# ANNUAL REPORT

OF THE

# MINISTER OF LANDS

OF THE PROVINCE OF

# BRITISH COLUMBIA

FOR THE

## YEAR ENDED DECEMBER 31ST

## 1924

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

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

VICTORIA, B.C., May 16th, 1925.

*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, 1924.

T. D. PATTULLO,

*Minister of Lands.*

VICTORIA, B.C., May 15th, 1925.

*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, 1924.

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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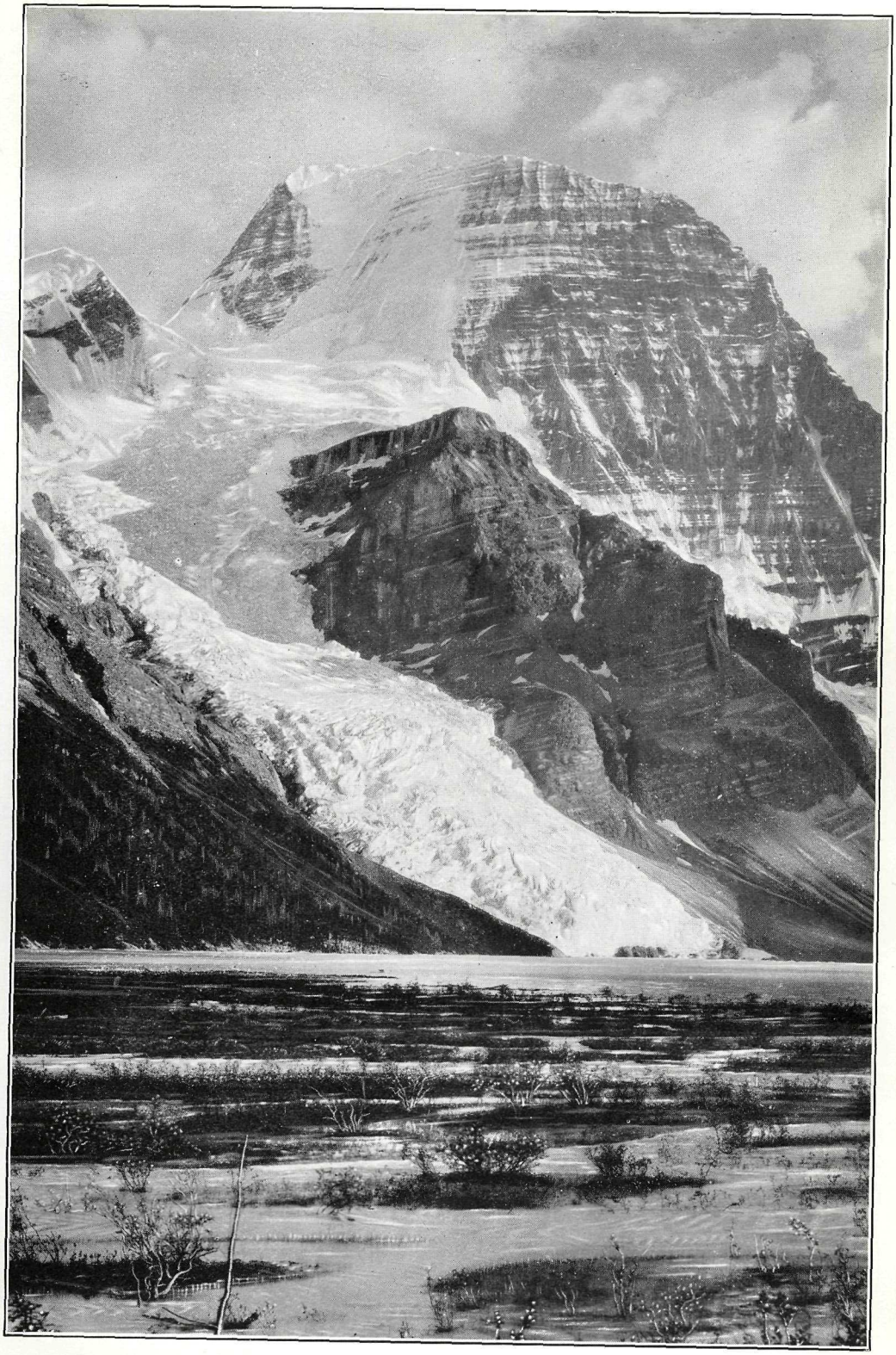

Mount Robson, from site of special monument to commemorate completion of survey of Alberta–British Columbia Boundary.

# DEPARTMENT OF LANDS.

VICTORIA, B.C., May 15th, 1925.

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

SIR,—I have the honour to submit report of the Lands Branch of the Department of Lands for the year ended December 31st, 1924.

The accompanying statements contain complete information pertaining to the administration and disposal of Crown lands by pre-emption, purchase, and lease under the "Land Act"; the Crown grants issued under the "Land Act," "Mineral Act," "Coal and Petroleum Act," "Taxation Act," and sundry Statutes wherein provision is made for the making of such grants; pre-emptions inspected; number of letters received and sent out; cash received through the various sources of revenue coming within the scope of this Branch; and summary or comparative statement since 1912.

Auction sales were held of lots in the Townsites of Tulameen and Kimberley. Only a few lots were sold in the former townsite, the auction being held mainly for the purpose of readjusting prices of lots previously forfeited under defaulting agreements of former sales, and for making such lots available at current prices.

At Kimberley there was more demand, thirty-one lots being sold at the auction and eighteen were subsequently sold on application according to the terms and conditions of the auction, the amount realized being $3,690.

Property in Point Grey Municipality to the value of $26,810 was disposed of on the terms and conditions of the auction held in Vancouver in 1921 and a block of 3.87 acres was sold at auction for $11,616.

A few lots were sold during the year in the Townsites of Atlin, Castlegar, McBride, Michel, Port Clements, Stewart, Telkwa, and Terrace; also in the acreage subdivisions adjacent to Powell River.

Some demand has continued for lands and town lots forfeited for unpaid taxes, a number of sales being made. A percentage of the purchasers were former owners, but the greater proportion of the sales were to persons who had no former interest.

A subdivision of some 2,400 acres of an expired logged-off timber leasehold situated in the Salmon River Valley, West Kootenay, near Salmo and Nelson, comprising some sixty parcels, was offered at auction and twenty-six lots were sold, valued at $11,459.35. A demand had existed for this land for some years, but it did not become available until the expiry of the timber lease in 1923. A number of returned soldiers purchased in the subdivision, to whom were extended more favourable terms than those generally given in such sales.

Sales were made in the South Okanagan Irrigation Project area of twelve parcels totalling 110 acres for $17,342.50, and one lot in the Townsite of Oliver for $350.

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

## PRE-EMPTION RECORDS, ETC., 1924.

| Agency. | Pre-emption Records allowed. | Certificates of Purchase. | Certificates of Improvements. |
|---|---|---|---|
| Alberni | 4 | 8 | 6 |
| Atlin | ..... | 15 | 2 |
| Clinton | 48 | 106 | 21 |
| Cranbrook | 15 | 37 | 3 |
| Fernie | 2 | 7 | ..... |
| Fort Fraser | 91 | 42 | 29 |
| Fort George | 149 | 93 | 15 |
| Golden | 1 | 1 | ..... |
| Kamloops | 35 | 76 | 18 |
| Kaslo | 3 | 6 | 2 |
| Nanaimo | ..... | 6 | 1 |
| Nelson | 6 | 104 | 1 |
| New Westminster | ..... | 7 | ..... |
| Penticton | 28 | 36 | 9 |
| Pouce Coupe | 22 | 5 | 5 |
| Prince Rupert | 22 | 87 | 6 |
| Quesnel | 77 | 70 | 22 |
| Revelstoke | ..... | 4 | 1 |
| Smithers | 48 | 38 | 16 |
| Telegraph Creek | ..... | 1 | ..... |
| Vancouver | 61 | 237 | 26 |
| Vernon | 49 | 38 | 6 |
| Victoria | 3 | 428 | 7 |
| Totals | 664 | 1,452 | 196 |

PRE-EMPTION INSPECTIONS, LAND RECORDING DISTRICTS, 1924.

| District. | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alberni | 1 | 1 | 10 | 11 | 6 | 10 | 10 | ..... | 13 | 10 | 4 | 13 | 89 |
| Atlin | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cranbrook | 2 | 2 | 8 | ..... | 11 | ..... | ..... | ..... | 10 | 1 | 2 | 11 | 47 |
| Clinton | 3 | 3 | 2 | ..... | 1 | 3 | 4 | 34 | 44 | 110 | 87 | 19 | 310 |
| Fernie | ..... | ..... | 1 | ..... | 1 | ..... | 2 | 2 | ..... | ..... | ..... | 3 | 9 |
| Fort Fraser | 21 | 9 | 8 | 1 | 16 | 4 | 41 | 78 | 57 | 101 | 26 | 13 | 375 |
| Fort George | 49 | 5 | 2 | 1 | 16 | 25 | 80 | 88 | 27 | 100 | 83 | 4 | 480 |
| Golden | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 1 |
| Kamloops | 51 | 12 | 4 | 5 | 7 | 1 | 12 | 5 | 23 | 37 | 47 | 47 | 251 |
| Kaslo | 14 | 1 | 5 | ..... | ..... | 1 | ..... | ..... | 1 | ..... | ..... | 5 | 27 |
| Nanaimo | ..... | ..... | ..... | 10 | ..... | ..... | 1 | ..... | ..... | ..... | ..... | 1 | 12 |
| Nelson | 1 | ..... | ..... | 1 | 1 | 1 | ..... | ..... | 2 | 1 | ..... | 1 | 8 |
| New Westminster | ..... | ..... | ..... | ..... | ..... | 2 | ..... | ..... | ..... | 5 | ..... | ..... | 7 |
| Penticton | 9 | 5 | 6 | 1 | 11 | 2 | 6 | 5 | 7 | 10 | 12 | 18 | 92 |
| Pouce Coupe | ..... | 1 | ..... | ..... | ..... | 2 | ..... | 9 | 6 | 15 | ..... | ..... | 33 |
| Prince Rupert | 24 | 8 | 1 | 5 | 16 | 9 | 19 | 5 | 11 | 23 | 12 | 12 | 145 |
| Quesnel | 8 | 16 | 2 | 3 | 3 | 24 | 48 | 7 | 66 | 173 | 84 | 61 | 495 |
| Revelstoke | 3 | 1 | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5 |
| Smithers | 2 | ..... | 3 | 1 | 4 | 4 | 18 | 47 | 40 | 18 | 3 | 15 | 155 |
| Telegraph Creek | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Vancouver | 2 | 4 | 22 | 22 | 9 | 16 | 25 | 8 | 36 | 76 | 47 | 67 | 334 |
| Vernon | ..... | 6 | ..... | 2 | 6 | 1 | 28 | 20 | 29 | 1 | 31 | 2 | 126 |
| Victoria | ..... | 1 | 2 | ..... | 1 | ..... | ..... | ..... | 1 | 3 | 16 | 5 | 29 |
| Totals | 190 | 75 | 76 | 63 | 110 | 105 | 294 | 308 | 373 | 684 | 454 | 298 | 3,030 |

## LAND-SALES, 1924.

| | Acres. |
|---|---|
| Surveyed (first class) | 381.2 |
| Surveyed (second class) | 7,752.5 |
| | 8,133.7 |
| Unsurveyed | 1,390.0 |
| Total | 9,523.7 |

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## CROWN GRANTS ISSUED, 1924.

| | |
|---|---|
| Pre-emptions | 248 |
| "Pre-emptors' Free Grants Act, 1916" | 18 |
| Purchase | 96 |
| Mineral | 183 |
| "Soldiers' Homestead Act" | ..... |
| Town lots | 171 |
| Reverted lands (other than town lots) | 87 |
| Reverted mineral | 43 |
| "Townsite Proportionate Allotment Act" | ..... |
| "Dyking Assessments Act" | 4 |
| "Public Schools Act" | 7 |
| Soldier Settlement Board | 7 |
| Land Settlement Board | 24 |
| Reverted town lots | 113 |
| Miscellaneous | 19 |
| Total | 1,020 |
| Applications for Crown grants | 1,029 |
| Certified copies | 28 |

### TOTAL ACREAGE DEEDED.

| | |
|---|---|
| Pre-emptions | 38,643.30 |
| Mineral claims (other than reverted) | 7,221.99 |
| Reverted mineral claims | 1,416.46 |
| Purchase of surveyed Crown land (other than town lots) | 6,078.07 |
| Purchase of reverted land | 12,917.487 |
| Purchase of unsurveyed Crown land | 1,230.20 |
| Lands conveyed to Soldier Settlement Board | 444.80 |
| Lands Crown-granted to Land Settlement Board | 3,985.85 |
| Miscellaneous | 101,694.817 |
| Total | 173,632.974 |

## REPORT ON COAL LICENCES, LEASES, ETC., 1924.

### Coal-prospecting Licences.

Number of licences issued, 98; area, 63,720 acres.

### Sundry Leases.

Number of leases issued, 92; area, 5,436 acres.

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## STATEMENT OF REVENUE, YEAR ENDED DECEMBER 31st, 1924.

### Land-sales.

| | Victoria. | Agencies. | Total. |
|---|---|---|---|
| Under "Coal and Petroleum Act" | $ 5,407 90 | ..... | $ 5,407 90 |
| Under "Taxation Act" | 54,960 34 | ..... | 54,960 34 |
| Townsite lots | 13,910 22 | $ 64,707 46 | 78,617 68 |
| Country lands | 4,186 53 | 48,142 78 | 52,329 31 |
| Pre-empted lands | 50 00 | 13,355 13 | 13,405 13 |
| Mineral claims | 300 80 | 1,431 30 | 1,732 10 |
| Improvements | 250 00 | 3,785 02 | 4,035 02 |
| Totals | $ 79,065 79 | $131,421 69 | $210,487 48 |

### Revenue under "Land Act."

| | Victoria. | Agencies. | Total. |
|---|---|---|---|
| Sundry lease rentals | $ 40,743 48 | ..... | $ 40,743 48 |
| Grazing rentals | 5,468 19 | ..... | 5,468 19 |
| Survey fees | 772 15 | $ 3,887 64 | 4,659 79 |
| Sundry fees | 14,192 05 | 2,290 00 | 16,482 05 |
| Royalty | 140 70 | ..... | 140 70 |
| Rent of property | ..... | 1,363 55 | 1,363 55 |
| Totals | $ 61,316 57 | $ 7,541 19 | $ 68,857 76 |

### Revenue under "Coal and Petroleum Act."

| | Victoria. | Agencies. | Total. |
|---|---|---|---|
| Coal licences | $ 9,400 00 | ..... | $ 9,400 00 |
| Coal rentals | 18,225 43 | ..... | 18,225 43 |
| Sundry fees | 7,044 00 | ..... | 7,044 00 |
| Lieu of work | 450 00 | ..... | 450 00 |
| Totals | $ 35,119 43 | ..... | $ 35,119 43 |

### Sundry Receipts.

| | Victoria. | Agencies. | Total. |
|---|---|---|---|
| Maps, blue-prints, etc. | $ 5,113 16 | ..... | $ 5,113 16 |
| Miscellaneous | 64 05 | ..... | 64 05 |
| Interest, South Okanagan Land Project | 2,798 28 | ..... | 2,798 28 |
| Totals | $ 7,975 49 | ..... | $ 7,975 49 |

## SUMMARY OF REVENUE.

| | Victoria. | Agencies. | Total. |
|---|---|---|---|
| Land-sales | $ 79,065 79 | $131,421 69 | $210,487 48 |
| Land revenue | 61,316 57 | 7,541 19 | 68,857 76 |
| "Coal and Petroleum Act" | 35,119 43 | ..... | 35,119 43 |
| Sundry receipts | 7,975 49 | ..... | 7,975 49 |
| Totals | $183,477 28 | $138,962 88 | $322,440 16 |

## SUMMARY OF CASH RECEIVED.

| | |
|---|---|
| Revenue | $322,440 16 |
| "Soldiers' Land Act"— | |
| South Okanagan Project | 20,334 35 |
| Houses, South Vancouver | 1,711 43 |
| "Better Housing Act"— | |
| Principal | 55,927 22 |
| Interest | 70,401 18 |
| Refunds to votes | 177,948 23 |
| Total | $648,762 57 |

