lake, which is evidently the original Mackenzie trail. A lift in the clouds here gave us a glimpse of some of the wonderful colours which give the mountains their name. They could not, however, compare in variety and vividness with those farther to the east. Keeping well above timber-line, we had little difficulty in finding our way in this direction, the main diversion arising from a grizzly whom we interrupted busily digging in the bed of a creek. On one of the ridges we found several pieces of obsidian, the black glassy stone originally used here for knives and arrow-heads, and from which Anahim Peak, once their main source of supply, derives its Indian name of "Beece." My companion having just read that, since the opening of Tutankhamen's tomb, necklaces of this material were fast becoming fashionable, made a collection while I was taking some photographs. Dr. Dawson, who made a careful examination of some specimens gathered in this neighbourhood, was of opinion that the obsidian must have hardened under great pressure, but that it must have cooled quickly and may therefore be supposed to have penetrated some already cold rock as a dyke.

The main peak, Tsitsutl, together with some of its neighbours, Dr. Dawson describes as "The gently sloping plateau like remnants of a grand flattened dome, which the range in its perfect shape must have formed." From the summit one gets a dim view of Mount Tatlow and Tazeko to the south and a good command of a vast extent of the Northern Interior Plateau, including many miles of the line of the 53rd parallel. Beyond this latter one sees the cairns of Mr. Swannell's triangulation north of Eutsuk Lake, and to the east those set by Mr. Merston on the Ilgachuz Range. The summit of Tsitsutl is easy to approach on horseback from the east, where the mountain is flanked by the plateau-like remnants so aptly described by Dawson. To the west, however, it is broken into a succession of steep ridges, formed of loose volcanic

material, exhausting to climb and very hard on one's footwear. The more vivid red and yellow streaks are apparently composed of a clayey-like material something like ochre; unfortunately some specimens of this which I collected had to be left behind, as I took a short cut to camp late in the evening and was unable to pick them up. The general effect of the colouring is extraordinary and varies from red and brown to yellow, grey, lavender, and violet, which, with the white of the snow and the green of the vegetation, combine to produce a wonderful effect. Although there have been several bad burns here, most of the valleys are accessible on horseback and travelling is easy in most directions. Signs of game are fairly plentiful, including deer and caribou, occasional goat, and plenty of ptarmigan. Black bear and grizzly appear to be numerous; one of the latter woke me up one morning a dozen yards away from the fly, but luckily got scared and ran away before I had time to think about it. The caribou here are already showing signs of depletion, and it would seem that unless stringent measures are taken for their protection they will go the way of the other large herds in the neighbourhood which have recently been exterminated. Moose, on the other hand, which have come into the country in the last ten years, are apparently more able to take care of themselves.

Ulgatcho.—Having returned to the summer trail, we journeyed northerly to Tonaybunkut or Long Lake over a stony trail well strewn with windfall. Some Ulgatcho Indians had just been catching their annual supply of salmon here and others had been making their catch at Salmon House, reached by a trail branching off here which appears to be in very good condition. From Long Lake northwards the main summer trail passes through some very good meadows which my companions told me were somewhat superior to those of the Anahim Lake country. These meadows, with the grazing areas on the Tsitsutl, should provide room for a few cattle outfits if complications with the Indians can be avoided. I believe that several of the Ulgatcho Indians who did well during the fur boom are now purchasing meadows on their own account in the valley of the Dean River. I found Ulgatcho Village to outward appearance very much the same as it was ten years ago, but I am told that communications with the outside world have improved, as a sleigh-road which is built nearly as far as Tetachuck will probably be completed this winter.

Qualcho.—In the Qualcho Valley west of Ulgatcho Captain Harry, one of the original Qualcho Indians, has built a very good house, barn, and corral on some land which I ran out for him in 1912. He has several cattle and horses and puts up a good deal of hay, but, like everybody else in the country, puts in a good deal of time in hunting and trapping. He claims to have raised some potatoes at Sigutlat Lake, but has not tried to do so in the Qualcho Valley. The old C.P.R. survey to Kimsquit runs down this valley and there was once a good trail, which is now, I understand, obliterated west of Sigutlat Lake.

Chezco.—I hired Captain Harry to show me a fresh trail to my old triangulation stations, Watoot and Nadedicous, and also to visit Cedajos, or Peak 9020, where I was anxious to place a cairn. This peak is the highest in the country and had been cut in by Mr. Swannell from most directions towards the north.

The way lay up the Chezco, a swift glacial stream which had to be crossed several times. At the foot of Cedajos is a place called "Schoolenatee" at the foot of a glacier which Captain Harry told me once used to extend right across the valley and necessitated a detour on the part of travellers. Its end is now at least a quarter of a mile away from the stream. Residents of Bella Coola say that they have noticed a considerable recession of the glaciers in that neighbourhood in recent years, so there may be some foundation for Captain Harry's yarn.

Ascending the glacier in question to within about 1,000 feet of the top of the mountain, we found that the ice-cap which was visible from the north-west covered the whole of the summit, making it impossible for triangulation purposes. The unusual amount of ice on the cap for a hill of this height is undoubtedly caused by the heavy precipitation arising from clouds coming up Dean Channel. We had nasty samples of this sort of thing on the two days when we climbed the glacier and were eventually quite glad to turn our backs on the neighbourhood.

Tesla Lake.—West of the mountain one caught a glimpse of a low valley connecting the Tesla Lake country with the Coast by way of the Sagumtha, a tributary of the Dean. The height of land which lay immediately below us is probably the nearest point to salt water on the whole of the Upper Fraser watershed, the distance to Dean Channel being apparently about 12 miles in a straight line. The old Indian salmon-trail from Ootsa Lake to the Coast came through the pass, but I believe nobody has ever taken horses here until this season, when

Pete McCormick reached Kimsquit with Mr. and Mrs. Erick. From all accounts it would appear that this route offers a promising means of access between the Coast and Eutsuk Lake and its adjoining system of waterways. Mr. Erick is a mining engineer who had come to examine a group of sixteen claims said to carry galena, chalcopyrite, and tetrahedrite, owned by Mr. Gadsden and others, on the south shore of Tesla Lake. There is, I believe, another group of claims in the neighbourhood staked by Mr. McCormick, and Indians report ore elsewhere in the neighbourhood. In view of the nearness to the Coast it seems possible that development might easily follow here if the deposits come up to expectations. It now seems possible that this or some other direct route to the Coast will be used for the shipment of pulp, which in 1913 I mentioned as likely to become an eventual product of the Interior.

Anahim Peak.—In running out the 53rd parallel some years ago I have taken sights on to a small object on the summit of Anahim Peak, said by Capoose, a local Indian, to consist of rocks piled up as votive offering by generations of obsidian hunters. This spring I received a message from Mr. Merston, who was working in the neighbourhood, to the effect that there was a monument on the summit of the peak, so I decided not to visit the spot until the close of the season, and continued to take sights on the "monument" from adjoining peaks. When I eventually got there and found that the object which we had all taken for a cairn was nothing but a bush, the joke took a good deal of explaining away. The bush, however, being a well-shaped and hardy specimen of the dwarf hemlock usually found on timber-line, made as good a beacon as any legendary rock-pile. Capoose, when tackled on the subject later, admitted that he had never been there himself but had got his information from his grandfather.

BELLA COOLA VALLEY.

The cairns erected on the way in had all to be visited on the return journey for angle-reading purposes, and luckily the final fall of snow held off until this was all complete. The packers, who preceded the angle-reading party by a few days, had decided not to shave until reaching town, in order to make the barber work for his money, but their appearance provoked so much merriment among a party from Bella Coola, who were taking a Sunday afternoon trip up the valley, that the idea was given up.