## STATEMENT OF LETTERS INWARD AND OUTWARD, 1924.

| | |
|---|---|
| Letters inward | 15,591 |
| Letters outward | 10,936 |

## SUMMARY.

| | 1912. | 1913. | 1914. | 1915. | 1916. | 1917. | 1918. |
|---|---|---|---|---|---|---|---|
| Pre-emption records | 3,655 | 3,855 | 4,304 | 2,277 | 1,167 | 824 | 823 |
| Certificates of improvement | 715 | 962 | 1,002 | 665 | 465 | 541 | 379 |
| Certificates of purchase | 5,065 | 3,640 | 1,805 | 990 | 729 | 778 | 592 |
| Crown grants | 2,737 | 2,110 | 1,376 | 718 | 847 | 1,167 | 1,512 |
| Total acreage deeded | 253,143.60 | 390,036.32 | 245,244.78 | 75,225.00 | 98,452.00 | 187,111.64 | 260,321.40 |
| Coal-prospecting licences | 2,003 | 1,090 | 545 | 198 | 120 | 71 | 72 |
| Sundry leases | 47 | 46 | 51 | 38 | 86 | 73 | 83 |
| Coal leases | 75 | 207 | 71 | 29 | 31 | 7 | 3 |
| Revenue received | $2,525,497 29 | $946,944 23 | $589,687 36 | $126,308 28 | $159,213 65 | $194,435 17 | $369,392 51 |
| Letters received | 43,302 | 31,738 | 30,287 | 19,151 | 13,779 | 15,780 | 22,500 |
| Letters sent | 21,612 | 17,305 | 14,790 | 10,104 | 8,432 | 12,632 | 12,500 |

| | 1919. | 1920. | 1921. | 1922. | 1923. | 1924. | ..... |
|---|---|---|---|---|---|---|---|
| Pre-emption records | 1,752 | 1,624 | 1,495 | 969 | 607 | 664 | ..... |
| Certificates of improvement | 326 | 328 | 217 | 154 | 123 | 196 | ..... |
| Certificates of purchase | 747 | 1,067 | 1,152 | 1,735 | 1,739 | 1,452 | ..... |
| Crown grants | 1,806 | 1,827 | 1,699 | 1,295 | 1,074 | 1,020 | ..... |
| Total acreage deeded | 512,844.87 | 215,364.50 | 163,161.76 | 116,990.85 | 68,945.233 | 173,632.974 | ..... |
| Coal-prospecting licences | 112 | 275 | 160 | 236 | 95 | 98 | ..... |
| Sundry leases | 51 | 113 | 104 | 122 | 92 | 92 | ..... |
| Coal leases | 1 | 12 | 6 | 17 | ..... | ..... | ..... |
| Revenue received | $251,471 25 | *$428,431 64 | $381,860 60 | $394,454 43 | $346,299 34 | $322,440 16 | ..... |
| Letters received | †53,835 | 32,180 | 28,951 | 22,857 | 19,381 | 15,591 | ..... |
| Letters sent | 18,063 | 19,912 | 22,372 | 16,517 | 14,688 | 10,936 | ..... |

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

# PART II.

# SURVEY BRANCH.

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# 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, 1924:—

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

FIELD-WORK.

The field-work carried on by the Branch is divided into three main classes—namely, surveys of Crown lands for settlement purposes, control surveys, and topographical surveys. The following is a short review of work done during the year under these three headings:—

*Crown Land Surveys.*—The area of Crown land surveyed totals 64,013 acres. Out of this area, 30,520 acres were previously surveyed into larger lots of approximately 640 acres as applications to purchase which reverted to the Crown under the "Soldiers' Land Act" and which require to be subdivided into quarter-lots for disposition as pre-emptions under the "Land Act."

As in previous seasons, the survey-work for settlement was confined to areas more or less readily accessible and likely to be required for actual settlement in the near future. The larger tracts so surveyed lie adjacent to the Canadian National Railway. Considerable areas were also surveyed covering logged-off areas near Kimberley, East Kootenay, and near Powell River, New Westminster District. In the case of these two areas the development and expansion of large industries in the vicinity is likely to result in an active demand for the lands surveyed when they are placed on the market.

In order to meet demand at various points throughout the Province subdivisions into villa lots and small acreage were made, notably at Powell River, Pender Harbour, Kootenay Lake, and Blue River.

This work involved the running of 380 miles of new boundary-line and the retracement of 198 miles of previously surveyed lines.

It is estimated that 830 parcels have been surveyed, 467 of which are lots suitable for pre-emption and the remainder running from town lots to acreage lots of from 5 to 10 acres.

*Control Surveys.*—The necessity for proper control surveys from an economic standpoint has been fully covered in previous annual reports of this Branch. The policy is to carry on a reasonable amount of this work each year with a view to eventually establishing a comprehensive system of control which will be adequate to meet current and future requirements. During the past season the Geodetic Survey of Canada completed a primary triangulation net which now extends from the south end of Vancouver Island to the south boundary of Alaska and including a number of stations on Queen Charlotte Islands. By using this work as a base this Branch has been able to triangulate and map the greater portion of the extensive coast-line of the Province, and to carry also triangulation nets across the Coast range of mountains with a view to spreading, eventually, a network of accurate control over the entire Province. It is expected that the Geodetic Survey of Canada will, in due course, co-operate further in this work by extending primary nets through various portions of the Province, thus permitting of greater refinement in our work by means of balancing between their stations whenever possible.

Triangulation control-work was carried on during the season at Knight and Seymour Inlets, on Queen Charlotte Islands, Kitimat and Lakelse Valleys, Morice Lake, and the Upper Chilcotin Valley.

Somewhat similar work was carried on on Slocan and Kootenay Lakes in co-operation with the Geological Survey, with a view to definitely locating a large number of Crown-granted mineral claims in these areas. In this work co-operation was continued as in 1923, with a party working under instructions of the Geological Survey of Canada.

*Topographical Surveys.*—Two parties were engaged on photo-topographical surveys, extending the areas previously covered in the Southern Interior. These parties were considerably hampered by weather and smoke.

A new departure, in the nature of an experiment, was made this year in sending a party into the Lillooet Plateau area with a view to obtaining topography and detailed information as to resources and agricultural possibilities, having in mind the fostering of development of the areas adjoining the Pacific Great Eastern Railway. The topography was obtained by track and stadia traverses, sketching and aneroid readings. The surveyor was instructed to make a special report on the natural resources and possibilities of the area, and whereas the maps are not yet complete, the report which is printed herewith would indicate that the results obtained fully justify the outlay on this work.

## 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, namely: Central and Northern Interior, Coast, and Vancouver Island.

The following paragraphs give the names of the 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. Nine parties were employed in this area, as follows:—

| Surveyor. | Locality. |
|---|---|
| 1. J. A. F. Campbell | Stuart River and Fort George Canyon. |
| 2. V. Schjelderup | Nechako and Bulkley Valleys. |
| 3. F. C. Swannell | Morice Lake. |
| 4. R. W. Haggen | Goat and Bowron Rivers. |
| 5. D. M. McKay | Canoe Creek, Lillooet District, and Upper Chilcotin, Range 3, Coast District. |
| 6. John Davidson | East of Coast Mountains, Ranges 2 and 3, Coast District. |
| 7. G. M. Downton | Lillooet District. |
| 8. L. S. Cokely | Blue River and Cranberry Lake. |
| 9. H. McN. Fraser | McGregor River. |

Mr. Campbell was employed in surveying Crown land in Lower Stuart River Valley and other miscellaneous surveys in the Nechako Valley. He also quartered a number of lots in the vicinity of Fort George Canyon.

Mr. Schjelderup was employed on miscellaneous surveys in the Upper Nechako and Bulkley Valleys, including also some work on Babine Lake and laying out summer-home sites on Stuart Lake.

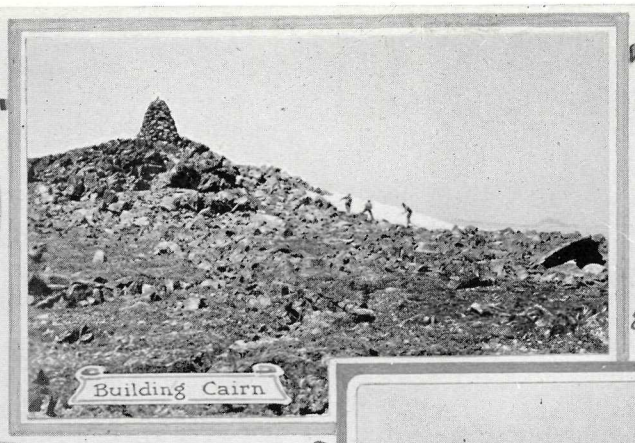
Mr. Swannell extended the control-work from his previous season's work northerly to cover Morice Lake and the headwaters of Copper River. It was hoped that this work could be connected to Mr. Monckton's triangulation of Kitimat Valley, but unfortunately the plans in this connection miscarried and, although certain rays were obtained by both parties on common points, the connection is not rigid.

Mr. Haggen made a traverse between the South Fork of the Fraser River and Isaacs Lake, mainly along the trail which follows Goat River. A similar traverse was made down Bowron River to Indian Point Creek.

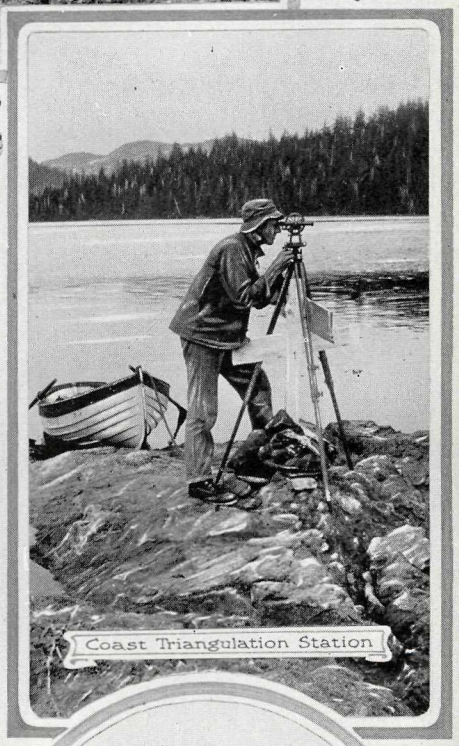
Mr. McKay made certain miscellaneous surveys in the Canoe Creek and Big Bar Mountain areas, in Lillooet District, after which he was employed on triangulation and topographical work in an area lying west of the 124th meridian and south of the 53rd parallel of latitude, being a high plateau area previously, practically, unexplored.

Mr. Davidson was employed in carrying a control triangulation along the east side of the Coast Range between previously established nets at Anaham and at Chilko Lake.

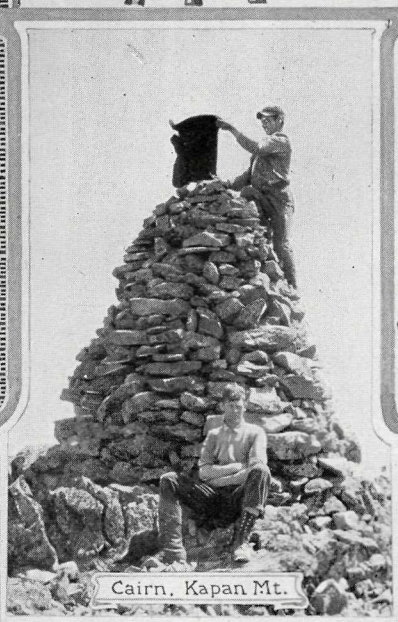
Mr. Downton, after attending to a few miscellaneous surveys in Lillooet District, was employed on work of a special nature with a view to obtaining more detailed topographical data and information as to natural resources of the territory served by the Pacific Great Eastern Railway. In all, an area of about 600 square miles in the south-eastern part of Lillooet District was so covered. Special attention is directed to Mr. Downton's report, appearing on page 58 of this volume. The map referred to in this report is not yet available, but it is intended to publish same in printed form as soon as possible.



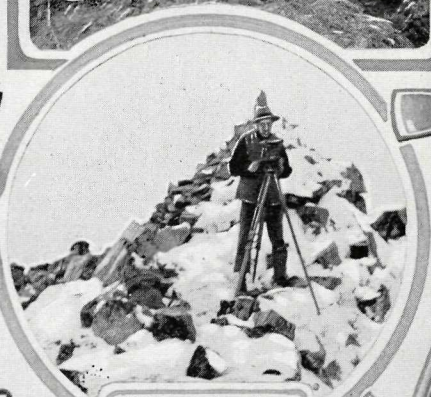
Building Cairn



Coast Triangulation Station



Cairn, Kapan Mt.



Triangulation Sta.
Perkin's Peak

Mr. Cokely laid out a small townsite on Crown lands at Blue River, a divisional point on the Canadian National Railway, and subdivided the bed of Cranberry Lake, which has become dry.

During the early part of the year a party in charge of Mr. McN. Fraser was employed in traversing the McGregor River with a view of laying down a base for timber-cruising work by the Forest Branch. Owing to the abnormally open winter this work did not progress as fast as was anticipated and had to be abandoned before completion.

A small survey of reserved lands in the vicinity of Prince George was made by W. F. Gregg, B.C.L.S.

*Southern Interior.*—The term "Southern Interior" is applied to that portion of the Province lying south of the Dominion Government Railway Belt. It comprises the older and more settled valleys of the Province. Four parties were employed in these areas, as follows:—

| Surveyor. | Locality. |
|---|---|
| 10. O. B. N. Wilkie | Midday Valley and Arrow Lakes. |
| 11. H. D. Dawson | Slocan and Kootenay Lakes. |
| 12. A. L. McCulloch | Blueberry Creek. |
| 13. B. A. Moorhouse | Kimberley. |

Mr. Wilkie surveyed some logged-off lands in Midday Valley, south-west of Merritt, after which he was employed on a miscellaneous survey on Arrow Lakes, including the tying-in of old Crown-granted mineral claims and other floating surveys.

Mr. Dawson's work consisted mainly of locating and tying in old mineral-claim surveys to the Geological Survey triangulation net in the vicinity of Slocan Lake and Kootenay Lake. This was a continuation of the co-operation established with the Geological Survey of Canada during the season of 1923 and referred to in last year's report.

Mr. McCulloch surveyed a number of parcels in Blueberry Creek Valley, about 17 miles north of Trail.

Mr. Moorhouse was employed on the survey of logged-off lands south-east of Kimberley. This rather extensive area, which consists mainly of a light soil which would be the better for irrigation, should nevertheless be in rather active demand when made available for settlement on account of its accessibility and proximity to the two prosperous towns of Kimberley and Cranbrook.

In addition to the above, A. H. Green, B.C.L.S., of Nelson, made a traverse survey of the road leading up Kokanee Creek from Kootenay Lake to the Molly Gibson Mine, and also laid out nine parcels for summer-home sites on Kootenay Lake, on the road between Balfour and Kaslo.

*Coast and Vancouver Island.*—The following surveyors were employed on work west of the Coast range of mountains:—

| Surveyor. | Locality. |
|---|---|
| 14. H. Idsardi | Harrison Lake and Lillooet River. |
| 15. M. W. Hewett | New Westminster District. |
| 16. Noel Humphrys | New Westminster District. |
| 17. G. K. Burnett | Powell River. |
| 18. L. S. Cokely | Vancouver Island. |
| 19. H. H. Roberts | Knight Inlet. |
| 20. J. T. Underhill | Seymour Inlet. |
| 21. A. E. Wright | Moresby Island. |
| 22. F. S. Clements | Queen Charlotte Islands. |
| 23. A. S. G. Musgrave | Moresby Island. |
| 24. P. M. Monckton | Kitimat and Lakelse Valleys. |

Mr. Idsardi was employed on control surveys on Harrison Lake and Lillooet River. He also made a resurvey of the boundaries of the old Douglas Townsite, at the head of Harrison Lake, and tied in a number of floating mineral-claim surveys on Fire Mountain.

Messrs. Hewett and Humphrys were employed for a portion of the season only on miscellaneous surveys at various points in New Westminster District.

Mr. Burnett was employed on the subdivision of logged-off and expired timber licences and leases in the vicinity of Powell River and Myrtle Point. Over 200 small parcels, ranging in size from town lots to 5- and 10-acre parcels, were laid out in the vicinity of Powell River. It is

expected that these will be in active demand when placed on the market, a number of them being already occupied by squatters. The remaining areas were laid out into parcels of 20, 40, 80, and 160 acres, according to the suitability of the lands for agricultural purposes.

Mr. Cokely made a survey of certain lands in the vicinity of Estevan in the early part of the season and in the fall small miscellaneous surveys in the Salmon River Valley, Sayward District, and at Alert Bay.

Messrs. Roberts and Underhill were employed on Coast triangulation-work at Knight Inlet and Seymour Inlet respectively.

Similar triangulation-work was done on Queen Charlotte Islands by Messrs. Wright, Clements, and Musgrave. A considerable portion of Mr. Musgrave's time, however, was taken up with the rectification of old timber surveys.

Mr. Monckton was engaged on a triangulation extending from Terrace, on the Skeena River, through Lakelse and Kitimat Valleys to Kitimat Arm. The upper reaches of the Kitimat were also covered with a view to connecting with Mr. Swannell's work to the east, which connection, however, was not entirely satisfactorily effected, as mentioned before.

### MISCELLANEOUS SURVEYS.

In addition to the above, numerous smaller surveys were made during the year, among which may be mentioned the compilation of the subdivision of Unit No. 1 of the University Domain at Point Grey, by R. L. Horie, B.C.L.S., and a resubdivision of portion of old Hastings Townsite in the City of Vancouver, to provide for access to the New Second Narrows Bridge, by J. A. Walker, B.C.L.S.

A subdivision of the former Songhees Reserve in Victoria, into parcels for disposal as industrial sites, was made by Bateman Hutchinson, B.C.L.S.

### PHOTO-TOPOGRAPHICAL SURVEYS.

Two parties in charge of R. D. McCaw and G. J. Jackson were employed on the continuation of the photo-topographical survey of the Southern Interior. Mr. McCaw covered an area of about 450 square miles south of Merritt, including Aspen Grove and the valley of the Coldwater River.

Mr. Jackson covered the Skagit River Valley and adjoining areas. In all, an area of about 340 square miles was covered during the season, the work being hampered considerably by smoke and weather conditions.

A sketch-map showing the areas covered to date by this class of work will be found facing page 118 of this report.

### 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, this year completed that portion of the Interprovincial Boundary which remained unfinished in the vicinity of the intersection of the 120th meridian with the summit of the Rocky Mountains. This boundary is now established from the 49th parallel to a point at about latitude 57° 27′ north; in other words, about 90 miles north of the Peace River. As it is not expected that there will be any necessity for some time to come for any further definition, it has been decided to disband the Commission on the completion of their reports.

In order to commemorate the work of the Commission, which is unique in the history of surveys in Canada from the standpoint of the extent of the work and the nature of the country covered, arrangements were made between the three Governments concerned to erect a special monument on the boundary in Mount Robson Pass. This monument was unveiled at a special ceremony on July 31st, 1924. Further details in this connection are contained in Mr. Wheeler's report.

### SURVEYORS' REPORTS.

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

### PRIVATE SURVEYS.

The number of private surveys dealt with shows an increase over the previous year, particularly under the headings of land purchases and mineral claims. The acreage of mineral-

claim surveys dealt with during the year exceeds that of any of the past ten years, with the exception of 1920.

In accordance with the "Forest Act," the surveys of timber licences were required to be completed in 1923; consequently there was no timber-licence survey-work during the past year, thus reducing to a considerable extent the scope of private survey-work in the Province from what it has been in the past.

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 official plans from survey returns; compiling departmental reference maps; clearing all applications; and other incidental work. It might be mentioned that one phase of the work of this Branch has been increasing recently, being that of clearing applications for reverted lands. This work entails considerable correspondence with the Land Registry Offices and the obtaining and filing of numerous copies of registered subdivision plans.

The Geographic Division deals with the compilation and drawing of maps; compilation of the Standard Base Map of the Province; the indexing of maps, plans, and other information; the photostating of plans and other documents; the distribution of lithographic maps; and correspondence incidental to this Division.

During the year the Geographic Division has been compiling a map of the south-western districts of the Province, showing Vancouver Island and the Mainland as far as Kamloops. This map will shortly be published and it is expected that it will be in considerable demand for commercial and tourist purposes.

During the year W. Fleet Robertson, Provincial Mineralogist, resigned his position as British Columbia Representative on the Geographic Board of Canada, a position which he held for twenty-four years. By Order in Council dated November 18th, 1924, G. G. Aitken, Chief Geographer, was appointed to fill this position. As geographic nomenclature in this Province is still in a more or less plastic state, it is expected that a considerable amount of work will devolve upon Mr. Aitken in his new duties for some considerable time to come.

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

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

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## REPORT OF THE CHIEF DRAUGHTSMAN.

December 31st, 1924.

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

Sir,—I have the honour to submit the following report on the work of the Survey Division for the year ended December 31st, 1924:—

The personnel of the staff at the end of the year numbers twenty-two, no change having been made.

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 627 field-books were received, as against 684 received during 1923. The various surveys contained in these field-books consist of 786 land lots, 260 mineral claims, 6 timber licences, and 105 traverse connections or triangulations.

During the same period 762 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 488 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 | 1,180 |
| Purchase surveys | 11,926 |
| Mineral-claim surveys | 11,382 |
| Timber-licence surveys | 33,028 |
| Coal-licence surveys | 7,561 |
| Lease surveys | 1,437 |
| Government surveys | 33,860 |
| Total | 100,374 |

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.

### 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 377 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 752 applications for pre-emption, 169 applications to purchase, 535 applications for reverted lands, 123 coal licences, 205 miscellaneous leases, 989 Crown-grant applications, together with 1,196 timber-sales and 120 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 23 new maps were compiled and 10 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 $346.25, while the sum of $1,547.18 was paid in for blue-prints.

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

| | |
|---|---|
| Mail and counter | 975 |
| Surveyor-General's Branch | 3,884 |
| Forest Branch | 10,122 |
| Other branches of Government service | 11,968 |
| Total | 26,947 |

There were also prepared 658 tracings (in duplicate) to be attached to Crown grants and 306 tracings (in duplicate) to accompany land leases.

### Correspondence and Accounts.

During the year 5,571 letters were received and 5,100 sent out, which does not include interdepartmental memoranda.

Table B, attached to this report, gives a summary of the office-work for the year 1924 and comparative figures for 1923.

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

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## 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 |
| 1924 | 1,180 | 11,926 | 11,382 | 33,028 | 7,561 | 1,437 | 33,860 | 100,374 |

Table B.—Summary of Office-work for the Year 1924 and Comparative Figures for 1923.

| | 1923. | 1924. |
|---|---|---|
| Number of field-books received | 684 | 627 |
| " lots surveyed | 663 | 786 |
| " lots gazetted and tracings forwarded to Government Agents | 674 | 762 |
| " miles of right-of-way plans dealt with | 204 | 377 |
| " applications for purchase cleared | 175 | 169 |
| " applications for pre-emption cleared | 784 | 752 |
| " reference maps compiled | 21 | 23 |
| " Crown-grant applications cleared | 1,103 | 989 |
| Total number of letters received by Branch | 5,923 | 5,571 |
| " " Crown-grant and lease tracings made in duplicate | 824 | 964 |
| " " blue-prints made | 30,732 | 26,949 |
| Total revenue from sale of blue-prints | $1,821.58 | $1,547.18 |

## 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 | " " | 1 00 |
| 16. | Graham Island, North-east Portion | " " | 1 00 |
| 16A. | Graham Island, South Portion | " " | 1 00 |
| 16B. | Graham Island, North-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. | Upper Fraser River Valley and Robson Park | " " | 1 00 |
| 18B. | Tete Jaune, Swift Creek, and Albreda | " " | 1 00 |
| 19. | Lower Skeena and Zymoetz River Valleys | " " | 1 00 |
| 19A. | Skeena and Kitsumgallum River Valleys | " " | 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 |

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

*Price-list of Blue-prints*—Continued.

| | | Scale. | Price. |
|---|---|---|---|
| 24B. | Lillooet District (Clinton and Green Lake) | 1 inch to 1 mile | $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. | Lac la Hache and Lone Butte | ,, ,, | 1 00 |
| 27B. | Fraser River Valley, Gang Ranch North | ,, ,, | 1 00 |
| 27C. | Fraser River, vicinity of Big Bar Creek | ,, ,, | 1 00 |
| 28. | North Part of Babine and Takla Lakes | ,, ,, | 1 00 |
| 28A. | Stuart, Pinchi, and Trembleur Lakes and Middle River | ,, ,, | 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, Flathead River | ,, ,, | 1 00 |
| 35. | North Saltspring, Gabriola, and Adjacent Islands | ,, ,, | 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 and North Thompson River Valleys (Blue River) | ,, ,, | 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. | Victoria and Saanich Districts | 2 inches to 1 mile | 1 00 |
| 47. | Peace River, West of Dominion Block | ,, ,, | 1 00 |
| 48. | Parsnip and Nation Rivers | 1 inch to 1 mile | 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 |
| 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 |
| 64. | North Saanich and South Saltspring | 2 inches to 1 mile | 1 00 |
| 65. | Boundary Bay, Fraser River Mouth, and Burrard Inlet | 1 inch to 1 mile | 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 |

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

*Price-list of Blue-prints*—Continued.

| | | Scale. | Price. |
|---|---|---|---|
| 16–9N. | Kootenay River Valley and Cranbrook | 1 inch to 1 mile | $1 00 |
| 16–9S. | Moyie River Valley | ,, ,, | 1 00 |
| 17–0S. | Duncan Lake and North End of Kootenay Lake | ,, ,, | 1 00 |
| 17–9N. | Kootenay Lake, vicinity of Kaslo | ,, ,, | 1 00 |
| 17–9S. | Nelson, Salmon River Valley, and South End of Kootenay Lake | ,, ,, | 1 00 |
| 18–9N. | Edgewood and Slocan River Valley | ,, ,, | 1 00 |
| 18–9S. | Rossland and South End of Lower Arrow Lake | ,, ,, | 1 00 |
| 18–20. | Nakusp and Upper Arrow Lake | ,, ,, | 1 00 |
| 21–23. | Columbia and Windermere Lakes | ,, ,, | 1 00 |
| 27–29. | Columbia River Valley, Wilmer and Spillimacheen | ,, ,, | 1 00 |
| 30–32. | Trout and Upper Arrow Lakes | ,, ,, | 1 00 |

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

*Victoria, February 1st, 1925.*

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## REPORT OF THE GEOGRAPHIC DIVISION.

*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, 1924.

The work of the Division has proceeded with efficiency of personnel and the standard of former years.

The map production of the Geographic Division for 1924 follows:—

PRE-EMPTORS' MAPS.

| Name. | No. of Copies. | Date of Issue. | No. | Scale. | Area in Sq. Miles. |
|---|---|---|---|---|---|
| Stuart Lake. Compiled and drawn | 5,500 | Feb., 1924 | 3C | 3 miles to 1 in. | 9,000 |
| Tete Jaune. Corrected and partly redrawn | 2,600 | Feb., 1924 | 3H | 3 miles to 1 in. | 6,000 |
| Lillooet. Corrected and partly redrawn | 4,500 | Oct., 1924 | 3K | 3 miles to 1 in. | 11,000 |
| Grenville Channel. Traced and drawn | 4,600 | Aug., 1924 | 3P | 3 miles to 1 in. | 6,000 |

The printing of the Stuart Lake and Tete Jaune Maps was completed early in the year. These were referred to in the Division report of last year.

Triangulation information of the coast-line being available, filling the requirement for detailed printed maps showing timber and land areas, two map-sheets were prepared. These were Grenville Channel (Pre-emptors' Series, scale 3 miles to 1 inch) and the Bella Coola Sheet (Land Series, scale 4 miles to 1 inch). As the time and staff were not available to make standard compilations, preliminary sheets based on the reference maps were produced in both instances to map the coastal area lying between the Northerly Vancouver Island Map to the south and the Prince Rupert Sheet to the north.

The stock of the Lillooet Pre-emptors' Map having become exhausted, this sheet was brought up to date and republished.

The success and experience gained in preparing the natural-resources type map of the Stuart Lake area shows the advisability of retaining the old map-sheets until the natural-resources information can be arranged and compiled in order of importance of the areas covered by the various Pre-emptors' Sheets.

Degree Sheet Series.

| Name. | No. of Copies. | Date of Issue. | No. | Scale. | Area in Sq. Miles. |
|---|---|---|---|---|---|
| *In Course of Preparation.* | | | | | |
| Rossland. Compiled and drawn surveys and drainage. Contouring nearing completion | ..... | Aug., 1925 | 4A | 2 miles to 1 in. | 3,100 |
| Nelson. Compilation of surveys and drainage about one-quarter completed | ..... | 1926 | 4B | 2 miles to 1 in. | 3,100 |
| Arrowhead. Compilation of surveys and drainage about one-half completed | ..... | 1926 | 4H | 2 miles to 1 in. | 3,100 |
| Bonaparte. Compilation of surveys about one-half completed | ..... | 1925 | 4O | 2 miles to 1 in. | 3,100 |
| Elk River. Compiled. Drawing for photolithography about one-half completed | ..... | 1925 | 4E | 2 miles to 1 in. | ..... |

The work remaining to be done on the Rossland Sheet is the finishing of the compilation of the contouring and the writing and editing of the naming.

The Nelson Sheet was held up awaiting the result of triangulation control survey made by the Geological Survey of Canada during the season.

Development of the Standard Base Map System has made it possible to proceed with a standard compilation covering the Arrowhead Degree Sheet.

Because of the demand for natural-resources information of the territory adjacent to the Pacific Great Eastern Railway, the compilation of the Bonaparte Degree Sheet was begun—an area of first importance for land-settlement purposes, one degree in area, latitude 51°–52° and longitude 120° 30′ to 121° 30′.

The land surveys for the south-west quarter of this area were compiled on standard accuracy to be the framework for the special natural-resources survey made by Mr. Downton, B.C.L.S., during the season.

The surveys of the remainder of the Degree Sheet have been compiled, and the natural-resources and contour information available in the Department for the other three quadrants of the map will be compiled and published with Mr. Downton's data.

The Elk River Degree Sheet has been recompiled and the new information supplied by the Interprovincial Survey in the map area has been included. This sheet is nearly completed.

Land Series Maps.

| Name. | No. of Copies. | Date of Issue. | No. | Scale. | Area in Sq. Miles. |
|---|---|---|---|---|---|
| Bella Coola. Traced and drawn | 5,000 | Nov., 1924. | 2E | 4 miles to 1 in. | 16,000 |

The area lying between the Bella Coola Sheet and the Chilcotin map area is formed by the Coast Range batholith and of little present geographic interest, with the exception of the pass leading to Bella Coola. The area adjacent to this pass is covered by a connecting strip which appears as an inset on the Bella Coola Sheet.

District and Division Series.

| Name. | No. of Copies. | Date of Issue. | No. | Scale. | Remarks. |
|---|---|---|---|---|---|
| Map of B.C. Provincial Electoral Districts—Redistribution, 1923 | 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. |
|---|---|---|---|---|---|
| *In Course of Preparation.* | | | | | |
| South-western British Columbia | 40,000 | April, 1925 | 1K | 1/500,000=7.89 miles to 1 in. | 71,500 |
| Wall-map of British Columbia | 10,000 | 1925-26 | 1L | 1/1,000,000 | ..... |

*South-western British Columbia.*—The key colour (black) and the colour showing contours (brown) were completed by the end of the year and in the hands of the printer. The design of this map was enlarged to provide general natural-resources information on the front of the map in the road colour (red). A useful method of showing the road mileage along the main highways is introduced, so that by a glance the distance can be checked off from any point on the road to any other point on the road. This is the first map upon which appears the trunk road and highway system classification established by the Minister of Public Works.

In addition to transportation and other information of special commercial and tourist interest, the following legend indicates the work necessary to detail this information:—

Cities (population, 1921 census, in red).
Government Agent Offices.
Mining Recording Offices.
Sub-mining Recording Offices.
Post-offices.
Villages.
Municipalities.
International Boundaries.
Land District Boundaries.
Park Boundaries.
Game Reserves.
Customs Posts.
Hospitals.
Automobile Ferries.
Camp-sites (organized).
Golf-courses (number of courses given).
Canneries.
Commercial Air-harbours.
Lighthouses.
Radio Stations (commercial).
Motor-boat Refilling Stations.
Power-sites (developed and undeveloped).
Railways.
Railways (under construction).
Railways, Electric.
Trunk Highways—completed, paved, uncompleted.
Main Highways—completed, paved, uncompleted.
Local Roads.
Trails—well-defined, indefinite.
Telegraph-lines (other than along railways).
Telephone-lines.
Steamship Routes, distances in nautical miles: 1 nautical mile=6,080 ft.; 1 statute mile=5,280 ft.
Relief Contours, showing land form and elevation above sea-level, 1,000 feet interval. Figures show height in feet above sea-level.
Falls and Rapids.

The usual natural-resources map gives prominence to resources such as gold, silver, etc., where the production is problematical. In this new map the references, though general, cover, with interesting and authentic notes, phases of agriculture, stock-raising, forest resources, game and fur-bearing animals, mining, fisheries, water-powers (showing the horse-power of those developed and undeveloped).

Further expansion of the work is the use of the back of this map to introduce comparative geographical tables comparing British Columbia especially with the four North-western States of the United States of America—Washington, Oregon, Idaho, and Montana—which are similar to British Columbia in types of population, climate, area, physiography, geographical advantage, and natural resources. These tables have been prepared by the various interested departments and are reliable statements.

In addition to the tables on the back of the map are shown itineraries of special interest to visitors, prepared by Boards of Trade and Publicity Bureaus of the principal centres of the map area—Vancouver, Victoria, Nanaimo, Kamloops, and Alberni. The itineraries describe the most interesting way to occupy oneself during a visit of a day, three days, a week, a month, or three months, in the respective neighbourhoods, and also give business and residential advantages of these communities.