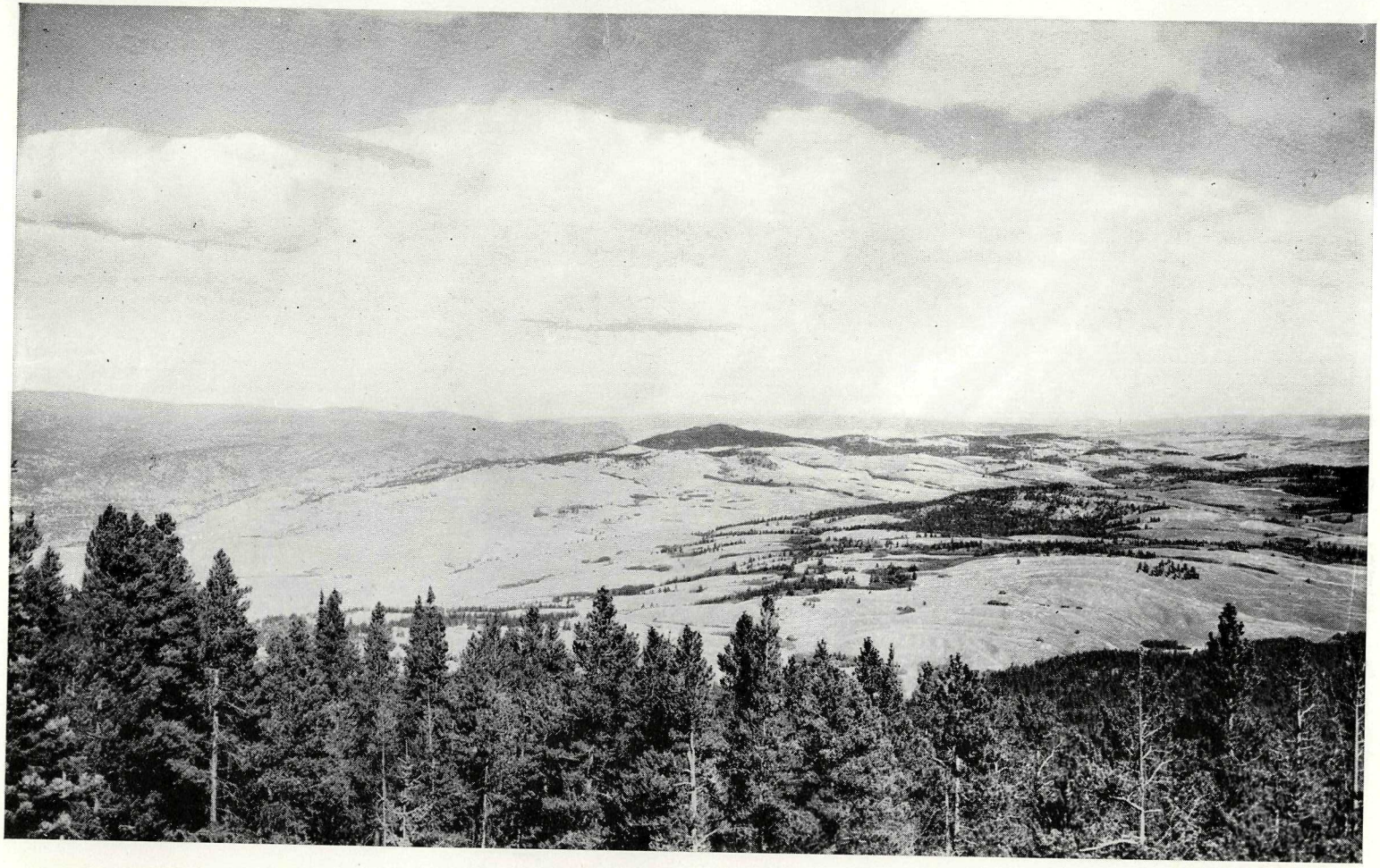
The valley forms a marked contrast to the rest of the country in the fall of the year, the pleasant orchards comparing well with the vegetation of the plateau above, where the leaves are already falling. The valley seems to have great possibilities from a fruit-growing point of view, as the Wilkerson Bros. claim to be able to raise melons from seed at their place a little above Canoe Crossing. The climate here is getting drier and a little farther east the "bunch-grass side-hills" give a good idea of the light precipitation. Several of the settlers were talking of irrigation this year as the summer had been unusually dry.

It is apparent that the valley is capable of producing a good deal beyond its local needs, and it seems a pity that connections with the obvious market, the great pulp plant at Ocean Falls, cannot be better developed. George A. Clothier, Resident Mining Engineer of the Northwestern Mineral Survey District, is of opinion that "the valley needs a big low-grade, operating mining property, employing about 1,000 men, to provide a local market for the varied produce." An account of his inspection of the Saloomt group of mineral claims is given in Mines Department Report for 1922.

PROPOSED PARK.

At the time of our return a public meeting had been held on the subject of the formation of a national park in the neighbourhood and a petition intended for the Dominion Government was circulating in the valley. The idea is linked with Bella Coola's hope of a highway to connect with the Cariboo Road in the Interior. The road would indeed be a boon to the valley, but whether the expense of its construction could be justified on general grounds is a matter beyond the scope of this report. The Cariboo Road would presumably have to be connected with the southern system of highways before tourists could be induced to come along the proposed highway to patronize the park in sufficiently paying numbers. Eventually, perhaps a ferry system might be made to connect with Vancouver Island to complete the circular trip, but this seems to be looking far into the future.

The local attractions are undoubtedly very great, and the wonderful series of Indian rock-carvings recently unearthed by Harlan I. Smith are of a more permanent nature than the fast-disappearing totem-pole. From a historical point of view it would be interesting and



Cattle-range in Nicola District.

instructive to demonstrate that the Lewis and Clark expedition was not the first to cross the continent, as many of our cousins to the South appear to believe.

PRESENT COMMUNICATION.

As regards the state of affairs at present, motors and trucks travel constantly to Canoe Crossing and some miles farther with a light load. Wagons can go some way farther up the valley, but beyond the end of the road pack-horses must be used as far as the Anahim Lake neighbourhood. A telegraph-line connects Bella Coola with Williams Lake. Pack-horses can occasionally be obtained at the Coast, but it is better for anybody contemplating a trip to make arrangements for a pack-train to be sent down from the Interior, where nearly all the animals are wintered. Arrangements can be made by telegraph as most of the owners are on the line. Supplies for a moderate-sized party for a short trip can generally be obtained at Bella Coola or Hagensborg.

I have, etc.,
R. P. BISHOP, B.C.L.S.

PHOTO-TOPOGRAPHICAL SURVEY, NICOLA VALLEY, KAMLOOPS DISTRICT.

BY R. D. MCCAW.

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

VICTORIA, B.C., December 23rd, 1923.

SIR,—I beg to report upon the photo-topographical surveys carried on by me in the Nicola Valley during the season just closed.

Your letter of instructions under date of June 8th required that I continue westerly from the area completed last year and extend to the limit of the Railway Belt on the north and west and as far south as time would permit. The surface covered during the past summer, I may say, extends to the limits of the Railway Belt aforesaid, and southerly, taking in the Nicola River and a portion to the south of that stream, the most southerly point being the summit of Iron Mountain, some 4 miles south of Merritt. The average distance done south of the Nicola River would be about 2 miles. The total area is approximately 435 square miles.

As former reports have dealt with technical details of this system of topographical survey, I will not go into the matter here, but would refer to my report of 1914. A different make of camera-plate was tested out this season—namely, the Ilford panchromatic plate. Some 40 dozen of these were used in the field, in addition to 28 dozen Wratten & Wainwright plates, the variety used in past years. The impression obtained is that the Ilford is a superior plate for this work. As usual, much paced and some chained traverse was done in parts of the area when required.