There are condensed articles concerning fisheries, fur-bearing animals, Customs and game regulations, etc., and index to post-offices of the map area. There are also two diagrammatic road maps showing the automobile highways from the East and the South to the Province.

The new wall-map of British Columbia is practically completed in the key colour (black) and about 50 per cent. of the drawing of the contours for photolithography is done.

### Miscellaneous.

| Name. | Scale. | Date. | For whom prepared, printed, etc. |
|---|---|---|---|
| Coast Triangulation Progress | 45 miles to 1 in. | Jan., 1924 | For Annual Report of Lands Department. Prepared copy for reproduction. |
| Photo-topographic Progress | 25 miles to 1 in. | Jan., 1924 | For Annual Report of Lands Department. Corrected red copy for reproduction. |
| Vancouver to Prince George | ..... | ..... | Pacific Great Eastern Railway. Special pamphlet. Prepared copy for reproduction. |
| Land Settlement areas—Four along Canadian National Railway and Pacific Great Eastern Railway | 3 miles to 1 in. | Mar., 1924 | Land Settlement Board. Prepared copy for reproduction. |
| University Lands Naming Competition | ..... | Oct., 1924 | Water Rights Branch. Zinc blocks. |
| Peace River area | ..... | Dec., 1924 | Department of Agriculture. Prepared copy for reproduction. |

Additional to the above miscellaneous works, several small maps, diagrams, illustrations, etc., were prepared for various departments and branches.

### Geographical Naming and Gazetteer.

Regular progress was made in conjunction with the British Columbia representative of the Geeographic Board of Canada in the naming of the geographical features of the Province which have been submitted for decision. In addition to the large number of single names dealt with, necessitating correspondence, searching of records, correcting of maps, etc., the following sheets were edited for geographical naming during the past year:—

| Name of Map. | For whom prepared. |
|---|---|
| 1. Bella Coola Pre-emptors' Sheet | B.C. Government. |
| 2. Grenville Channel Pre-emptors' Sheet | B.C. Government. |
| 3. Lillooet Pre-emptors' Sheet | B.C. Government. |
| 4. Barkerville area | Geological Survey of Canada. |
| 5. Kokanee Glacier Park Sheet | Geological Survey of Canada. |
| 6. Kootenay Park Sheet | Geological Survey of Canada. |
| 7. Rayleigh and Vinsulla Sheet | Geological Survey of Canada. |
| 8. Louis Creek Sheet | Geological Survey of Canada. |
| 9. Creston Sheet | Geological Survey of Canada. |
| 10. Driftwood Creek Sheet | Geological Survey of Canada. |
| 11. B.C.-Alberta Boundary Survey names (4 sheets). | |
| 12. Referenece Map 39A. | |
| 13. Reference Map 39. | |
| 14. Reference Map 41. | |
| 15. Reference Map 41B. | |
| 16. Reference Map 3B. | |
| 17. Chart of Okisollo Channel | Hydrographic Survey. |
| 18. Chart of Gunboat Passage | Hydrographic Survey. |
| 19. Chart of Johnson and Return Channels | Hydrographic Survey. |
| 20. Chart of Meyers Passage | Hydrographic Survey. |
| 21. Chart of Rawlinson Anchorage and Griffith Harbour | Hydrographic Survey. |

| Name of Map. | For whom prepared. |
|---|---|
| 22. Chart of Idol Point to Ocean Falls | Hydrographic Survey. |
| 23. Water Rights Branch, checking names in connection with the power-sites of B.C. | |
| 24. South-western B.C., Commercial and Visitors' Map | B.C. Government. |

The compilation of the Gazetteer has been advanced steadily—to date nearly one-third of it has been edited and is now in the hands of the printers. As already pointed out, the compilation of this work necessarily is slow because of the close checking required on all geographic features as to location, descriptions, spelling, etc., and the fact that only one assistant is now employed on this work.

### COST-CARD SYSTEM.

This year the number of demands for work from other offices has decreased considerably, while the size of each order has been much larger than before. During 1924 there were twelve orders with a charge value of $310.06, compared with eighteen orders valued at $147.63 for 1923.

### MAP-MOUNTING.

The volume of map-mounting requirements during the year equalled that of the previous year; the slight decrease shown in the receipts and credits reflects the reduction in the cost of materials. The following is a synopsis of the work accomplished by the Map-mounting Division for the year 1924:—

| | |
|---|---|
| Loose-leaf map-books prepared | 9 |
| Maps cut to fold and mounted | 2,262 |
| Blue-prints mounted | 139 |
| Photostat prints fitted, joined up, and mounted | 1,300 |
| Official maps repaired | 39 |
| Miscellaneous (field-books, brown-paper books, etc.) | 100 |

A fine example of map-mounting and leather-work design was the special loose-leaf map-book prepared for the Canadian section of the British Empire Exhibition, London, England.

Careful craftsmanship was shown in the map-mounting production throughout the year.

In addition to carrying out the map-mounting requirements of the Survey Branch, the cash receipts and credits for the period January 1st to December 31st, 1924, amounted to $1,305.21.

| | Work done, Receipts and Credits. |
|---|---|
| Geographic and Survey Branch | $1,277 99 |
| Lands Department | 502 87 |
| Other Departments | 679 20 |
| Public | 123 14 |
| Total | $2,583 20 |

### PHOTOSTAT.

The volume of work for the past year equalled that of the previous year, which was the highest production for our equipment to date. The work carried out was more varied, much of it being of a confidential and important nature. There was a slight decrease in the volume of straight copying-work upon which faster time and larger output can be obtained. This is reflected in the decreased receipts and credits from the previous year. The standardizing of the rectigraph paper has been satisfactory and a distinct saving.

| Year. | Requisitions. | | Receipts and Credits. | | |
|---|---|---|---|---|---|
| | Dept. | Public. | Dept. | Public. | Total. |
| 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 |
| 1924 | 792 | 187 | 2,675.75 | 748.50 | 3,424.25 |

### Map Stock and Distribution.

| Year. | Maps issued to Depts. and Public. | Maps received into Geographic Stock. |
|---|---|---|
| 1921 | 16,375 | 24,492 |
| 1922 | 17,047 | 18,663 |
| 1923 | 19,800 | 57,102 |
| 1924 | 19,466 | 30,108 |

| | |
|---|---|
| 1. Cash receipts for printed maps, January 1st to December 31st, 1924 | $1,252 78 |
| 2. Credits (Lands Department) for printed maps, January 1st to December 31st, 1924 | 885 17 |
| 3. Credits (Government Agents) for printed maps | 534 88 |
| 4. Value of printed maps issued free to Government Agents and public, January 1st to December 31st, 1924 | 2,038 22 |

The work of stocking and distribution was carried out economically and satisfactorily.

| Year. | Letters received and attended to. |
|---|---|
| 1921 | 1,298 |
| 1922 | 1,318 |
| 1923 | 1,400 |
| 1924 | 1,399 |

### Standard Base Map.

The Standard Base Map staff has consisted of one computer and three draughtsmen, with the exception of a period of five months, when one draughtsman was employed on the compilation of the Nelson and Arrowhead Degree Sheets.

The receipt of fresh survey information necessitated the compilation of new S.B.M. routes and the revision of certain others. Altogether, the length of new traverse compiled was 2,400 miles.

The work of plotting the skeleton routes on the scale of 1 mile to 1 inch was continued, thirteen new sheets of 30-minute area being completed, besides which two sheets were readjusted and entirely replotted.

In all, fifty-two of these 30-minute area sheets have been completed, representing nearly 30 per cent. of the area of the Province covered by S.B.M. traverse routes.

A plot on the scale of 20 chains to 1 inch was made of the area covered by the photo-topographical survey of Mr. McCaw, B.C.L.S., in the Nicola District, nine 10-minute quadrangle sheets being completed.

During the year there was a steady demand for control points established by S.B.M. system, and control nets were supplied for the following:—

| Geographic Printed Maps. | Departmental Reference Maps. |
|---|---|
| Arrowhead Degree Sheet. | Nos. 3B, 17B, 18A, 24A, 24B, 27C, 29, 30, 42A, 42B, 42, 50, 15–9S. |
| Bonaparte Degree Sheet. | |
| Nicola Degree Sheet. | |
| Grenville Channel Sheet. | |
| Lillooet Pre-emptors' Map. | |

### Land Registry Plans.

Arrangement was made for the transfer of all work in connection with the registration of Land Registry plans to the Survey Division.

### Central Index.

The indexing of plans, records, etc., under the Central Index system, which had been more or less in abeyance owing to pressure of other important work since 1920, was continued.

I have, etc.,

G. G. Aitken,

*Chief Geographer.*

## STUART RIVER AND FORT GEORGE CANYON, CARIBOO DISTRICT.

BY J. A. F. CAMPBELL.

PRINCE GEORGE, B.C., November 5th, 1924.

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

SIR,—During the greater part of June I was engaged on old surveys in the vicinity of Sinkut Lake and along the line of the Canadian National Railway between Vanderhoof and Finmoore. A large part of the time was spent in moving from point to point, as the work was scattered. In latter part of June I crossed Nechako River at Finmoore and moved north by wagon to near Stuart River. I originally had intended to use canoes on Stuart River, and shipped three canoes to the mouth of the river, but owing to high water I started my first move by wagon and found the country so open that I was able to cut my own wagon-roads for camp moves without undue delay, so did not require canoes.

I worked along Stuart River, surveying vacant land into 160-acre lots until the first week in August, when proximity of a large forest fire driven by a high wind compelled me to leave the area for the time. I was fortunate enough to obtain two teams and wagons without delay, and on their arrival at 2.30 a.m. started to move to Nechako River, where I cached my surplus supplies and outfit and moved the party by train to Prince George; then by motor-boat down Fraser River to Fort George Canyon, where eight sections were quartered into 160-acre lots. On completion of work at the canyon I moved by wagon to Prince George, a distance of about 25 miles; then by train and wagon to the camp on the Stuart River, from which the fire had driven me some weeks previously, arriving there on September 3rd. Work was continued in this area until October, when I moved to the mouth of the Chilako River, the season's work being brought to a conclusion at that point.

Much has been written about the agricultural resources of Stuart River Valley, but most of the articles have reference more to the Upper Stuart and Necoslie River lands. The area in which my work was confined was the Lower Stuart River and not more than 15 miles from its mouth.

Stuart River takes head in Stuart Lake and drains a large lake area to the north, and is the principal tributary of Nechako River, entering in latitude 54° N., longitude 123° 30′ W., at a point about 60 miles west of Prince George.

### AN HISTORIC ROUTE.

The Stuart was first sighted and explored by white men in 1806, when traders of the North-west Fur Trading Company, later amalgamated with the Hudson's Bay Company, entered the river and followed it to Stuart Lake, where the trading-post of Fort St. James was founded, which for many years was to be the fur capital of New Caledonia. Many of the men whose names are linked with pioneer days in British Columbia started as clerks in the Hudson's Bay post at Fort St. James and travelled the Stuart and Fraser Rivers with the fur brigades. Until the building of the Grand Trunk Pacific the Stuart was the main artery by which supplies were taken to Fort St. James and the posts to the north. Now Stuart Lake is connected to Vanderhoof by a good motor-road and the river is little used, except by an occasional hunting-party or trapper. There are many old camping-grounds at convenient points along the river, where the fur brigades would pitch camp for the night, the same places being used year after year until a considerable clearing was made. Old iron-studded river tracking-boots, broken cooking-utensils, etc., are much in evidence at the larger camping-grounds.

For 25 miles from its confluence with Nechako River the Stuart is shallow and swift, flowing between rather precipitous banks, with little or no river-flats, usually so noticeable along most of the northern river. Farther along the river the banks are not so steep and there are many well-farmed river-flats, but in the area surveyed the banks rise about 250 feet above the river at a slope of about 30°. From the top of the bank the land flattens out, and for miles back from the river there are practically no undulations, except where a slight decline is made to some creek or meadow.

### Vicinity of Webber Lake.

The land adjoining Lots 5404 and 5429 and extending east to the Stuart River, a distance of 5 miles, has a growth of open small poplar and scattered pine, with a few patches of fir on the crest of the river bluff. There are a few small meadows in the area surveyed, the largest being about 30 acres in size. The clearing in most cases is rather light, some of the adjoining farms clearing from 5 to 10 acres of similar growth in a season, including slashing, burning, and grubbing the smaller stumps, the larger stumps being left to be blown with powder.

To the north of Lot 5429 the timber is principally lodgepole pine, fairly well scattered, the largest trees seldom exceeding 8 inches in diameter. During the summer a fire spread through this part of the area and in many instances completely cleared the land of timber and windfall without injuring the soil to any appreciable extent, except where the soil was shallow and light. In a few years' time the burnt-over area will make excellent grazing, as it is free from down timber and a great part of the standing timber. Within two months of the fire new grass had started and was growing with great rapidity.

All the land surveyed, together with the adjoining surveyed land, may be described as bench land, lying at an elevation of 2,300 feet and about 250 feet above Stuart River. There are a fair number of settlers in the district, the majority being of either Scotch or Norwegian descent, having settled within the past ten years from the Prairie Provinces. The settlement is locally known as the Webber Lake Settlement, taking its name from a small lake in the vicinity. Most of the farms raise stock for the market and keep a number of dairy cattle, the butter either being made on the farm and retailed or else the cream shipped to the Vanderhoof Creamery. The numerous meadows are used entirely for hay-raising to provide winter feed for the stock. Usually enough feed is raised on the farm to see the stock through the winter, but due to the dry summer this year there will be a considerable shortage, many of the farms getting less than half a crop. As a rule there is a plentiful supply of potatoes and roots, but again the dry summer interfered, and, coupled with a number of rather severe summer frosts, the crop is far below the average. I found it very difficult to purchase potatoes, etc., from the farmers, for in some cases they had just sufficient for their own use. The oat-crop was fairly successful and in most instances this crop was up to the average.

The nearest post-offices are at Chilko and Finmoore and at the latter place is a general store and school. There are also schools at Chilko and on Lot 5430, near Webber Lake. A portable sawmill is operated near the lake and a large number of the farm-houses are frame buildings instead of the usual log cabins.

### Fort George Canyon.

Fort George Canyon is a contraction of Fraser River 18 miles below Prince George, where the river breaks through a shaly rock formation. The canyon, about a mile long, is U-shaped and the river is broken into numerous narrow channels by rocky islands with precipitous banks. At the lower end the canyon is 200 feet wide, and the river, especially at high water, rushes through with great force, making it extremely dangerous for canoes and small crafts.

Eight lots lying to the west of the canyon were subdivided, and with the exception of one lot that bordered the river, most of the land was on the high benches back from the river. Along the river at this point the land is rather rocky and good agricultural land is not encountered until the top of the bench, about 400 feet above the river, is reached. The bench land is extremely rich in quality and the clearing of the small poplar and willow very light. In places many acres can be made ready for the plough by the clearing of a few scattered willows and old stumps. The one or two settlers in the area have cleared considerable land without a great deal of effort, and their crops, principally hay, oats, and roots, were not damaged by the summer frosts or dry weather so prevalent in most parts of the district this year.

### Transportation.

The transportation facilities throughout the district are improving year by year, and is especially noticeable in the large number of motor-vehicles on the roads. Until the widespread use of the motor-car by farmers, many of the roads were no more than wagon-tracks through the bush, but the general use of motors has changed this, most of the roads being now properly graded and ditched and, where possible, are also gravelled. In the area in vicinity of Webber Lake there are a number of very good roads, especially the one running from Vanderhoof,

passing Webber Lake to the north and crossing Stuart River a few miles north by a bridge. There is also a good road from Finmoore, the nearest station on the Canadian National Railway, running north and joining the Vanderhoof Road near Webber Lake. On both these roads motor-cars can be used. There are also numerous cross-roads, some in fair shape for wagons, while others can only be used satisfactorily in winter, as they cross too many swamp meadows for use in the spring and fall.

The Canadian National Railway follows the south bank of Nechako River, and at Finmoore and Hulatt, stations on the railway, are Government-operated ferries, the one at Finmoore being installed this fall. The ferries are in operation from 7 a.m. until 7 p.m. free of charge to passengers and wagons, with a small charge for crossing outside of these hours.

There is a daily passenger service, except Monday, on the railway, with the mail being carried east and west on alternate days, and a freight service east and west on alternate days.

### INDUSTRIES.

Along Stuart River are scattered patches of heavy spruce and fir, together with a few timber limits of good spruce. The spruce near the mouth of the river is being logged off, the logs being driven down the Stuart and Nechako and held at Hutchinson, where a small mill is in operation. No doubt if this is a continued success the larger stands of timber on the Upper Stuart and lakes to the north will be logged and cut at mills on the Canadian National along Nechako River.

The making of railway-ties, at which, in former years, many men found employment in winter, has this year been cut in half, so that some of the larger contractors may not find it profitable to open their camps. To some extent this is favourable to the farmers who have a small stand of pine on their land and will be able to sell all the ties they make. At the price paid for ties, 67 and 57 cents, less a small commission to the larger contractor, a farmer who is in a favourable position will be able to add considerably to his income in the winter months.

### CLIMATE.

Precipitation in Nechako Valley and along Stuart River is in most years fairly light, but is usually sufficient for all requirements, so that the past season, which was very dry with little rainfall, especially during the months of July and early August, cannot be used as an average. Naturally the dry weather in the early part of the summer was damaging to the crops, giving in many instances less than half a crop. The light rainfall in the summer was more than compensated by the heavy rains in September, but too late to be of much benefit to the farmers.

The highest temperature recorded was on August 10th, when the thermometer read 100° at noon, but this high reading was partly due, no doubt, to the proximity of forest fires. There were a number of days in July and August when readings of more than 90° were noted. In the latter part of June and early July there were severe morning frosts, but summer frosts in this district are not unusual, but are not of the frequency of former years.

The snowfall in the winter months is seldom over 2 feet, and very low temperature for any length of time is exceptional. Occasionally it may drop to 40° below zero, but the duration of these cold spells is not over a day or so, the average winter temperature being well above zero.

### GAME AND FISH.

There is plenty of game in the country, moose, deer, and bear being the more plentiful, with a fair number of grouse and many ducks and geese in the fall. To the north of Stuart Lake, where the country is mountainous, there is an abundance of grizzly bear, sheep, goat, moose, and caribou, besides a large number of smaller game. A party from the Eastern States spent six weeks in that district and all obtained the full limit allowed. When the excellent hunting obtained is better known, together with easy access to the hunting-grounds, I have no doubt that many parties will patronize the district to the north of Stuart Lake, using quarters at the lake as their main base.

The fishing, as in most parts of Northern British Columbia, is usually very good. In the larger lakes char, whitefish, and trout can be obtained either by rod and line or by troll, while in the creeks and rivers the usual specie is rainbow trout and Dolly Varden.

### General.

During the past few years the country between Vanderhoof and Prince George and extending north and south of Nechako River has opened up rapidly, more so the country to the north of the river. Many new settlers have come into the country, especially from the Prairies, and while a number have left, the steady influx more than offsets those who have left. A great aid to the rapid settlement of the country is good roads, and although there are not nearly enough at present, yet within the past year or so most of the main roads have been improved for motor and heavy vehicle traffic, while branch roads have been built into the more settled areas, giving fairly easy access to the nearest town or railway-station.

A great aid to the farmers has been the cheap stumping-powder supplied by the Government through Farmers' Institutes. Previously the cost of powder was almost prohibitive and many farms that would have been cleared of the heavy stumps lay idle, but under the present arrangements the purchase of powder is now within the reach of most settlers, and most of them make full use of it.

To the present the easiest crop to dispose of is timothy-hay, as the numerous mills and logging camps along the Canadian National require a steady supply. As the camps purchase by the car-load it is necessary to properly bale the hay and have car-load lots for sale, as the larger camps do not purchase in small quantities. Some farmers make the mistake of putting up swamp or wild hay for sale, but as a rule this cannot be sold in quantity unless there is a big shortage of good timothy-hay, and the price obtained for it is about half the price or less than that paid for timothy, with the cost of harvesting and marketing the same.

I have, etc.,

J. A. F. Campbell, B.C.L.S.

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## RANGE 5, COAST DISTRICT.

By V. Schjelderup.

Burns Lake, B.C., January 14th, 1925.

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

Sir,—Surveys were carried out in Range 5, Coast District. The main work consisted of subdivision into quarter-sections of lands previously surveyed into lots of 640 acres for applications to purchase, which later reverted to the Crown. Some 26,250 acres were thus subdivided, most of which lies adjacent to the Canadian National Railway between Rose Lake and Houston. Ties connecting up isolated groups of surveys were made by traverse and triangulation, covering a mileage of 54 miles. On Stuart Lake small lots were laid out and subdivided for summer-home sites, covering all the best locations for such along the shore of the south-eastern end of the lake.

### Rose Lake to Houston.

Rose Lake is a small lake at the summit on the Canadian National Railway between the Bulkley and Endako Rivers, 2,367 feet above sea-level. There is a school, post-office, and general store at the west end, about a quarter of a mile from Rose Lake Station. The area tributary to Rose Lake received its full share of settlers coming into the district during the last few years, and although one cannot say that they, as yet, have made much of a success at farming, considerable land has been cleared and a good living made from the tie industry in the winter months and road-work in the summer.

Forestdale is the next station west, about 7 miles from Rose Lake. There is a well-stocked general store, post-office, school, and church at Forestdale, which is the centre of a comparatively well-settled area. One of the best and oldest farms in the district, owned and operated by Clark Bros., lies a couple of miles east of the station. Roads lead in all directions from Forestdale, connecting it with the main Government road between Hazelton and Burns Lake, the Clark Farm, Elwin and Day Lakes, Crow Creek, and Maxim Lake. At the Provincial Potato-show at Victoria, 1923, potatoes grown on Crow Creek received second and third prizes, Irish Cobblers and Early Six Weeks varieties respectively.

Topley, some 9 miles from Forestdale, is the next centre, where there is quite a little village with a good hotel, post-office, school, and two general stores. A considerable amount of freight for the Hudson's Bay Company's post at Fort Babine is now being taken in over the Topley–Babine Lake Road, a distance of some 25 miles, and during winter travellers to and from Babine Lake generally choose this route. The area around Topley was badly hit by the 1922 forest fires and but little green timber is left.

Next along the line of the Canadian National Railway comes Perow. Although the area on the north side of the railway is as well settled as anywhere else in the vicinity, there is as yet no post-office nor store. A school was opened there last summer.

Eight miles from Perow is Knockholt Station, but with the exception of the station building there is nothing there. North Bulkley Post-office and school, some 2 miles east, serves the settlement to the east and Houston takes care of the settlers south and west of Knockholt. The land at North Bulkley was taken up some twenty years ago and is still successfully farmed by the same settlers who originally picked the spot, when, practically speaking, they had the pick of the whole Nechako and Bulkley Valleys to choose from.

Houston, about 4 miles from Knockholt, is, and has for a long time been, the centre of quite a settlement. There is a good hotel, school, post-office, general store, and church. Annual fall fairs are held there and the exhibits shown should be proof enough for any one of the agricultural possibilities of the district. Houston is the rail-head for the Owen Lake country, the west end of Francois Lake, and part of the Wistaria area. Prospectors going into Sibola and Sweeney Mountains generally make it their base. A recent publication in the *Interior News*, of Smithers, dealing with finding of rich ore in the Sibola Mountain area, reads as follows:—

"E. G. Bellicini, of Houston, was a business visitor in Smithers during last month, and he brought in several fine specimens of ore from the new strike made on Sibola Mountain this summer.

"Mr. Bellicini recently had a visit from his co-owner, Chung King Ho, a retired merchant of Vancouver, who came up as far as Houston for a personal inspection of the ore that had been packed out to that point. He was greatly elated with the ore taken out and stated he was prepared to finance a much more extensive programme of development-work next season in order to determine if there was a sufficient body to warrant a mill being erected at the mine.

"The samples exhibited by Mr. Bellicini are free-milling and appear to be extremely rich, being well studded with coarse pieces of gold. He has had no assays made, however, as the samples brought out would show values of several thousand dollars, which might have a tendency to raise their hopes too high. They wish to prove the extent of the vein before making a report on values.

"Sibola Mountain, which is located in the Tahtsa Lake country, is about 90 miles from Houston and about 50 miles from salt water, and therefore the question of transportation to and from the mine is a serious one, the route at present being by wagon-road and trail from Houston.

"Sweeney Mountain, which is about 5 miles from Sibola, has also very rich values in silver, copper, and zinc."

### MAXIM LAKE.

A tie was made from Lot 4251 south of Forestdale to Lot 4252 south of Maxim Lake. Maxim Lake is 3½ miles long and about half a mile in width and lies at an elevation of 2,550 feet above sea-level. The lake is alive with rainbow trout of excellent quality; there are also char, whitefish, and ling. No agricultural land to speak of was seen. To east and south-east of Maxim Lake the country rises to approximately 800 feet above the lake. To south-west there appears to be nothing for miles but low gravelly ridges and spruce-swamps. A few miles west the country rises to at least 1,000 feet and appears to be very broken. The timber on both sides of the lake is mostly pine and I understand an extensive area of it is good tie-timber. Maxim Lake may be reached by road either from South Bulkley or Forestdale.

### TOPLEY–BABINE LAKE ROAD.

From Lot 1354 on Babine Lake a traverse was run through to Lot 2633 near Topley. The route of the Topley–Babine Lake Road was followed. From Topley a motor-car can be used for the first 3 or 4 miles of this road and for another 6 or 8 miles a wagon may be used, but for the balance of the distance I would not advise any one to attempt any other means of

transportation than pack and saddle horses. Although the summit is 3,550 feet above sea-level, or, in other words, 1,350 feet higher than Topley, the ascent is fairly gradual, as is also the descent, except for one long steep grade (10 to 15 per cent.) some 4 miles before reaching Babine Lake. This is a good winter road.

Generally speaking, the whole area for miles on both sides of the road was swept by terrific forest fires in 1922 and only an odd patch of green timber remains here and there. There is a hay meadow some 40 acres in extent about 7 miles from Babine Lake at an elevation of 3,000 feet, otherwise no agricultural land was noticed. The country to the west of the road is more or less rolling, dotted with numerous small lakes, beaver meadows, and swamps. There are no high hills or ridges until reaching the hills extending north from Knockholt—Grouse Mountain and the snow-capped mountains south of Chapman Lake; to the east Huckleberry, Black, and Fulton Mountains, and beyond these a succession of high timber ridges which have escaped the fire ravages.

Fulton Mountain is approximately 5,500 feet, while Black Mountain is a few hundred feet lower. In between the ridges and mountains are numerous small lakes, beaver meadows, and swamps. Nowhere have I ever seen so many old signs of beaver as in this area between Babine and Topley, but the fires and unrestricted trapping must have annihilated the beaver or driven them out. Between Black and Huckleberry Mountains a number of promising-looking mineral claims have been located. Most of this traverse was run under most unfavourable weather conditions and I did not succeed in obtaining as much topography as otherwise might have been hoped for. The triangulation stations on both Fulton and Black Mountains were occupied, but owing to poor visibility results were not satisfactory.

### Fulton Lake.

From Lot 1613A at the foot of Fulton Lake a connection by triangulation and traverse was made to Lots 1608A and 1609A, Range 5, Coast District. The Lower Fulton Lake, which lies at an elevation of 2,450 feet, is 3 miles long and from 10 to 40 chains wide. The upper lake is 5 miles long with an average width of half a mile. The two lakes are less than a quarter of a mile apart and the difference of elevation is only a few inches. The 1922 forest fires swept the whole area south of these lakes to within a mile of the west end of the upper lake. The area to the north was swept by the same fire, but it did not cover as much ground as on the south, nor did it sweep so far west. No agricultural land of any extent exists adjacent to the lakes nor west along the route of the traverse. At the south-west corner of Lot 1609A there is a patch of meadow land, but nothing worth while for settlement.

### Fulton River.

Fulton River, about 1 chain wide and from 6 to 24 inches deep, draining Chapman Lake into Fulton Lake, winds down through spruce and willow bottoms varying in width to over half a mile. The country to the north appears more or less broken and is timbered with pine, spruce, and poplar. Fulton Lake drains easterly into Babine Lake. The length of the river is about 4 miles, with an average width of a little over a chain, and from 12 to 24 inches deep. To within about 1½ miles from Babine Lake the river is swift and flowing in a canyon 150 feet deep, and of the 150 feet difference in elevation between the lakes the drop in the first half a mile is about 100 feet—one fall 50 feet and another 15 feet high. At the outlet of Fulton Lake, and especially below the falls, the trout-fishing is just splendid; cut-throat and rainbow trout seem to be there in equal abundance.

### Stuart Lake.

This lake with its tributaries has for a long time been noted as an ideal spot for tourists, big-game hunters, and for summer-home sites. Various privately owned properties near the lower end of Stuart Lake have from time to time been subdivided and sold to local people at Fort St. James, Vanderhoof, and Prince George for summer cottages and camp-sites. The distance from Vanderhoof, on the Canadian National Railway, to Fort St. James, the Hudson's Bay post at the lower end of the lake, is about 40 miles by road.

Owing to the bad condition of the road between Quesnel and Prince George tourists have been prevented from visiting Stuart Lake and vicinity with their cars, but judging by the inquiries made they will be coming this next season by the hundreds, provided the road is put

into shape before it is too late. Parties of big-game hunters have been in this last two years and are very well satisfied with their sport. A party of American hunters this last fall went as far north as Thudade Lake region, where in less than a week's hunting six caribou, twelve mountain-goat, two moose, one grizzly and one black bear were shot.

### A SUMMER RESORT.

About 2 miles up the lake, on Lot 3184, Mr. Baynes, a Vancouver business-man, is establishing a summer resort. Grier Starrett, who is in charge of the construction, states that next summer there will be ten buildings, including the main building, which is 40 by 50 feet, and cottage cabins, 26 by 34 feet, which will each have four bedrooms, sitting-room, toilet and bath-room, and hot and cold water in every room. Outside plans include tennis-courts and bowling-greens. Along the beach, half a mile long, a wide sidewalk will be built and at the end a large two-story boat-house, the upper floor being fixed up for a dance-hall.

Although rainbow trout as large and fine as I have seen anywhere are caught in Stuart Lake, I would not call the lake a fisherman's paradise. Besides rainbow trout there are white-fish, char, and sturgeon in the lake. Splendid fishing may be had in the river below the lake. For miles along the north shore of the lake there are unlimited quantities of limestone.

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

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## TRIANGULATION SURVEY, MORICE LAKE, RANGES 4 AND 5, COAST DISTRICT.

BY F. C. SWANNELL.

VICTORIA, B.C., January 5th, 1925.

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

SIR,—Last season I extended the main triangulation system based on the 53rd parallel northward and westward. The intention was to push across the Coast Range to the headwaters of the Kitimat River. Up this valley P. M. Moncton, B.C.L.S., was to carry a triangulation extended from a base at Terrace and connected with Kitimat Arm. Owing to the jumble of rugged glacier-bearing mountains, the bad weather encountered, and difficulties of transport we did not connect, although at one time were only 4 miles apart. In addition to mapping this part of the Coast Range, I surveyed two large lakes—all of this country being hitherto almost entirely unknown.

### MORICE RIVER WATERSHED.

Morice Lake is the farthest north of the remarkable group of large lakes which push far into the Coast Range between latitudes 53 and 54 N. Access may be had to it by water by coming up the Morice River, or by Indian trails from Houston, Owen Lake, and the west end of Francois Lake. By river the distance from the Canadian National Railway and the junction of the Bulkley with the Morice must be nearly 70 miles, the river being very crooked.

### MORICE RIVER—C.N.R. TO MORICE LAKE.

Our experience with the Morice River was rather unfortunate, as we struck extreme high water, it being early in June. The river was bank-high everywhere, very muddy, and running like a millrace. Although we had an excellent river-boat and a heavy-duty Evinrude engine, recourse had often to made to pole and paddle and occasionally to lining. At low water, however, the only time the Indians attempt to go up, there are many long bars up which they line their canoes.

At 20 miles up is an Indian cabin, where a large creek enters from the north-west. Below this point is much good bottom land and poplar benches, nearly all of which was surveyed some fifteen years ago. Here the river is 100 yards wide, running deep in one channel, the current being 5 miles per hour. The country up-stream becomes hilly and is densely timbered on the broken benches, commencing 50 feet above the river-bed. Pine and spruce predominate. Owen Canyon at Mile 24 is 100 yards long, the river breaking through a rocky gate in a cross-ridge. We portaged here, but at low water the canyon is easily ascended. Shortly above, Owen Creek

comes in. The country from here through to Owen Lake is surveyed, but, except for some excellent bottom land at the creek-mouth, is rough, being cramped between the spurs of Morice Mountain on one hand and the high rocky hills at the base of Nadina Mountain.

For 4 miles above Owen Creek we had good water; then the river splits into many channels. Twice the main one was completely blocked by driftwood and we had to chop a passage through for the boat. There were also several sharp, dangerous turns where the whole current drove under log-jams. Thirty miles above Owen Creek the North Fork was reached, 80 yards wide and very muddy, at this flood stage of the water. The left fork was ascended. Its water was greenish but much clearer. It was clear of drift-timber, but soon became a torrent. Twelve miles above the forks is a short canyon and half a mile of bad water. The canyon is 180 feet above the forks in altitude. The remaining 3 miles to Morice Lake is good water. The legend on Father Morice's map, "ascent 11½ hrs., descent 1¼ hrs.," is a pithy comment on the swiftness of this branch. We took fourteen hours to get up this fork, being delayed by having to portage the boat 40 yards to pass a bad overfall at the canyon.