SEASON'S OPERATIONS.

The party was organized about the middle of June at Merritt. Some preliminary work was done from there during June 13th, 14th, and 15th, by way of placing some new and replacing some old signals on triangulation stations. On June 16th a camp was located on Clapperton Creek, about 3 miles north of Nicola. At this time, as our transportation would be dependent on pack-horses, we were in possession of nine head, five being Government-owned and four being hired. Work was projected from this camp until June 27th, convenient points in the vicinity being occupied as camera and triangulation stations. The signal on Iron Mountain south of Merritt was also repaired at this time and another signal placed on a bluff about half a mile north-west of the main station, as the main station was not visible from the north-west. During our stay at this camp there was considerable rain, a condition which at this time of year was not unwelcome, as the menace of forest fire and accompanying smoke was lessened for the time being.

On June 28th we moved up Shuta Creek to Lot 2405, near Swakum Mountain. A main triangulation signal was placed on the summit of this feature and a few photographic stations occupied in the vicinity. Swakum Mountain is the highest open top on a small plateau which has a number of small knolls rising from 100 to 300 feet above the average base. Water is shed in all directions and is contributed to Clapperton Creek, Rey Creek, 8-Mile Creek, and Shuta Creek. Several mineral claims are located in the vicinity and upon one a good deal of work has been done. Silver-bearing galena and an ore of zinc is the output of this claim, although no active work is going on now.

From the Swakum Mountain area we moved to Lot 4216, on Clapperton Creek, and continued work in this locality, and on July 11th moved on up Clapperton Creek to a position near Lost Lake. This is the reservoir which flooded Nicola by way of Clapperton Creek last year when the dam broke. The upper part of Clapperton Creek watershed is generally a thickly timbered plateau with flat valleys. There are a number of lakes which are used as storage-reservoirs in addition to Lost Lake. These are known as Surrey, Sussex, and Kent Lakes on the main stream, and Bob, Mable, and Conant Lakes on tributary streams. Another series of lakes, known as the "Frogmoore Lakes," contribute water to Moore Creek, which flows into the north end of Nicola Lake. These lakes lie close to the south limit of the Railway Belt, in a valley which is the continuation easterly of the valley of Sussex and Surrey Lakes. Camps were located at Sussex Lake and near the Frogmoore Lakes while operating in this area. On August 2nd we moved to Rey Lake, a reservoir on Rey Creek, tributary to Mamit Creek, and were occupied in this locality until August 14th, when camp was moved on down to the main Mamit Creek Road. About this date there was a good deal of rain and showery weather continued for several weeks longer, although it caused us to lose little time.

Surveys were now started along the Mamit Creek Valley and continued from subsequent camps at Quenville's ranch and Lot 1585. Mamit Creek is the next largest stream to the Nicola and Coldwater Rivers within this year's work. It heads in the Railway Belt and flows almost south to the Nicola River, joining it south of Lower Nicola. Mamit Lake is a widening of the stream about 4½ miles south of the Railway Belt and is a body of water over 2 miles long and from a quarter to half a mile in width. A dam at the lower end has turned it into a good natural reservoir, the water from which is conveyed by Mamit Creek to lands about Lower Nicola. Generally the east side of the valley of Mamit Creek has many open areas and the timbered areas are usually free from undergrowth. The west side is all timbered and is again very free of undergrowth. Several small streams join Mamit Creek from the west, coming from within the Railway Belt. The Aberdeen Mines are located on one of these, known as "Broom Creek." At present there is no work going on there, but the extent of the plant gives indication of considerable activity a few years back.

As the greater part of the balance of the work was along main roads, a light Ford truck was hired and used during the last eight weeks. The Government pack-horses were kept until near the end of the season, as they were needed at times, while the horses that were hired were returned.

The valley of Mamit Creek for the time was left at 8-Mile Creek, and on September 6th camp was moved to Nicola and operations commenced along the main Nicola Valley, between Nicola Lake and Merritt. Smoke began to bother us a good deal at this time and until the end of the season the atmospheric conditions were often very poor. The Iron Mountain Main Station was occupied on September 10th and the Swakum Station on the 13th. The latter was read under very poor conditions, as smoke rolled in so thickly that all readings were not completed. On September 24th the Hamilton Mountain Station was occupied, but rain prevented the observing of all stations wanted. The main stations were not occupied again as the readings obtained were considered sufficient.

The last camp of the season was located at Lower Nicola on September 25th. From this camp the Merritt area was completed and the lower part of Mamit Creek; also the main Nicola Valley to Canford. On October 11th we broke up camp, paid off the men, and stored the outfits. My assistant and I remained at Merritt until the 17th in order to complete the traverse of the Nicola River above Merritt.

GENERAL.

The atmospheric conditions for the season were fair. Smoke was with us from about the middle of July to the end of the season in more or less quantities. The season was generally showery, which greatly helped vegetation and also helped to keep fires and resultant smoke down. Very little time was lost, although some of the days, when we occupied photographic stations, were very poor for camera-work. Again, during very bad conditions, necessary traverses and exploratory trips were made.

Following is a summary of stations, etc., done this year:—

Main triangulation stations	3
Photographic stations	140

Separate camera stations	216
Land-ties made	30
Miles of paced and other traverse (about)	200

The area done consists of the entire watershed of Clapperton Creek, part of the watershed of Moore Creek, the greater part of Mamit Creek watershed, and the main Nicola River Valley from Nicola Lake through Nicola, Merritt, Lower Nicola to Canford. The area is generally timbered, excepting portions along the main Nicola River and on the east side of Mamit Creek. The Swakum Mountain area has considerable open area, also the ridge north of Rey Creek, both due no doubt to fires in days past. In the vicinity of Merritt, Nicola, Lower Nicola, and the lower portion of Mamit Creek there is much yellow pine. In higher altitudes fir and yellow pine mix, while on the tops and in the back valleys jack-pine is the predominant growth. Fir is found in scattered growth right to the summits in places, the greatest altitude of the area not exceeding about 5,700 feet above sea-level. Generally there is a good growth of grass and very few parts visited have not been grazed by stock at some time or other. The Swakum Mountain area is a very fine summer range and the growth of grass and weeds seems more luxuriant there than elsewhere.

The country is well supplied with roads and trails. Main roads leave Merritt, going to Spences Bridge, Kamloops, Princeton, Ashcroft, Savona, and up the Coldwater River. A good road extends up the east side of Mamit Creek and is the highway connecting with Ashcroft and Savona. On the west side of Mamit Creek is a good road from Lower Nicola to the Aberdeen Mines. From the road on the east side of Mamit Creek branch roads extend up Sheep Creek, 8-Mile Creek, and Rey Creek. A road extends up Clapperton Creek from Nicola to Lot 2405, with branch roads into Pleasant Valley and a valley to the north of this. Another road or wagon-trail which is steep in parts leaves the Clapperton Creek Road and extends up Shuta Creek to Swakum Mountain. A good pack-trail continues up Clapperton Creek to Lost Lake from Lot 2405, and thence to Sussex and Surrey Lakes, and connects with a wide stock-trail which gives connection easterly past the Frogmoore Lakes to Moore Creek and Stump Lake, and gives connection north-westerly into Meadow Valley. A connecting trail also extends easterly from the east end of the Rey Creek Road to the Clapperton Creek Trail. There are many other pack-trails, some of which will be shown on the topographical map to follow. Those described are the main routes.

Range and feed conditions were much improved this last summer over the two previous years, due to increased rainfall and a lessening of the grasshopper pest, although in parts this was still bad. Grain and hay usually looked good, but unfortunately much of the latter was left too long before mowing.

The main industries at Merritt are coal-mining and lumbering. The working coal-mines are situated a little to the west of Merritt. Outcroppings appear at various places and mining operations have been commenced in one or two other parts, although there is nothing being done at these at present. All season logging was being carried on in the yellow-pine woods west of Merritt, the product being hauled by trucks to the mill there. Another mill near Lower Nicola was in active operation all season.

The railway communication of the district is by the Kettle Valley. A line of this railway follows the Nicola River from the main line of the Canadian Pacific Railway at Spences Bridge to Merritt, and then continues up the Coldwater River, connecting with the main line of the Kettle Valley Railway at Brookmere. A branch from Merritt to Nicola gives railway communication to the latter place.

The game in the area completed is typical of the entire district. In parts deer are fairly numerous, and then again they are scarce. There are a few black bear. Tracks of these were seen quite close to civilization. Grouse seem to be numerous in parts and prairie-chicken are seen in the open areas. There are no fish in the Clapperton Creek Lakes, but we believe these were stocked during the past summer. Mamit Lake has plenty of trout. Coyotes, ground-hogs, badgers, and porcupines were seen, the former in large numbers. Fox-farming is carried on extensively in the district, and with apparent success.

The map-work is progressing and the customary sheets will be submitted. Some photographs have already been handed in.

I have, etc.,

R. D. McCAW, B.C.L.S.

PHOTO-TOPOGRAPHICAL SURVEY, YALE AND SIMILKAMEEN DISTRICTS.

By G. J. Jackson.

Victoria, B.C., December 15th, 1923.

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 Similkameen and Yale Districts and consisted of the valley of the Similkameen River from Copper Mountain to the International Boundary, including the watershed area of all the streams flowing into it. On the east it connects with my work of the season of 1920 and completes the watershed of the Ashnola River.

Season's Operations.

The party was organized at Princeton on June 13th. The next day we moved up the east side of the Similkameen River about 25 miles to Placer Creek, when we commenced the season's operations. We worked eastward to the divide between the Similkameen and Ashnola Rivers and then south along the divide to the International Boundary, occupying sufficient stations to complete the Ashnola watershed, as well as stations looking westward to the Similkameen basin. We then dropped into the Paysaten River Valley and worked down it to the junction with the Roche River. Then worked up the Roche and Cambie Rivers to the head, occupying stations on each side and making several flying trips to cover the area between the main river and the International Boundary. From the head of the Cambie River we ascended the Three Brothers Range and worked northward along it to the Hope–Princeton Trail on Whipsaw Creek. We then made a move of 40 miles down the Whipsaw to the Similkameen and up the west side of the Similkameen to the Roche, and then we worked both sides of the river down to Copper Mountain. We completed the season's work and moved down to Princeton on October 9th.

During the first two weeks we were delayed by the depth of the old snow and the consequent lack of horse-feed, also by almost continuous rain. From then on the weather, on the whole, was very favourable for our work; on several occasions when smoke did collect there was enough rain to clear the atmosphere.

The triangulation system for the season was controlled by stations of the International Boundary Survey and of the Geological Survey of Canada, supplemented by new ones of our own.

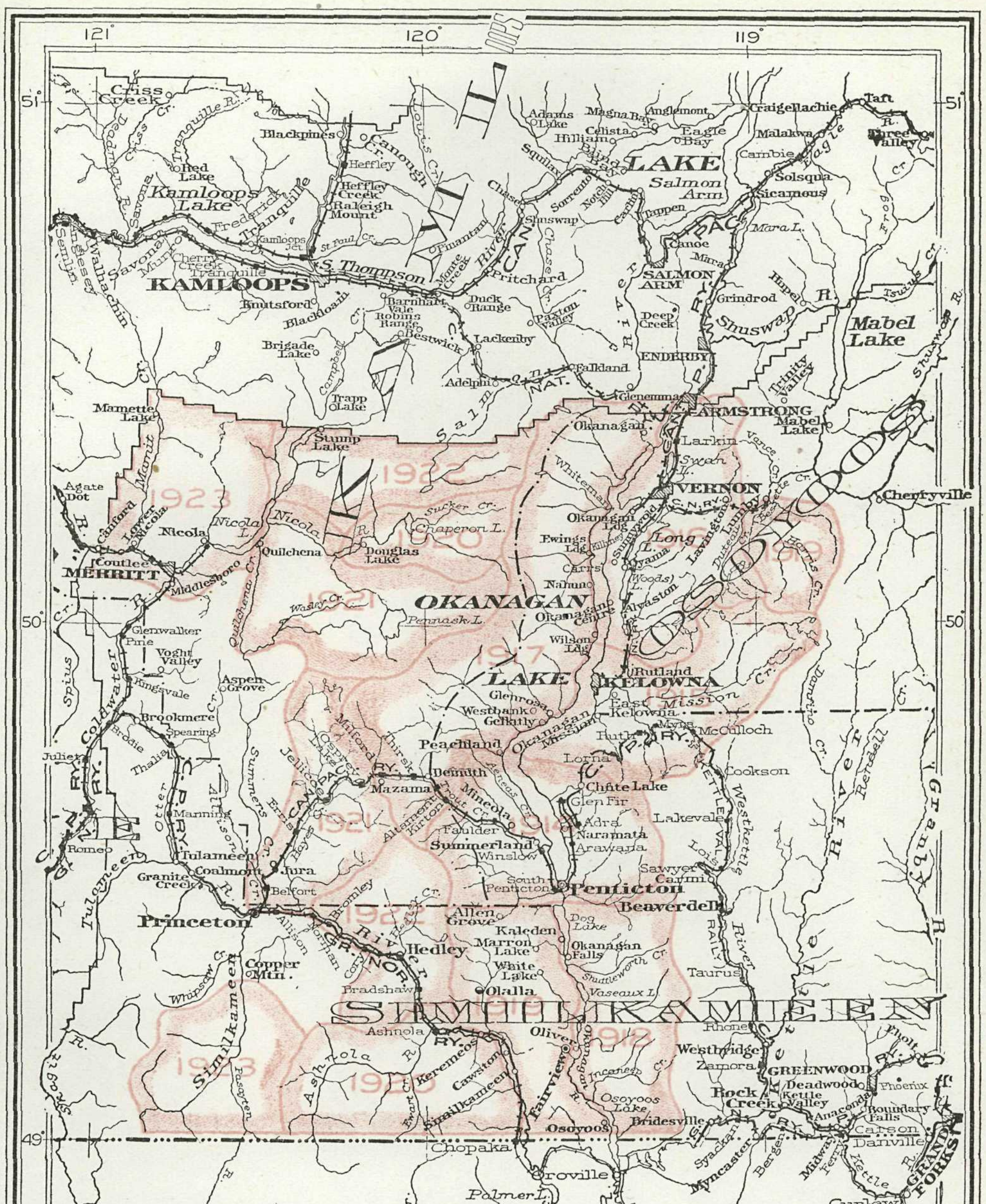
During the season 65 dozen views were taken and the following stations occupied:—

Main triangulation stations	6
Main photographic stations	127
Separate camera stations	90