### Morice Lake.

Morice Lake is 25 miles long, lying south-west, and is remarkably straight, the low hills at the outlet being visible from almost the head of the South Arm. Its height above sea-level is 2,600 feet, the water greenish and very cold, the lake being entirely glacier-fed. In June the temperature of the surface water was 42° F.; by the end of August it had only risen to 44°. Even in summer the lake is very rough, strong westerly winds almost continually blowing down it and the waves piling in very heavily on the beach at the outlet. Calm days were an exception.

For 10 miles up the lake averages 2 miles in width; then a wide deep bay runs off to the north-west for 6 miles. The main lake continues on 15 miles, narrowing down from over a mile to little over half a mile in width at the head. This last 15 miles may be considered as filling a deep narrow valley. The mountains run straight up from deep water in craggy masses or steep detritus-strewn and slide-swept slopes. The only low land is a large flat, densely timbered, on the west side of the bay. Some 1,000 acres have here been built out into the lake by a torrent draining an amphitheatre of glaciers behind Billygoat Mountain. The main feeders of the lake are three. Nanika River, entering from the south at 2 miles from the outlet, has built out into the lake a semicircular delta two or three sections in area. About 70 feet wide and 2 feet deep, its yellowish-green waters impinge far out into the lake, causing a regular tide-rip when a heavy sea is running down the lake from the west. After a course of about 6 miles, the upper part of which is in canyon, this river drains Nanika Lake, which is reported as nearly 20 miles long. A river 160 feet wide and 2 deep, turbid with glacial silt, enters the head of the main arm through a flat, swampy delta. Its course must be short, as a ring of glacier-capped mountains closes completely round 3 or 4 miles up.

### Atna River and Lakes.

The third and main affluent, Atna River, 80 feet wide, 3 or 4 deep, enters the head of the West Arm or bay. After a crooked and very swift course of 400 yards, Atna River expands into a lake one-third of a mile in length, into whose head the river tumbles in two wild cascades, dropping in all 24 feet. We portaged 80 yards across the neck of a peninsula into the first lakelet, and from the eddy at the foot of the cascades a 120-yard rough portage brought us into a second lake expanse nearly half a mile long. From this a very swift 200-yard chute between rock walls leads into Atna Lake. We endeavoured to line up, aided by the engine, but sheered and swamped directly the line tautened. The drop is 12 feet. The country was very rough, but we cut a ¼-mile skid-road across the hill, over which we dragged the boat. Returning, the boat was shot light down the chute, a risky proceeding, as a couple of jagged rocks lie in mid-channel among the smother of white water. All our supplies and camp outfit we packed directly from Morice to Atna Lake over an old Indian portage. It was originally cut sixty-four years ago, reblazed ten years ago, and is about a mile long.

### Atna Lake.

From the wretched Indian lean-to at the end of this trail Atna Lake extends about 3½ miles as an irregular "L"; the long arm running west. The lake is nearly 40 feet above Morice Lake and completely mountain-walled. A river flows in at the west end through a

wide deep valley chequered with large meadows and swamps and heading 12 miles to the south-west in large glaciers. Directly west, appearing to be only 3 or 4 miles away, although really 10, towers a high crag peak (over 9,000 feet), the southerly point of a sharply serrated ridge, below which lie immense glaciers. This ridge is the main backbone of the Coast Range; Henderson River, a branch of the Kitimat, springing from the glaciers on its west slope.

### ATNA LAKE TO HENDERSON RIVER.

Climbing the range to the north of Atna Lake, we discovered a wide deep valley bearing north (magnetic) for some 40 miles. Its head was in the immense glaciers of the Atna Range. The nearest approach to a pass in this direction lay over the summit ice-fields, the range to the west of the deep valley being very high, craggy, and glacier-bearing. We cut trail from Atna Lake 3½ miles to a summit at 4,200 feet and down into the valley-bottom at altitude 3,200 feet. The valley-bottom here is a mile wide, perfectly level, with continuous meadows for 5 miles westerly, finally ending abruptly in the moraines of the Atna glaciers, long tongues of which nearly reach the valley-floor. Climbing up the glaciers, which flatten out at an altitude of 5,200 feet and sprawl over the summit, a deep mist-filled valley, bearing north and lying far below, was seen. This we now know to have been the valley of Henderson River, two or three miles to the north. The head of the main Kitimat River runs out of the same glacier.

### VALLEY OF CLURE AND BIRNIE RIVERS AND COPPER RIVER GORGE.

We proceeded to cut trail down the wide valley bearing north (magnetic). It held its width and was mostly meadow for 8 miles from its head, the river winding through it being swift, silt-laden, 150 feet wide and 2 deep. Eight miles down the meadows cease, the valley contracts, and enters box canyon. Progress was very difficult, as we were headed off by lateral feeders also in box canyon. Twelve miles down, the river for a couple of miles is out of canyon running swiftly over a boulder-bed.

Here we discovered a camp and a pencil inscription: "Clure, Copper City." (I have since learned that Clure, trapper and prospector, reached this point by crossing from the Kitnaiakwa into the main valley and following down Birnie River.) Between this camp and Atna Lake there was no sign of a human being having ever been before us. After another couple of miles, again in box canyon, Clure River was joined by Birnie River, of equal size, but flowing in exactly the opposite direction in the same valley. The combined stream turns sharply at right angles and leaves the valley, dropping abruptly out of sight into an immensely deep and narrow gorge or cleft cut through the western mountain-wall of our valley. We cut trail to the summit of the mountain pierced by the gorge.

From altitude 5,500 feet we looked directly down into a deep valley bearing N. 15° W. for 20 miles. Its western wall was a long line of jagged crag peaks above hanging glaciers. The eastern mountain rose abruptly to timber-line and then rounded out. For 7 miles the valley was acutely V-shaped, the river being out of sight in continuous box canyon. The drop in the river from the head of the gorge to the foot of the box canyon probably is over 1,500 feet. We got no farther in this direction, our provisions being almost exhausted, our foot-gear cut to pieces, and what lay ahead unknown.

### MORICE LAKE TO THE HEAD OF SEYMOUR LAKE.

The return trip to Houston from Morice Lake was made by pack-train. A fairly good Indian horse-trail runs from the mouth of Seymour Creek, 2 miles up Morice Lake to Seymour (Long) Lake, following the shallow depression of Seymour Creek. By trail the distance is 6 miles through undulating and bench country. The soil is sandy or gravelly and the growth smallish jack-pine and spruce. Many bushy beaver meadows lie along the creek, but the only one affording good horse-feed is 3½ miles from Morice Lake. This flattish country extends westward to Nanika River, along the lower course of which are a few small areas of bottom land. As a whole, however, the country for miles is of the worthless jack-pine covered type.

### SEYMOUR (LONG) LAKE.

Seymour Lake is 8 miles long, lies nearly west to east, and at its widest place is only a mile in width. No creek of any size drains into it; the lake is very shallow; the water blackish, it being derived by seepage from neighbouring swamps. A sort of trail exists along the north

shore, but is in bad shape, brushy and blocked by windfall. There is very little land of any value along this lake, but the undulating country running nearly 4 miles back from the south shore and towards Nanika Lake is timbered with a heavy stand of spruce and pine.

### Seymour to Poplar (Tagetochlain) Lake.

A good pack-trail runs from the head of Seymour Lake, following a narrow valley with much open grassy side-hill and many small meadows along the creek. This strip of good country is narrow, however; the country on either side being hilly and densely wooded with jack-pine. Seven miles from Seymour Lake we branched off from the main trail, which continues on to Morice River and down it. We followed the trail to Poplar Lake, a distance of 8 miles farther, passing en route two small lakes, the larger of which is known as Bill Nye Lake, after an Indian whose cabin stands on the shore. The country is hilly and timbered except at the head of Poplar Lake, where there is good bottom land. Poplar Lake is about 12 miles long, is very narrow and crooked, and much cut into by bays and peninsulas. Both sides are hilly, but the north shore has been burnt over, the side-hills are open, and the growth of peavine and fireweed very luxuriant. This land is all surveyed. The trail is very faint and hard to follow. From the smoke-houses in the meadow at the foot of the lake to Owen Lake is 20 miles; to Francois Lake about the same. Owen Lake is 27 miles by road from Houston, 10 miles of which is very bad.

### Agricultural Possibilities.

The only land of any value for agriculture or cattle-raising lies in the area between Morice and Owen Lakes. Excepting small areas west of Poplar Lake, all of any value has been surveyed. Morice Lake, lying almost entirely in the Coast Mountains, has no good land around it. The flats at the outlet are gravelly. There are extensive meadows at its western end and in the valley beyond Atna Lake. These meadows, although large, are of the alpine type; the snowfall is very heavy and the summers short and cold, the air being chilled by the tremendous glaciers and snow-fields which overhang these valleys. The extremely large meadow at the head of Clure River is very remarkable for its size. It would appear to occupy an ancient lake depression silted up by the material ground to meal under the Atna glaciers. The deposit of fine silt, quite free from gravel, is probably very deep. The grass-growth is luxuriant and wild timothy was noted. At present, however, it would be difficult to find a more inaccessible place. In fact, never have I been so cut off from civilization as here. This applies to Morice Lake as well. For over four months I did not see another human being other than members of my own party.

### Timber Resources.

Owing to no white men having before penetrated this region the forest-growth has nowhere been touched by fire. For 10 miles up Morice Lake pine and spruce are the predominant species. Poplar does not go beyond Seymour Lake. At Atna Bay hemlock and balsam commence, and farther in the range the hemlock becomes very large. There is a stand of about 1,200 acres at the west entrance of this bay. The fan-like deltas built out into the lake by glacial torrents are heavily timbered. A valley running from near the head of the lake across to Nanika Lake, probably 12 miles, was densely timbered up to 4,000 feet altitude on either side with hemlock, balsam, and some spruce. A good area of spruce lies south of Seymour Lake. The upper 30 miles of Morice River runs through the original forest of spruce and pine, as yet untouched by fire.

### Climatic Conditions.

As far in as Seymour Lake the climate is that prevalent over the whole Northern Interior Plateau. As one enters the mountains, however, the rainfall becomes much greater. In the centre of the range, at the head of Morice Lake and Clure River, the climate is almost coastal. The snow lies very deep and late. Trap-line blazes near the junction of Clure and Birnie Rivers were 12 feet in the air. From June 15th to August 15th the average noon temperature was 55° F. The hottest day was August 2nd, 84° F. Rain fell on twenty days, between June 15th and July 31st. The first fortnight of August was beautiful, clear, sunny weather. The weather, however, broke about the middle of August, and the remainder of the season we got much cold raw weather and rain, with violent gales from the west. There was no frost, however, until early in October.

### GAME AND WILD ANIMALS.

In the mountains goat were fairly plentiful, on several occasions being seen in bands of as many as twenty-five. Caribou were only seen once, eight being counted crossing a glacier opposite Copper River Gorge. There were plentiful signs of grizzly bear and six were encountered during the season. Black bear were not at all numerous, only one being seen on Clure River. Moose and deer range as far as the foot-hills, but not into the mountains. One large buck was seen on Clure River meadows and two deer at the gorge. They are very scarce, however, probably on account of the great depth of the winter snow. Grouse were scarce, except in the poplar country east of Seymour Lake. Rabbits were plentiful here too, but dying off fast. There was no other game in the mountains except a few ptarmigan. Even the groundhogs or whistlers were very few. There were many geese on Atna Lake the end of July.

Trolling was not at all good in Morice Lake. Once at the mouth of the big glacier creek at Atna Bay large rainbow took the troll almost as fast as we could put it out. We caught twelve, averaging 3 lb., in half an hour. Later we trolled many times past this same place and could not even get a strike. At the outlet we caught three or four steelhead. This is evidently their spawning-ground. We could catch no fish in Atna Lake. The water is probably too thick with glacial silt. A peculiar circumstance was that a little lake in Clure Valley was teeming with small speckled trout, although all the neighbouring lakelets were quite devoid of fish.

I have, etc.,
F. C. SWANNELL, B.C.L.S.

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## GOAT, BOWRON, AND COTTONWOOD RIVER VALLEYS, CARIBOO DISTRICT.

BY R. W. HAGGEN.

WILLIAMS LAKE, B.C., December 1st, 1924.

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

SIR,—The first work undertaken was a traverse of Goat River Valley from Lot 8023, 4 miles south of the Prince Rupert branch of the Canadian National Railways, to Lot 9883, at Isaacs Lake, and levels were carried through from the bench-mark set by the Geodetic Survey at the railway-bridge over Goat River.

A number of years ago, probably in the latter seventies, a trail was built from Barkerville, then the main trading-town of the Central Interior, to the Fraser River, via Bowron (Bear), Indian Point, and Isaacs Lakes, Wolverine Creek, and Goat River to the Fraser River. In those days there was a considerable quantity of fur caught in the country tributary to the Upper Fraser, and Barkerville, about 80 miles distant from the mouth of Goat River, was the most convenient point at which to outfit; there was also, at a later date than the Cariboo gold-rush, a small rush to Goat River, the gravels of which carry values from Diggings Creek to the confluence with the Fraser, a distance of some 10 miles.

This old trail was used by prospectors and trappers and kept in passable condition until, with the advent of the Grand Trunk Pacific Railway, the points along the Fraser River became the outfitting-posts of the district, and since 1914 it is doubtful if any pack-horses were taken over the trail. It is not surprising that we found it overgrown and had to do a great deal of work to put it in passable shape for transporting the outfit. The trail does not show any evidence of judgment on the part of the original locators, and would seem to have been, originally, a trap-line; at one point it was quite practicable to shorten it by 3 miles, and in so doing to eliminate a number of steep hills, following a bench instead; in fact, the trail would be well suited to serve as one of the "horrible examples" for a treatise on what errors to avoid in trail-locating. It is only passable when seasonable conditions are favourable. Nevertheless, it is much better than no trail at all. For 24 miles out of Barkerville there is a road, the first 20 miles of which is suitable for automobile traffic.

### Vicinity of McBride.

I organized the party at McBride, the divisional point on the railway, 145 miles east of Prince George, a town of some 400 population. The stores at McBride carry good stocks and prices were reasonable; while, as the section is a lumbering one, first-class axemen were obtainable.

While in that locality I was pleasantly surprised to see the splendid crops of grain, hay, and vegetables raised on the silt land in the Fraser Valley; the quality of the grain and vegetables was such that they could have been exhibited, without apology, in a fair in competition with anything grown in the Province.

At Rider Tunnel, 5 miles east of the mouth of Goat River, there is an orchard in which apple-trees are now in bearing.

### Goat River Valley.

Goat River Valley itself is heavily timbered and contains no agricultural land, with exception of a little at the mouth that may be used in the future. From the mouth of the river to Milk River, 11 miles, there is a heavy growth of hemlock, spruce, and cedar, the latter almost invariably being hollow. The valley is narrow and the hillsides steep. Above Milk River there is no cedar, its place being taken by balsam; while the trees, which are frequently 4 and 5 feet in diameter between Milk River and the Fraser, are much smaller, not, as a rule, exceeding 12 to 18 inches. Here, also, the mountains are steeper and higher, rising above timber-line, and in many places the sides are swept by avalanches.

One is diffident about expressing an opinion concerning the mining possibilities. Above Milk River there is no gold along the bars, but between Milk River and the Fraser the gravels and schists carry values on the east side, but no one who has worked there in recent years seems to have made wages. All work has been by primitive methods, either rocking or sluicing with only a small head. The whole valley is filled with boulders, which adds greatly to the cost of mining, but from information gleaned the yardage values of the gravels must be good. During the past season a well-known mining engineer made an examination of leases held near the mouth of Boulder Creek, 7 miles up Goat River.

Goat River Valley is rather disappointing as a game country. At the mouth moose are quite plentiful, while there are some caribou and deer on the higher mountain-levels, and, of course, goat near the summits. There are a few bear, very few birds, and practically no fish; the most common animal is the porcupine, the Goat River variety being more depredatory, stupid, and determined than any I have encountered. Fur-bearing animals do not appear numerous, but there are some marten, weasel, mink, and beaver in the locality.

There are few, if any, places in the Interior of the Province where there is a heavier precipitation than through this pass. During the season we had very few days on which there was neither rain nor snow, and there were several spells of heavy, continuous rain; two of these brought Goat River and its tributaries up to the spring level, badly hampering the survey operations and entailing the destruction of a valued transit, and very nearly a fatality. With the continued rain and the sodden condition of everything, anything that could be damaged by dampness was damaged; the trail, except where it was on stone or shale, became a quagmire, while every one developed into a pessimistic crank. Looking back on it, I must express appreciation to the members of the party for staying with it; probably this was in a measure due to the fact that for three weeks we were fairly marooned, Goat River and Milk River barring the return to the Fraser and Macleod River sweeping over the trail ahead.