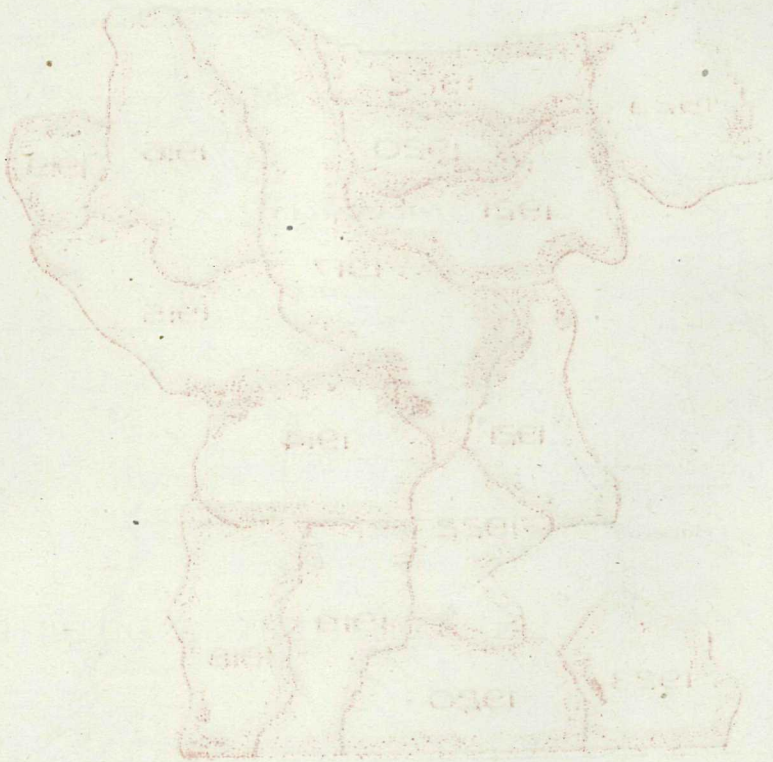
In addition to these, a considerable number of ties were made to land and mineral-claim surveys and 75 miles of compass traverse were run. About 30 miles of horse-trails were cut and many miles of old ones cleared out.

General.

The Similkameen River lies nearly north and south from Princeton for about 30 miles, where it forks into the Roche and Paysaten Rivers. About 9 miles up from Princeton the Whipsaw and 9-Mile Creeks come in from the west, and about 25 miles up Copper Creek comes in, also from the west, and Placer Creek from the east. The Paysaten River rises in the States and flows nearly north from the boundary for about 13 miles to the junction with the Roche. About 10 miles up the Roche, in a south-westerly direction, at what is known as the "Three Forks," the river divides into three—the Chuchuwanten, Castle, and Cambie Creeks. The Chuchuwanten comes from the south and Castle Creek from the south-west, both having their source across the boundary. The Cambie comes from the west. Three or four miles up the Cambie the Little Muddy Creek flows in from the west from Gibson Pass and Lightning Lake. The Cambie Valley here turns north and south; about 5 miles up this creek the Mamaloose Creek comes in from the west from Allison Pass. Continuing north up the Cambie, we come to the head in about 10 miles. Besides those mentioned, there are many smaller creeks flowing in from both sides.



Index Map
Showing areas covered by
PHOTO TOPOGRAPHICAL SURVEYS
1914-1923
Scale



West of the Similkameen River and between the Whipsaw and Copper Creeks, and surrounded by them, is a thickly timbered hill, known as "Friday Mountain." Copper Creek drains a basin of about 75 square miles to the west of this. Between the Copper and the Roche there is a range of hills extending west from the Similkameen River until they join the range known as "Three Brothers." This range lies north and south between the Cambie on the west and the Copper and Whipsaw Creeks on the east and rises to an elevation of 7,450 feet. To the west of Cambie Creek there are broken hills, forming the divide between it and the Skagit waters. To the south, between the Cambie and the Chuchuwanten, the hills rise towards the boundary and they are very rugged, reaching an elevation of about 8,000 feet. Between the Chuchuwanten and the Paysaten there is a high ridge running south from the Roche to the boundary, reaching an elevation of 7,050 feet. To the east of the Similkameen and Paysaten a range of hills extends south from Copper Mountain to the boundary, forming the divide between the Similkameen and Paysaten on the west and Wolf Creek and Ashnola River on the east.

At present there are two roads leading into this section of the country from Princeton. One up the east side of the Similkameen River to the mining camp at Copper Mountain, about 12 miles from Princeton, and continuing 2 or 3 miles beyond this camp. From the end of this road there is a pack-trail as far as Placer Creek, where the river can be easily forded in low water. The other road is up the west side of the river for about 12 miles; at about 9 miles the Hope–Princeton Trail up the Whipsaw comes in and at about 11 miles the Roche River Trail begins. This is a good trail up to and along the Roche River to Cambie Creek and up the Cambie to Allison Pass and through to the Skagit. There are also branches up to Gibson Pass and Lightning Lakes, which lead also to the Skagit. Besides these, there are old trails up some of the other creeks, but these are, for the most part, badly filled in with windfalls; the exceptions are those few that are kept open for trap-lines.

The valleys of the Similkameen and its tributaries above Copper Mountain are narrow, with very little land suitable for agriculture, although there are some river-flats and lower benches that might be used, but as yet no attempts have been made to clear and cultivate them.

The whole area is thickly timbered up to the timber-line at about 6,500 feet. In the valleys and lower side-hills there are fir, spruce, balsam, and black pine, while higher up it is largely black pine, with some spruce. Many areas are old burn covered with windfalls and grown up with a dense growth of young black pine.

There are two areas suitable for stock-grazing. One is situated on the divide between the Ashnola and Paysaten Rivers, extending north from the International Boundary for 5 or 6 miles, with a width of from 1 to 2 miles. This is just at timber-line; some of it is bare of trees, while the rest is comparatively open. It has never been used by British Columbia stock, but appears to have been used by American sheep-herders for their sheep. This area could be most conveniently reached from the Ashnola River Trail, but could also be reached from the Paysaten.

The other area is much larger, extending south from the Hope–Princeton Trail nearly to the Roche River and west to Cambie Creek, including the Three Brothers range of mountains. Most of this is comparatively open timber grazing, while there is about 10 square miles of open country on the Three Brothers Range. A portion of this area near the Hope–Princeton Trail has been used for stock, but most of it has never been touched. It is all easily accessible from this trail.

The area is well mineralized. The mine at Copper Mountain has a large body of ore and considerable work was done there this season. Although not shipping at present, it will undoubtedly be a large copper-producer in the near future. There are also several prospects along the Roche River which have good showings.

Game is plentiful throughout the area; mule-deer and black and brown bear were seen everywhere, also tracks of an occasional grizzly. We also saw a few goats. Blue grouse and fool-hens were plentiful in the hills; there were a few willow-grouse in the valleys and some ptarmigan were seen on the mountain-peaks.

The usual fur-bearing animals are in this area; beaver were the most in evidence, the others being fairly well trapped.

For the most part the fishing is not good. The main rivers, the Roche and the Cambie, have lots of trout, but they are very small. The Lightning Lakes and one other up Placer Creek had in them numbers of rainbow trout about a foot in length.

This section of the country should be more popular than it is for hunting and camping parties, as it is easily reached from Princeton by means of a pack-train. There are many fine camping-sites on the Three Brothers Range and in the range between the Ashnola and Paysaten Rivers. The scenery from these ranges is very beautiful and there is plenty of game to make it interesting for hunters.

The work on the maps is now in progress, and, as usual, triangulation, topographical, and timber-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.

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

December 31st, 1923.

SIR,—The work of the boundary survey was conducted as in past years. Acting under instructions, Mr. Cautley's division continued the production of the 120th meridian north from monument 84-5, which was the most northerly point reached by his survey in 1919. This monument is near the north boundary of Township 84 and about 12 miles north of where the Interprovincial Boundary crosses Peace River. The survey was carried on from May 28th to August 28th and the meridian produced a distance of 77½ miles, the last monument built being No. 97-5, near the north boundary of Township 97.

Up to the end of the 1919 season the survey of the 120th meridian had been marked by concrete monuments placed at such distances apart, approximately 1 mile, as to be intervisible. It was now decided to abandon the construction of concrete monuments and to use only the secondary type of monument authorized by the 1921 conference, which monument in general construction closely resembles the standard Dominion Land Surveys posts used on base-lines. The reason for such decision was due to the great scarcity of gravel for concrete and the tremendous labour and expense of hauling it and cement to the points where required.