Twenty-six miles from the mouth of Goat River the trail leaves the river at Summit Creek and follows through a wide, swampy pass, the summit of which is about 40 feet higher than Goat River, the elevation being 3,727 feet. A mile from Goat River Wolverine Creek is reached, this being a tributary of the North Fork of Quesnel River, and the trail follows the valley to Isaacs Lake.

Through the Summit Pass there are open swamps, and in the late summer and fall there is good feed for horses in this pass. Several slides from the high mountains on the west sweep over the flat, and there must be deep snow during the greater part of the year.

The valley of Wolverine Creek is wider than that of Goat River and the creek has a somewhat steeper fall. There is a very fair stand of spruce, balsam, and hemlock in the valley.

From the mouth of Wolverine Creek it is about 38 miles to Barkerville, 14 miles being by trail and 24 by road.

### ISAACS AND INDIAN POINT LAKES.

Isaacs Lake, the most northerly of the circle of lakes at the head of Swamp and Bowron Rivers, is some 20 miles long and about ½ to 1 mile in width. It is a pretty lake, with mountains rising above timber-level on either side, and there is a good stand of timber, mostly spruce, cedar, and hemlock, on the hillsides. No cruise that would enable an estimate to be given of the timber available has yet been made in this section. From Isaacs Lake to Indian Point Lake there is a portage of about 1 mile through a low pass. Indian Point Lake drains through Indian Point Creek to Bowron River, and from it to the outlet of Bowron Lake to Bowron River is 7 miles.

This circle of lakes is one of the best hunting-grounds in the Province, moose, caribou, black and grizzly bear, and goat being numerous, while there is excellent fishing in several places; the mouth of Wolverine Creek being one of the best spots.

### A LAKE TRIP.

A trip well worth taking for either hunters or sightseers is the round of these lakes. A boat can be taken from the foot of Bowron Lake by road to Kibbee Lake; then snaked along the trail to Indian Point Lake, 7 miles. This lake is about 5 miles long, with a trail along the length. From the east end of Indian Point Lake there is a portage of about 1 mile over a good level trail to Isaacs Lake. Isaacs Lake is about 20 miles long, draining into the North Fork of Quesnel River. The river is followed, with some portages, for about 2 miles into McLeary Lake, a beautiful body of water, but of no great size. From McLeary Lake to Long Lake the river is again followed, and there is an easy channel from Long Lake to Sandy Lake. From Sandy Lake the river, creeks, and swamps are followed, and a portage lies between this drainage and Spectacle Lake, on the Bowron River. From Spectacle Lake there is the connection of Upper Bowron River, quite navigable, to Bowron Lake and the point of commencement. This trip round the lakes is especially to be recommended to camera-hunters, who can do their hunting in the summer when the weather is such as to make boat-travelling most agreeable. It is not uncommon to see from thirty to fifty moose on this round trip, while the whole journey is one of unusual beauty. These lakes are a favourite resort for big-game hunters, a number of whom visit the locality every fall.

While this section used to be very popular for trapping, the catches latterly have been small, marten, beaver, etc., having been pretty well trapped out during the era of high prices.

This whole locality is well timbered and, with the large body of navigable water, would be good for economical logging. Of course, at the present time, there are other timber areas close to transportation, and no immediate development is to be looked for. However, it is not to be overlooked that Goat River offers a good route for a line of possible traffic development, the distance from the railway at the mouth of Goat River to Isaacs Lake being just under 35 miles, and the grade from the summit down Goat River being just about 1 per cent. From the summit to Isaacs Lake via Wolverine it would be about 1.5 per cent. Taking this in conjunction with the large area of timber in the whole Quesnel River watershed, it is not unbelievable that the section may justify opening up.

Some years ago, when the Grand Trunk Pacific Railway was under construction and the Pacific Great Eastern not decided upon, the Goat River Pass was selected for a road to give Barkerville more direct access to the railway. From Ashcroft to Barkerville involved a haul of 280 miles, while to Rooney, on the Grand Trunk Pacific, it would be rather under 80. The road was built to about 1 mile beyond Bowron Lake, but as the construction of Pacific Great Eastern brought steel within 60 miles of Barkerville the necessity ceased to exist. Under any circumstances the heavy snowfall on Goat River would make this pass undesirable for a wagon-road.

In making the traverse of Goat River Pass permanent posts were set every mile and the elevations recorded for each of these posts.

Having completed this traverse, the trail was cleared to Indian Point Lake and the outfit moved to Bowron Lake, from which I made a similar traverse down Bowron River to Lot 9518, on Indian Point Creek.

### Bowron River Valley.

Bowron River Valley on this section is rather wide, the flats averaging from ½ to 1 mile and the hills on either side not attaining any great height. The bottom is fairly level, but swampy in many places. Vegetation consists of spruce, jack-pine, and poplar of no commercial value. While there are several flats with a sandy loam soil, agricultural efforts in the valley, carried on in a desultory manner for a number of years, have met with but little success owing to the prevalence of summer frosts. Apart from raising hay for a few head of stock, there is no inducement to do any more than raise a garden, as there is no market available, Barkerville being amply served from Quesnel.

The settlers who are in this section are all guides and trappers, and the raising of feed for pack-horses or of garden-truck for the house is incidental to their regular occupation.

To a point about 3 miles below Lot 429, or 14 miles from Bowron Lake, Bowron River is quite sluggish and easy to navigate with boats; from that point it becomes rocky and hazardous and is only used in case of necessity.

From Bowron Lake a road leads 6 miles down-stream to Duffy's, and from there an excellent trail leads to Cockrane's, on Indian Point Creek; in fact, I took my car 2 miles down this trail during the season.

Indian Point Creek is a stream about 1 chain in width and flows in a nice wide valley. Hunters who were there during the fall had very good success on this and Dominion Creek. J. D. Cochrane, whose home is on Lot 9518, is a very successful guide and a naturalist. Latterly he has been devoting a good deal of time to taking moving pictures of game in their natural haunts. He and Captain McCabe, of Bowron Lake, have some magnificent game pictures taken in this area.

The final work of the season was the traverse of the Cariboo Road at Cottonwood.

The past season saw one new mining development in the Cariboo District, the construction of a dredge on Antler Creek, 6 miles from Barkerville, by the Kafue Copper Mining Company. At this date the construction has been completed but operation has not started.

Owing to the unusually heavy precipitation there was no shortage of water for the hydraulic claims and the amount of gravel moved was decidedly larger than usual.

I have, etc.,

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

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## CANOE CREEK, LILLOOET DISTRICT, AND HEADWATERS OF BLACKWATER AND CHILCOTIN RIVERS.

By D. M. MacKay.

Victoria, B.C., January, 1925.

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

Sir,—The work assigned to me consisted of ties and the survey of three lots in the Lillooet District, and a triangulation and topographical survey of that part of Range 3, Coast District, lying between the easterly limits of the Merston triangulation survey of 1923, the 124th meridian, and the 53rd parallel.

I left Victoria on May 15th, proceeding to Canoe Creek Ranch by way of Ashcroft and Clinton. The work here consisted of a connection between Lot 3984 on the Fraser River and Lot 646 situated in the vicinity of Big Bar Creek.

Instead of organizing a regular survey party, I carried on the work in this area until June 11th with the assistance of two men, making my headquarters up to this date at Canoe Creek Ranch.

### Canoe Creek.

I commenced operations from the south-west corner of Lot 3984, carrying the traverse along the Clinton–Gang Ranch Wagon-road, which at this point runs south-easterly along the upper benches of the Fraser River until the valley of Canoe Creek is reached, when the road turns

and runs easterly through the valley of Canoe Creek for a distance of 11 miles, and for the most part north of the stream and at varying distances of a few links to 20 chains from it.

The benches of the Fraser in the vicinity of the mouth of Canoe Creek have a gentle slope towards the river and form a distinctive feature of the landscape. These benches are almost treeless, with occasional patches of light sage-brush, and are for the most part covered by a healthy growth of bunch-grass and wormwood, the latter being greatly relished by cattle during the late fall and winter. The Fraser areas in this immediate section are particularly valuable, in that cattle can range all winter without extra feeding, the numerous ravines in which invariably are found clumps of poplar and willow affording shelter from the cold north winds.

The soil is mostly fine river-silt with varying percentages of sand and clay on a boulder-clay and gravelly subsoil. This soil is of a porous, non-retentive nature, but where water has been obtainable has proved to be most productive.

The B.C. Cattle Company, which controls extensive areas in this locality, has approximately 80 acres under cultivation at the mouth of Canoe Creek, known as the Lower Ranch. This acreage, which is irrigated by the waters of Canoe Creek, produces heavy crops of alfalfa, while potatoes, tomatoes, sweet corn, other vegetables, and small fruits are grown successfully.

Canoe Creek itself lies in a narrow valley, the sides of which in places are rocky and precipitous, while in others the bed of the stream is only a few feet below surrounding cultivated areas.

The headquarters and main buildings of the B.C. Cattle Company's holdings are situated on Canoe Creek, approximately 3 miles from the mouth, the altitude here being 2,600 feet above sea-level. The ranch is in charge of L. C. Hannan, whose able management has brought this holding to be regarded as one of the best cattle-ranches in the Lillooet District.

The country here is different from the Fraser benches. There is an almost entire absence of sage-brush and the hills are clothed to their summits with a sparse but fairly uniform growth of fir. Rock-outcrops occur in places in the valley, but the soil is highly productive. The company's holdings, which extend easterly through the valley to a point close to the western limits of Indian Reserve No. 2, with the exception of Indian Reserve No. 1 and a few other small parcels, are largely given over to the raising of alfalfa.

Near the west boundary of Lot 2241 the road joins the Jesmond–Kelly Lakes Road, which runs almost due south for 6 miles over a rocky stretch of country. This area is covered by a growth of jack-pine interspersed with clumps of poplar. It is of very little value from an agricultural standpoint.

A lot of 160 acres lying westerly from and adjacent to Lot 2242 was surveyed for the Forest Branch and numbered 5345. This parcel contains very little good land and is timbered with jack-pine and some fir of poor quality.

### BIG BAR MOUNTAIN.

Lot 5344, which I surveyed, is situated in the vicinity of Poison Lake, Big Bar Mountain, and contains approximately 60 acres of good land. I closed in the parcel immediately to the north of this lot, giving same number 5343.

Dry-farming is carried on somewhat extensively in this area, and, I understand, with encouraging results. Heavy crops of wheat and oats of good quality were raised by the settlers of Big Bar Mountain this season.

### CHINA GULCH.

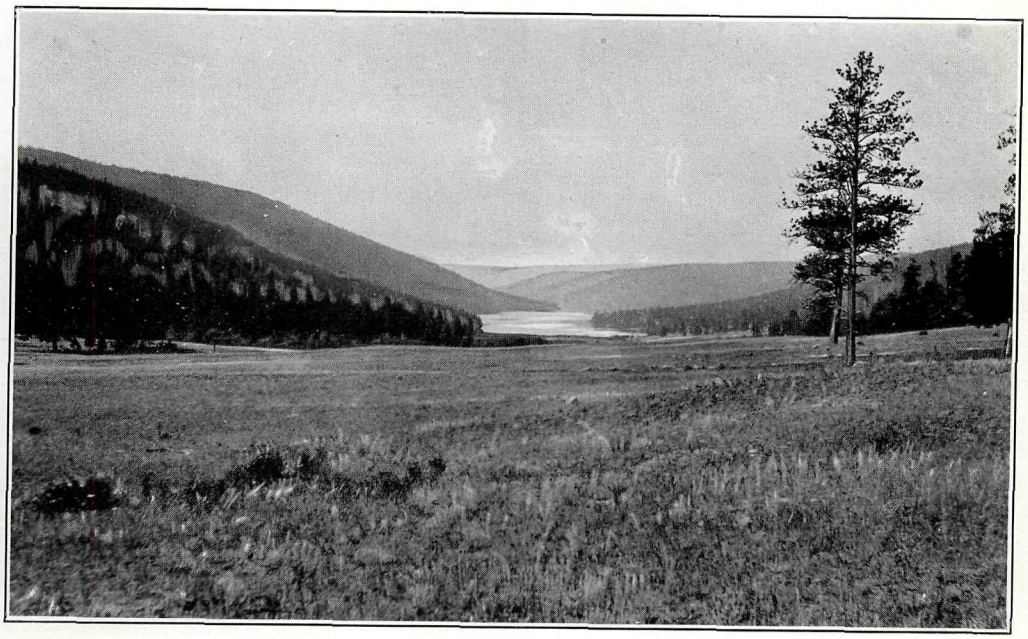
From Big Bar Mountain I moved to China Gulch and made a tie from Lot 2518, situated to the east of the head of the gulch, to Lot 227, situated on the upper bench of the Fraser River south of China Creek.

Of the country traversed by the tie, no particular mention need be made, the valley of the creek being narrow, with only small patches of agricultural land. The area is principally suitable for grazing and is at present utilized for this purpose.

I closed the work in the Lillooet District on July 2nd and commenced the move the following morning by wagon-road via the Gang Ranch, Hanceville, and Redstone to Puntzi Lake.

For the purposes of this report, the country covered by triangulation is divided into the following areas: Puntzi Lake to Chezacut, Clusko River Valley, Upper Clisbako, Upper Bae-

Typical timber range, Lillooet District.



Loon Lake range land, Lillooet, vicinity of P.G.E. Ry.

zaeko, and Upper Chilcotin; the Upper Chilcotin being that portion of the valley westerly from the junction of the Chilcotin and Clusko Rivers.

### Puntzi Lake to Chezacut.

I entered this section from the south, using the road which connects with the main Tatla Lake Road 5 miles due south of Puntzi Lake. The area traversed by this route up to Chilcotin River is to a large extent stony, with numerous small dry meadows, the hay of which appeared stunted and of poor quality. Small low ridges timbered with fir and jack-pine occur between Puntzi Lake southerly to the main road, while a ridge of considerable size covered for the most part with fir lies to the north of and between Mount Huntley and Chilcotin River. My first camp in the area was situated near the north boundary of Lot 107, our water-supply being obtained from a good, never-failing spring near by.

I occupied Mounts Palmer and Huntley to obtain from these points some idea of the area allotted to me for triangulation and mapping, and also to re-establish these stations and secure bearings to points appearing suitable for the triangulation extension.

On July 12th I continued the move to Chezacut, using the road already referred to, a fork of which crosses Chilcotin River just east of the east end of Chilcotin Lake and connects with the Redstone–Chezacut Road immediately south of Clinchintampan "River," incorrectly classed as such, its channel being only that of a very ordinary stream and dry for most of the year.

On the north side of Chilcotin Lake the Mulvahill Ranch is situated. This settler is improving his holdings and is engaged in cattle-raising.

The area traversed by the road between Chilcotin Lake and the Redstone–Chezacut Road is timbered with jack-pine, with a scattering of low-grade fir. The soil is poor, with rock-outcrops occurring frequently.

As one proceeds northerly the country changes, the soil being better and less stony; semi-open tracts occur until the country widens into the spacious flat areas at Chezacut which produce yearly heavy crops of wild hay of excellent quality. The Maxwell and Copeland cattle-ranches are located here, the main road from Redstone terminating at the former holding.

The hills in this vicinity are not high and on the lower slopes a healthy growth of wild grasses, wormwood and yarrow, with occasional patches of peavine and vetch, was noticed.

### Clusko River Valley.

Two sleigh-roads run northerly from the Maxwell Ranch—one up the Clusko Valley and on the east side of the river for a distance of 11 miles; the other farther to the east and close to the 124th meridian to some meadows north of Mount Sheringham.

The valley of the Clusko varies in width from a few chains to half a mile, with patches of good land, some of which are open, while others are covered with clumps of willow and poplar. The soil is mostly a light clay loam on a gravelly subsoil, but owing to the altitude, which is approximately 3,650 feet, is unsuitable for agricultural purposes. It is principally important from a cattle-raising point of view.

Two trails diverge from this valley near the north boundary of Lot 1079; one of recent construction, built by the Forest Branch, runs westerly for 11 miles to some brush-meadow areas known as Moore's Flats, while the other runs easterly to Lot 1083, north of Mount Sheringham. At the junction of these trails the Clusko flows smoothly over a gravel-bed, has an average width of 50 links, and is easily fordable. Much of its water comes from the meadows and swampy areas lying to the north and north-west of Mount Sheringham, while a small lake known as "Horsehoof" also adds to its supply.

### Upper Clisbako.

On August 7th I established my camp on the Clisbako River, 1½ miles north of Canyon Mountain, and from here explored the territory around the headwaters of this stream.