Mr. Wheeler's division continued the photo-topographical survey of the watershed from Bess Pass, situated not far north of the south boundary of Township 50 in Range 10, to Township 55 in Range 14. Both parties carried on the work with a view to closing it at the end of the 1924 season.

MR. CAUTLEY'S SURVEY OPERATIONS.

Mr. Cautley reports in part as follows: The party organized at Edmonton and left for Peace River on May 17th. Travelling by boat up the river 150 miles, Boundary Landing was reached on May 21st, where the party was met by packers and a pack-train. The party then proceeded to Boundary Lake, a distance of 18 miles by the survey-trail of 1919, and having completed the survey of the lake began work on the boundary on May 28th.

From May 28th to August 28th the survey progressed steadily northward, the last monument built being 97-5, which occurs on the summit of a high ridge and overlooks, towards the south, nearly 50 miles of low flat country through which the survey passes. This ridge is an eastern spur of a main ridge which lies in a general north-easterly and south-westerly direction and forms the watershed between the Nelson and Hay Rivers. The northerly production of the boundary will cross at least one more tributary of Hay River before passing into the Nelson River drainage-basin.

On August 29th the party started homeward and arrived at Peace River on September 10th and were paid off as from September 12th. The horses were taken by the packers down to Rio Grand to be wintered.

During the season 77.5 miles of line were surveyed and seventy monuments established. The whole line was carefully levelled and check-levelled. Surveyed connection was made with the twenty-second and twenty-third base-lines and a great deal of painstaking topographical exploration was done for 1½ miles on either side of the boundary.

GENERAL DESCRIPTION OF COUNTRY.

Mr. Cautley reports that in the whole distance surveyed in 1923 there are only three important topographical features—namely, the Clear Hills and the Doig and Chinchaga Rivers.

The Clear Hills are an extensive system of ridges lying E.N.E. and W.S.W. They attain a maximum altitude of about 3,600 feet, or 2,350 feet above the Peace River. The boundary crosses near the middle of Township 38 at an altitude of 3,300 feet and passes over the westerly extremity of the main ridge.

The Doig River is a main tributary of Beatton River. It flows across the boundary in a general westerly direction near the north boundary of Township 91. Here the stream has an average width of 65 feet and is from 18 to 30 inches deep, with a sluggish current of less than half a mile an hour. On July 23rd, at a very low stage of water, Mr. Cautley estimated the flow at 44 cubic feet per second. One week later, after heavy rains, his packers reported that the river had risen 5 feet and that the horses had to swim to get across. The water was warm and tea-coloured but good.

The Doig River drains a vast muskeg country. The valley at the boundary is 75 feet deep, and it is characteristic of the country that within 20 feet of the top of the banks the surface stretches away in wet muskeg for miles.

The Chinchaga River crosses the Interprovincial Boundary, flowing in a general easterly direction, 2 miles north of the south boundary of Township 96 and is said to be a tributary of Hay River. At the boundary the Chinchaga is about 60 feet wide and 24 inches deep and the current varies from ½ to 1½ miles an hour. On August 21st Mr. Cautley estimated the flow to be 133 cubic feet per second. From the estimations made it might appear that the Chinchaga carries three times as much water as the Doig, whereas the two streams are so similar in size and character that it is impossible to say which carries the most water. The channel flows in a valley about 45 feet deep and meanders in long loops and bends to such an extent that a mile of general course represents three of its channel. There are occasional riffles, but as a rule the channel is full of water from bank to bank. Like the Doig, the Chinchaga drains a large muskeg area and the water is muskeg-brown but good.

The dominating characteristic of the country is muskeg. Comparatively high ridges many miles apart form local watersheds. So flat is the intervening country and so sluggish and indirect the drainage that the land has become saturated and has developed a spagnum-moss character which differentiates it as muskeg. It is probable that the depth of the moss on the soil beneath is not very great, and in view of the marked differences of elevation it is certain that enormous areas of muskeg could be easily drained. Usually the muskeg alternates with low ridges covered with jack-pine, which rise a few feet above the general level.

There are a number of Indian trails, most of which seem to have origin before there were white men in the country. The trails are necessarily very indirect, because, generally speaking, the only possible location for a summer trail is right along a creek or river.

TIMBER.

Along the narrow creek-valleys and on some of the high ridges there is a limited quantity of spruce timber from 18 to 24 inches in diameter, of good marketable value if it were practical to get it to market, but it does not occur in sufficiently large bodies to justify building logging-railways or tractor-roads, the only way of getting it out at present. Bush fires have occurred in many places, but the marshy nature of the country tends to confine fire within comparatively small areas.

GAME.

Fewer animals of all kinds than usual were seen because so much of the country passed through is muskeg. Bear, moose, deer, and beaver were plentiful in the river-valleys and, beaver excepted, on the higher ridges. It is a curious fact that there should be grizzly bear in such a country, but, although none was seen, Mr. Cautley was informed that several had been shot within the last two years.

Black bear were very numerous and a great nuisance. Three caches built on stages 9 feet above the ground were raided and loss sustained. It was noticed on the way back that nearly all the carefully built mounds at monuments had been partially destroyed and tumbled into the trenches. It was also noticed that all the mounds composed of black earth seemed to have been attacked, while those on sandy ridges had not been touched.

One of the periodic epidemics which kill off the rabbits occurred last year and millions were scattered over the country. It is curious that, although dead rabbits were so thick as to occur

at intervals of not more than 50 feet apart, sometimes for miles at a time, no two bodies were ever seen close together.

North of the Doig River there are numerous colonies of beavers in almost every creek; the Chinchaga River itself was dammed in several places.

There are trap-lines all through the territory traversed, and it is said to be a good trapping country for beaver, musk-rat, lynx, and marten, but that there are few foxes.

Apart from possible discoveries of minerals, the only valuable natural resources of the vast territory, of which the land covered by the season's survey is only a fractional part, are: First, a potential deferred value as a timber reserve of poor quality, poor because 75 per cent. of the country is muskeg, on which valuable timber does not grow; and, second, a present and immediate value as a first-class fur reserve.

Unfortunately our Governments seem much more alive to the necessity for preserving the country's supply of game animals than the country's supply of more important, because more valuable, fur-bearing animals. The existing regulations governing trapping do not attempt to prevent more than one trapper from trapping the same district, with the result that all the trappers in any given district vie with one another in an attempt to exterminate the fur. The working-out of the above policy is particularly disastrous in the cases of beaver and musk-rat, because it is so easy to exterminate these animals as far as each colony or lake is concerned. Thus a good musk-rat slough of 600 acres ought to produce an annual crop of, say, 2,000 rats, whereas if all but one or two odd rats are taken every year the annual crop may be only twenty or forty rats. Incidentally it may be pointed out that 600 acres of slough that produce 2,000 rats annually would create a revenue comparable with that obtained from 600 acres of good homesteaded land.

For an exclusive trapping lease that was conditionally renewable from year to year a trapper could afford to pay the Government a good round fee that would more than pay for all the additional patrolling that the policy would entail; moreover, the only source of revenue to the people of Canada from many millions of acres in the Northland would be conserved.

There is one great point in favour of encouraging the trapping industry, which is that, whereas every squatter in unsettled and unsurveyed territory is a fire-setter by instinct and necessity, the trapper is very careful about fire, not because he is a more responsible type of citizen, but because fire ruins his business.

GEODETIC SURVEY TRIANGULATION.

The Geodetic Survey of Canada again co-operated with the Boundary Survey, and the triangulation to connect the Dominion Land surveys at Yellowhead Pass with the 120th meridian at its intersection with the watershed was carried forward under the superintendence of H. F. Lambart, of the Geodetic Survey. Three parties were in the field—a reconnaissance party, directly under Mr. Lambart, and two observing parties engaged in reading the angles between the various stations established by him the previous season.

Mr. Lambart's party continued the reconnaissance from the Stations "Felix" and "Curley" at the end of his 1922 season's work. He carried the triangulation to Jarvis Pass, where he established a base to control the northerly portion of the chain. Eleven observing stations were selected and cairns built at them for the use of the angle-reading party of next season. While at this work Mr. Lambart identified and took readings on the cairn built by Mr. Cautley on Torrens Mountain at the end of his 1922 season.

The Topographical Division tied in the camera stations of the photo-topographical survey with the cairns built by Lambart, and as soon as his triangulation is completed the definite location of the watershed and of the topographical features adjacent to it will be known and will enable accurate maps to be published.

TOPOGRAPHICAL DIVISION.

SURVEY OPERATIONS.

The party organized at Jasper and made the necessary tests of survey cameras at that place. This work and getting outfit and supplies ready to move occupied from June 7th to 9th.

It was necessary to get all possible supplies forward to the field of operations at the beginning of the survey, for the point of commencement at Bess Pass was six days distant from Jasper by pack-train and the work would be continually getting farther away, so on June 10th

A. J. Campbell, D.L.S., moved out with a train of eighteen head of pack-horses loaded with supplies to establish a cache at Colonel Pass, situated about half-way. The streams were in flood and one horse was drowned and a load of supplies lost in crossing Meadow Creek. In addition to this misfortune, eight head of horses wandered away looking for feed, of which there was very little so early in the season. Three days were lost before the horses were found, so Mr. Campbell cached his loads two days out and returned to Jasper on the 15th. Mr. Wheeler arrived with the full party the same day and another pack-train was got ready.

On June 18th a start was made, but again delay was encountered through missing horses. While they were being looked for the party moved to Yellowhead Pass and cleared out the trail up the big hill to the north of it; also sent forward supplies as there was too large a quantity to be carried at one move.

On June 25th the party arrived at Colonel Pass. Getting forward supplies, hunting lost horses, and cutting out trail caused much lost time, and it was July 6th before the party arrived and went into camp at the mouth of Carcajou Creek. Between July 7th and July 12th five camera stations were occupied in the vicinity of Carcajou (Wolverine) Pass, to supply information that could not be obtained at the end of the 1922 season owing to storm conditions.

On July 16th camp was made at Bess Pass and two stations occupied on the 17th. The party now moved over Jackpine Pass and occupied stations on the heights bordering the Jackpine River Valley. Between July 21st and 31st fourteen camera stations were occupied, of which three were stations of the geodetic triangulation survey—namely, "Whistler," "Beaver," and "Resthaven."

Between August 1st and 10th rain and snow hindered the photographic work and only four stations could be occupied. On August 11th a trail was cut up the Middle Branch of the Jackpine and on the 14th camp moved to Meadow Lake Pass. August 15th to 20th eight stations were occupied and on the 21st the party moved over Jones Pass to Oasis Camp. Here G. G. D. Kilpatrick, of Mr. Lambart's party, paid the camp a visit. On August 23rd a move was made to Beaverdam Pass.

Low clouds and rain interfered, so that from August 24th to 31st only five camera stations were occupied; "Curley," one of Lambart's geodetic stations, was of the number.

The party now moved down the valley of the West Branch of the Jackpine River and over the Big Shale Hill, camping in a valley on the north side below "Pang" Station of the geodetic survey, where it was held for four days by rain and snow. On September 6th a further move was made to South Morkill Pass and camp pitched on the bank of Muddywater River. Between the 6th and 8th four stations were occupied, of which "Pang" and "Felix" belonged to the geodetic survey. On September 10th the party moved to South Muddywater Pass and between then and the 14th nine stations were occupied, of which "Gilbert" was a geodetic station.

The work had now been carried as far north as the season would permit, so on September 16th the party started for Jasper, returning by the Jackpine and Bess Passes to Robson Pass and thence to the Fraser River Valley, and up the same to Yellowhead Pass and by the Miette River Valley to Jasper, where the pack-train arrived on September 28th.

En route on September 27th two stations were occupied on the west side of the Moose River Valley, near its junction with the Fraser, to gather information missing from the survey of the previous season. The members of the party engaged in this work took the train to Jasper and all arrived there on the 28th and were paid off on the 29th.

It was an exceptionally good season's work. Although the month of August was erratic as to weather conditions, it was made up for in September and the survey was pushed well forward, making its completion in 1924 a certainty, provided the general average of good weather was to be had. In all, sixty-three camera stations were occupied and 540 photographic plates exposed. The field-work was directly in charge of A. J. Campbell, D.L.S., ably assisted by A. S. Thomson; both did excellent work.

CARCAJOU PASS.

This pass is locally known as "Wolverine Pass," but owing to there being a pass of the same name in a more southern location the name "Carcajou" has been substituted. It is described in the 1922 report of the Surveyor-General. The altitude of its summit is 5,120 feet above sea-level. Several camera stations were occupied in the vicinity to supply missing data of the previous year.

BESS PASS.

This pass also is described in the 1922 report. Its altitude is 5,330 feet. Work was begun here in 1923 by the occupation of a station, "Whiteshield," to augment the data already obtained.

JACKPINE PASS.

A high trail encircles the south-west slopes of the Mount Bess massif and leads over the Jackpine Crossing of the watershed. The altitude of the pass summit is 6,694 feet and the direct distance from Bess Pass Summit nearly 4 miles. On the north side it falls steeply to the head of Jackpine River. The route is an arduous one, rising and falling 1,000 feet or more several times. The summit lies well above timber-line and the approaches on both sides are grassy or shale hills.

JACKPINE RIVER VALLEY.

The course of the Jackpine River is a little west of north for something more than midway of its length, when it bends to a north-east direction and joins the Smoky River. The upper part of the stream lies in a restricted bed bordered by a thick growth of spruce forest, with, on the east side, several open grassy slopes where avalanches in the distant past have swept away the timber. These "slides," as they are called, furnish excellent pasturage for horses. A few miles down the valley opens to gravel-gars, and then to broad, wet marshes, which, while not impassable, furnish very bad travelling for horses. These wet meadows continue for several miles to near the beginning of the bend. The valley then becomes thickly forested and the stream flows swiftly between walls of jack-pine and spruce.

The trail lies for the most part along the edge of the stream, where the going is better, although very uncertain owing to numerous mud-holes and swampy spots. Like the stream, it follows the line of least resistance, as all original trails do, and has a very erratic course. Taken as a whole, it is one of the worst trails to be found in the entire region.

Not far above the bend the jack-pine growth begins and soon fills the entire valley-bottom and the lower slopes enclosing it; hence the name. Scattered ponds are seen along some margins of the meadows close to the enclosing forested slopes. The stream flows through the meadows over a clear gravel-bed, and it is assumed that the marshy humus forming the meadow lands is merely a shallow deposit over a gravel-wash from the glaciers at its source.

MEADOW LAKE PASS.

The summit of Meadow Lake Pass is 24 miles distant from Jackpine Pass in a straight line N.N.W., but is probably one-third more by trail. It is at one of the headwaters of the stream, known locally as the "Middle Fork" of Jackpine River. The summit is in an open meadow with park-like bunches of spruce scattered picturesquely around. It lies at an altitude of 5,059 feet above sea-level. The valley is enclosed by steep slopes, heavily timbered with spruce, balsam-fir, and jack-pine. Two charming little lakes are seen, one on either side of the summit. The larger lake, that on the south or British Columbia side, is named "Meadow Lake" on the Jobe-Phillips map, a name that is somewhat incongruous, for the lake is surrounded by a dense fringe of forest-growth. It has a very picturesque setting.

BEAVERDAM PASS.

The trail cut out by the Topographical Division does not go direct to Meadow Lake Pass but follows the Middle Fork to its main source below Jones Pass Summit. This summit is not on the Great Divide but on a local watershed in Alberta, which separates the waters of the Middle and Western Branches of the Jackpine River. Beyond it the country opens out to frequent marshy meadows in the valley-bottoms. These beautiful golden meadows give the valleys a park-like pastoral appearance, and one looks to see herds of deer and flocks of mountain sheep and goats browsing in their midst, an expectation that is seldom realized, at any rate during the summer months. They provide excellent pasturage for horses and numerous crystal rills with clear gravel bottoms flow through them at intervals. While wet on the surface, the grassy turf is of tough texture and permits of travel over it on horseback.

Beaverdam Pass is distant from Meadow Lake Pass 6 miles in a straight line N.N.W. Its summit has an altitude of 4,974 feet. The name is taken from the Jobe-Phillips map and is possibly due to an outcropping ridge of rock that extends across the valley, just below the

summit of the pass on the British Columbia side, which has a resemblance to a dam. No signs of beaver were noticed around the small tarn seen close to the summit on the Alberta side.

A well-beaten trail from the junction of the Middle Fork with Jackpine River leads north-westerly. It crosses the West Branch and, passing over the watershed at Beaverdam Pass, turns south-westerly on the way to McBride, a village of the Canadian National Railway in the Fraser Valley. There are some mining prospects a few miles westerly from Beaverdam Pass Summit and presumably the trail connection has been made to them. Hunting-parties also come in from McBride and pass over to the Jackpine valleys. It is likely also used to bring in trappers' supplies, for cabins and trap-lines were noticed in the neighbourhood of the pass on the Alberta side.

AVALANCHE PASS.

In a straight line, slightly west of north, the distance between the summits of Beaverdam and Avalanche Passes is practically 3 miles. The altitude is 5,195 feet. The summit lies in an open meadow similar to those already described. The approach from the south is very gradual but much steeper on the British Columbia side. The name is from the Jobe-Phillips map, and the reason for it is likely due to a snowslide that took place at the summit of the pass very many years ago and has left some rotting debris of the timber it swept down at the time. It is not a spectacular slide and but slight indication of it is left to tell the tale. It is the only evidence of an avalanche apparent in the vicinity. The West Branch of Jackpine River heads on the south side of the pass and a small stream flowing to the South Branch of Morkill River on the north side.

SOUTH MORKILL PASS.

On leaving Avalanche Pass Summit the course of the watershed turns from a previous N.N.W. direction to one nearly due east and describes a broad loop around a basin which contains the headwaters of the South Branch of Morkill River, a tributary of Fraser River known locally as "Little Smoky River." South Morkill Pass crosses the watershed near the top of the loop. The altitude of its summit is 5,434 feet. One of the heads of the Muddywater River, which may possibly be the main source, flows from it on the Alberta side. The country here consists of broad meadow-land valleys and areas of open spruce forest divided by low mountain ridges. It has a beautiful park-like appearance and is delightful to travel through. There is unlimited feed for horses and it is ideal for game. It is not to be wondered at that parties of tourists and hunting-parties visiting it, of which there are many, should be filled with rapture after the trials and tribulations of the Jackpine Valley.

MUDDYWATER PASSES.

A pass over the watershed about 7 miles north of Avalanche Pass separates the waters of Sheep Creek on the Alberta side and the North Branch of Morkill River on the British Columbia side. This crossing has been designated North Morkill Pass. It lies beyond the scope of the 1923 season's survey, but between it and South Morkill Pass are two other crossings of the watershed which are here referred to as South Muddywater Pass and North Muddywater Pass. The south one lies some 4 miles north-west of South Morkill Pass and the other some 3 miles farther north. The South Muddywater Pass separates the waters of the South Branch of Morkill River from those of the North Branch of the Muddywater, and the other the waters of the North Branch of the Morkill and the South Branch of the Muddywater. The altitude of the summit of South Muddywater Pass is 5,924 feet. That of the north pass is not yet known as it lies beyond the scope of the season's survey.

GAME AND FISH.

From Carcajou Pass northward, in the vicinity of the watershed, is a good game country and plenty may be found by those who know where and how to look for it. Moose are plentiful in the more heavily timbered areas where marsh lands and ponds abound, as at the head of Holmes River and Carcajou Creek, and in the upper reaches of the Jackpine River, where the wide swampy meadows provide good feeding-grounds. Woodland caribou are plentiful and are seen on the open ridges and in the meadows along the forest margins. In the late fall and early winter they are to be seen in droves. Mountain-sheep can be found along the shale and rocky ridges at the heads of the Muddywater and Sheep Creek. Goats are high up near the summits of the mountain ridges, but come down lower in the fall when feed amidst the crags gets scarce.

Small deer are in all the woodland and can frequently be seen. Bear, both brown and grizzly, are to be met with, but most often on the British Columbia side, where the formation is more rugged and the forest-growth thicker.

Signs of beaver, such as houses, dams, and cutting of trees, were seen in the more swampy valleys of the Holmes and Jackpine Rivers and of Carcajou Creek, but not to any great extent, and are doubtless to be seen in many other valleys on the British Columbia side. Trappers' cabins and trap-lines were noticed in a number of the valleys, but no fur-bearing animals were seen.

No fish were found in any of the streams, but they are reported in Sheep Creek, and, if there, should be in all the adjacent Alberta streams. As trout are found plentifully in Grant Brook, a tributary of Fraser River, they should also be found in other tributaries of that waterway on the British Columbia side of the watershed. As a rule fish are not plentiful so near the glacial sources of the streams owing to scarcity of food for them.

GENERAL REMARKS.

The higher snow-clad mountains terminate a short distance north of Mounts Bess and Chown at Mount Resthaven, and from there on bare-topped ridges with outstanding elevations do not exceed an altitude of 8,700 feet above sea-level. In the far distance northward the isolated summits of Mount Sir Alexander, Mount Ida, and a few others rise to a little above or below 10,500 feet, but it is an isolated group and the last before reaching the flatter country of the Peace River District. Beyond the Jackpine the valleys between the mountain ridges are open and easily accessible, on the Alberta side presenting wide stretches of meadow lands, more or less swampy, and broad areas of alp-lands on the lower slopes mingled with belts and groves of forest-growth. On the British Columbia side the timber is more thickly grown and the meadow lands are fewer and farther apart.

No timber of high commercial value was noticed in sufficient quantity to make lumber operations desirable. Scattering bodies of spruce on the hill-slopes and of pine (*Pinus Murrayana*) on the lower benches of the valleys were seen in small quantities, but so near the heads of the streams that getting it out would be difficult and expensive. On the British Columbia side the valleys are more thickly timbered and Douglas fir appears, but the same conditions as to logging operations exist. So far forest fires do not seem to have been prevalent. There are burned-over tracts here and there, but they seem of ancient origin.

Access to the area surveyed is difficult. The existing trails are bad and in some cases, as in the valleys of the Jackpine River, very bad. The routes seem to have been selected with poor judgment, the chief factor of selection apparently being the avoidance of clearing out trails through timber. This desire seems to have carried them over many of the higher hill-slopes, involving heavy grades for travel.

Notwithstanding the many difficulties, the region seems to attract tourists. Parties from Jasper, Robson, and McBride go in frequently and brave the horrible trails and stupendous hills with apparent enjoyment. The instinct seems to be to get into the unknown primeval wilderness, and the beautiful park-like valleys north of the Jackpine River when reached are worth the labour for both nature-lovers and big-game hunters. This tourist business is one that seems to be increasing yearly and one that provides a considerable income for that part of the country.

Full reports and maps are now being prepared and will be filed in due course.

I have, etc.,

ARTHUR O. WHEELER,

Interprovincial Boundary Commissioner.

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