There are some extensive wild-hay meadows here, while much of the land bordering the streams could be readily cleared and when cultivated would no doubt produce good crops of hay.

The hills in this section are low, their summits being covered with a tangle of windfall, through which is growing a thick, healthy growth of jack-pine. During the past few years fires have swept over large tracts of this section of the country, in some cases burning very thoroughly the timber on the lower slopes. This condition exists on the lower north slopes of Mount Sheringham and also on the lower benches of the hills in the vicinity of the Clisbako River. These

burnt-off areas could at present be easily cleared and with sufficient moisture would no doubt become quite productive, as a healthy growth of fireweed, yarrow, peavine, and a number of wild grasses was noticed in places where the decaying windfalls did not interfere with their growth.

The vegetation and soil is similar to that of the Clusko River Valley.

### UPPER BAEZAEKO.

On August 13th I commenced moving northerly to the main Baezaeko River, the trail built by Mr. McElhanney during the survey of the 124th meridian being used for this purpose. This trail, although well defined, is now filled in with windfalls and in places required much clearing.

Less than half a mile north of the river crossing a junction with a well-marked trail occurs. This trail is mostly used by Indians and trappers in their journeys up and down Baezaeko River.

About 5 miles westerly from the 124th meridian the valley of the Baezaeko widens out and a series of grassy flats interspersed with willows border the stream. These flats are in no case of more than a few acres in extent, being much cut up by the windings of the river, which is here of an average width of 60 links, flowing over a gravel-bed and easily fordable. The grass is plentiful and of a better quality than that usually termed swamp-grass; these conditions obtain until terminated by a canyon about 3 miles farther up-stream.

A good wild-hay meadow lies at the westerly end of the canyon, approximately 80 acres of which could be cut. This meadow has been staked more than once. Several old application posts were noticed.

The trail and stream diverge from this meadow, the former keeping a westerly direction and the stream-valley heading away south-westerly. The trail follows along stony jack-pine ridges, parts of which are covered with a thick young growth of this timber and a dense matting of windfalls, until at 2½ miles above the canyon it enters a large meadow of good swamp-grass, through which a small stream of excellent water flows.

A trapper's cabin and barn have been built here; though only a few years old, there were no signs of recent habitation. The trail from this point follows up the small stream for about a mile; then crosses and continues westerly until a large muskeg is reached, when it swings southerly and after about 4 miles over stony jack-pine country turns westerly round a steep hillside about 60 feet above Baezaeko River. I established a camp here. The triangulation station North Hill is close to this point, from which was obtained a good view and much data of the surrounding country. The trail was not explored beyond the immediate vicinity of this station.

### UPPER CHILCOTIN.

Three miles north of its junction with the Clusko the valley of the Chilcotin is narrow and continues so as one proceeds westerly until Lot 968 is reached. Here the valley widens out until a few miles farther the spacious, partly open meadow areas known to the settlers at Chezacut as the "Wheatlands" are reached. Some fencing has been done here, but outside this no other improvements have been made. The hay is cut by Indians, who also reap the yearly crop of a good wild-hay meadow of approximately 80 acres situated 3 miles to the north and slightly west of these holdings.

Continuing westerly, the valley narrows again, and this condition obtains until we emerge into the wide, semi-muskeg areas below and to the north-east of the Itcha Mountains. Much of this pasture is strewn with ice-worn boulders and is covered with clumps of low willow and a sparse growth of stunted jack-pine interspersed with open grassy areas. The grass in places is plentiful and of good quality, but cattle can only range here for a limited period during each year owing to the shortness of the season.

The valleys of the streams tributary to the Chilcotin are narrow, along the bottom lands of which are found patches of good meadow-grass. The timber is mostly jack-pine and poplar with clumps of willow and alder. Travel is not difficult through these valleys, the ground being for the most part singularly free from windfalls and heavy underbrush, while well-worn cattle and wild-animal trails are nearly always found and prove helpful.

### GENERAL.

The elevation renders the area covered by triangulation unsuitable for anything but cattle-raising. The acreage available for this purpose is not great and is almost entirely limited to the valleys mentioned.

Summer frosts are not frequent, but occur during the whole summer. The winters are long and cattle have to be fed for nearly four months. Much rain fell during our stay in the area and only a few hot days were experienced.

The stockmen have had a poor season. The price obtained for beef cattle continues low, and this is disheartening to the settlers engaged in this enterprise, some of whom are of the opinion that remedial legislation may be necessary to save this important industry to the Province if the present situation continues.

Redstone, which has a post-office and good general store, has a weekly mail service and is on the Williams Lake–Bella Coola telegraph-line. The mail comes but once a month to Chezacut. The post-office at present is located at C. Mulvahill's ranch. Williams Lake, on the Pacific Great Eastern Railway, is the nearest town, freight and mail for the Redstone and Chezacut areas being handled by motor-trucks from this centre.

### GAME.

Moose and deer were seen frequently during the season, the almost impassable condition of parts of the country between Chilcotin River and the 53rd parallel affording much protection to these animals. Grouse and water-fowl were not plentiful. A number of foxes are trapped yearly around the headwaters of the Baezaeko. A fine black specimen of this valuable animal was seen near the close of the season. Numerous signs of the activities of beaver were noticed in different parts of the area.

I have, etc.,
D. M. MACKAY, B.C.L.S.

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## TRIANGULATION SURVEY, RANGES 2, 3, AND 4, COAST DISTRICT.

BY JNO. DAVIDSON.

VANCOUVER, B.C., January 6th, 1925.

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

SIR,—This season's work in Ranges 2, 3, and 4, Coast District, consisted of several scattered surveys of land applied for by intending settlers, and a triangulation survey connecting existing systems made previously in Range 4 by F. C. Swannell, in Range 3 by W. C. Merston and R. P. Bishop, with the Chilko Lake triangulation made by R. P. Bishop in Range 2, Coast District. The party left Vancouver and travelled by the Pacific Great Eastern Railway to Williams Lake; from there by motor-truck to Chilanko Forks.

The storekeeper, R. W. Pyper, had applied for an area of land to include the buildings erected by him, and a survey of it was commenced the next day. On its completion, a new road, which had been cut out over the ridge separating Chilanko Valley from Punzi Creek Valley, was followed to the foot of Fire Mountain. This was climbed and a start made on the triangulation survey by erecting a new beacon over Mr. Merston's Fire Station.

From here we moved back to Chilanko Forks; then up the Tatla Lake Wagon-road to within 5 miles of Tatla Lake Post-office, where the road, which branches south, was followed to Tatlayoko Lake. This road is very rough and full of rocks and is never travelled for pleasure; but the Tatla Lake Road, while steep in places, is a good road throughout its length.

At the north end of Tatlayoko Lake I picked out one of the high peaks of the Niut Range as suitable for a station for extending to the south, as the main Niut Peak is unclimbable. A likely-looking draw on the north side was followed up to about 5,000 feet above the lake, where further progress was barred by high cliffs, and the descent made to camp after sixteen hours' hard climbing. A flat-bottomed boat was found on the lake and a day spent in patching it and recaulking the seams to make it fit for travel. In it we moved about 7 miles down the lake; then climbed up a draw on the south side of the peak to timber-line, where we camped at the foot of a canyon at the edge of the snow. From here we reached the top of the peak, erected a tall cairn, and returned to the head of the lake. On a second high peak of this range, Niut 2, a cairn was later erected for extending to the north and west. This was an easier climb, as it was found possible to cut out a trail to timber-line and take up pack-horses.

Between the Tatlayoko Road and Skinner's ranch a piece of land bordering on a small shallow lake was surveyed for an intending settler and Skinner's meadow picked out as a site for a base-line at the south end of the work.

Beacons were erected on the low mountains, Skinner, Splinter, Tatla Hill, and, later, on Little Meadow Mountain to permit of base-line expansion to the main triangles of the system.

From Tatla Hill a high ridge, which seemed well located for a very necessary station from which to expand to the south and east, was seen in the neighbourhood of Chilanko Forks. Accordingly the return trip was made to Chilanko Forks and a trail cut through the jack-pines some 7 miles to the foot of the ridge, which was found to terminate in a well-defined summit, from which, after clearing off the timber, a good view of the surrounding country in every direction was obtained. This station was named "Meridian," as it was believed to be very close to the 124th meridian.

On completing here we moved back to Tatla Lake and outfitted for the journey north to Mount Swannell, the farthest north station occupied. My aim was to pick out suitable peaks, erect the necessary cairns or beacons on the way up, and to read the angles on the way down.

The Anaham Lake Wagon-road was followed to Cariboo Flats, from where the first side-trip was made, over an old pack-horse trail, following up McClinchy Creek to the big bend; thence west to Charlotte (Kapan) Lake. From here a good view of the surrounding mountains was had, and I picked out a peak as being the most favourably situated for a station and named it "Kapan" after the Indian name for the lake.

As a very dense forest of jack-pine covered the country between the lake and the mountain, we cut a pack-trail to the foot and a foot-trail to the top of it. The last 2,000 feet of the ascent is over slide-rock, but the peak is higher than its neighbours, has an excellent summit, on which a good cairn was erected.

On the return trip a well-travelled Indian trail was followed to Towdestan, where the wagon had arrived in the meantime and where I hired an Indian to guide me over the muskeg lying between here and Lion Station of Mr. Merston's survey. This was reached after a tedious trip in bad weather through a wretched piece of muskeg and bush. A new cairn was erected on the summit, the old cairn tied on to, and all the angles, with the exception of Fire, read. This station was found to have been stripped by the wind-storms, and on the first opportunity I sent a man back to it to replace the cloth on the target.

From Lion we moved back to the wagon-road at Anaham Lake, where the wagon had arrived and was left, this being the end of the wagon-road. Here I hired extra pack-horses and proceeded to Capoose's.

Mr. Bishop had informed me of the need to reflag his Mount Barlow Station, so to have this done I sent on to Ulgatcho an assistant and an Indian who knew the country. They took no food with them, as the Indian advised that they would be able to purchase meals at Ulgatcho. On arriving there they were treated to a cup of tea and two soda-crackers. Early the next morning they were treated to another cup of tea, rode to the top of Mount Barlow, where they erected a new beacon, and then made the return trip to our camp at Capoose's, over 40 miles, to get something to eat.

During this time I moved with pack-horses up to Scot Station in the Ilgatchuz Mountains, where I was able to read the angles and see to Swannell Mountain.

On my return to Capoose's I investigated and reported on the surveys at Abuntlet Lake—Lots 254 and 356, Range 3, Coast District. From here I proceeded to Ulgatcho, where I hired as guide an Indian who had made the ascent of Mount Swannell from Euchu Lake the season before. F. C. Swannell had told me that he believed there was some sort of a trail on the south side of the mountain which would save several days' travelling around by the Tetachuck. Captain Harry, the headman of Ulgatcho, after being questioned, remembered a trap-trail which he described sufficiently accurately to enable us to pick it up. Leaving Ulgatcho with an assistant and the guide, we rode along the old Fort Fraser Trail to the east end of Entiako Lake, where after a thorough search we found the trap-trail described to us and followed it easterly up a narrow valley of burnt jack-pine, through which flows a small stream. This stream flows from a lake about 2 miles long and from 10 to 20 chains wide, which lies at the foot of Mount Swannell, travels for about 2 miles through a narrow V-shaped valley, then widens out into a lake half a mile long by 10 chains wide. After leaving this lake it drains a chain of swamp meadows and empties into the Entiako River.

From the head of the larger lake a trail was cut through the timber on the steep easterly slope of the mountain to timber-line, and we camped on the shore of a small lake in a pretty alpine meadow, some 600 feet below the summit. The stormy weather during which this trip had been made still continued, and after staying five days on the peak I returned to Ulgatcho without obtaining some of the angles I would have liked to get. The weather cleared sufficiently the day after reaching here to allow me to complete the readings from Barlow Station and the next day we moved to Capoose's.

Owing to the long spell of wet weather Dean River had risen several feet and could not be forded; so a raft was built to get the supplies across the river. While this was being done I investigated the base-line possibilities of a series of fine hay meadows along the east bank of the river, but could not make use of them as there were no suitable hills to expand to or from. The supplies were rafted and the horses swum across the river to the foot of a trap-trail, which was cut out, being choked with windfalls, and followed to timber-line on Tsitsutl, where we camped. Here again gales of wind and swirling snow-storms delayed the work and three ascents were made before completing.

While waiting for the clouds to lift one day I climbed down from the summit towards Anaham's Peak to investigate the feasibility of establishing a base-line on a long slope of drift material. This was found to be greatly broken up, although from the summit it had looked fairly uniform, and the two eminences which looked favourable for expansion were found to be too close together and not at all suitable. While climbing back to the top of Tsitsutl, along the toe of a big snow-bank, at an elevation of about 7,000 feet above sea-level, I found a stone-tipped arrow. Judging from its position when found, lying in a tiny trickle of water at the edge of the snow, I believe that it has lain buried in the snow for a very long period and only thawed out this summer. The shaft is of cedar in excellent preservation and the head is secured to it by a sinew lashing. Two sets of three quills were also attached to the shaft by sinew, but these were lost in descending to camp in the dark.

Anaham's Peak was called by the Indians "Beece," this being their name for the stone found there (obsidian), from which their arrow and spear heads were made. They have told me that a piece of this stone large enough to make one arrow-head was worth six beaver-skins in trade, and that many raids were made by men of other tribes to obtain a supply of this rock, and that frequent fights took place over its possession.

Anaham, after whom the peak is now called, was a very able chief and moved his tribe to the Chilcotin country, where he obtained for them a large fertile area now known as the Anaham Rancherie.

While on Tsitsutl we saw two young caribou which had been killed by Capoose's boys, and learned that one of the two herds of caribou remaining in the district lives on this range and that the other is somewhere up the Atnarko Valley.

On descending the mountain we had again to raft and swim Dean River, which was followed up-stream to Anaham Lake, to the comparative comfort of the wagon and cook-stove, which meant bread instead of bannock. From here we moved to Towdestan and with the pack-horses travelled to the foot of Kapan Mountain.

The first three ascents of this peak were made in fine weather, but a smoke haze made the outlines of the peaks only faintly visible. On the theory that the summits of the peaks would be visible above the haze before the sun raised it out of the valley, the fourth ascent was made by moonlight, and we arrived at the top a full hour before sunrise. When the sun did appear it lit up the clouds with a glorious burst of colours, which we would have enjoyed a great deal more had we not been so intensely cold. As the day dawned our peaks began to show up in the distance, slightly above the smoke haze, but before any of the cairns became visible clouds began to gather and we were driven down by a snow-storm. This settled the haze, and on the next ascent there was fair visibility and enough angles were read before another snow-storm came on. The next day we moved towards Towdestan in the first snow of the season to fall in the valleys. At Towdestan I met one of my assistants, whom I had sent to Lion Station to read on to Fire, which had been reflagged, and the whole party moved down to McClinchy's place, where, while waiting on the weather to clear, we made a survey of land applied for as a pre-emption. The last day of this survey was an ideal Indian summer day and seemed to promise the six weeks or two months of good weather which, all the older settlers had been telling me, invariably occurred at this season of the year.

With this good weather we moved to timber-line on Mount Perkins, which was tied to last year by Mr. Merston by traverse and triangulation from the surveys in the valley.

Cloudy weather and snow-storms again delayed the work, and three ascents were made during a week before any angles were read.

From Perkins we moved to Tatla Lake, where I divided my party, sending two men with horses to Fire and Meridian Stations, while I took the wagon and the remainder of the party down the Tatlayoko Road to near Quetsin Lake. There, while waiting for better weather, I commenced the survey of two areas applied for by intending settlers. After two fair days we moved up to timber-line on Niut 2 and camped there in a snow-storm, which lasted the next two days. On the next day a lull took place and we made the ascent as the clouds lifted off the summit, and were greatly cheered by seeing them rise first from one peak and then from another, just as required. The last peak showed up in time to read to it before the sun went down, and we descended to camp after dark. The weather now became more settled and I decided to complete the triangulation, and so moved to Skinner's meadow, a few miles south of Cochim Lake, where I layed out and measured a base-line 132 chains long.

The original station erected on Skinner Mountain was not visible from this base, so a new station was erected on the east side of the mountain and a traverse tie made to the old station. Another station was erected and occupied on Little Meadow Mountain to complete the expansion. Camp was moved to Lunch Lake, from where Splinter and Tatla Hill were climbed in very cold weather, when the first snow of the real winter came, about a month earlier than usual.

This completed the triangulation survey for the season, the party from Fire and Meridian Stations having rejoined me at Skinner's and it being too late to attempt the ascent of Mount Tatlow at Chilko Lake.

We now moved back to Quetsin Lake, where the surveys before mentioned were completed in zero weather. The thermometer registered 15° below on a few nights. From here we travelled by wagon to Chilanko Forks, completed a small survey there, and travelled by auto to Williams Lake in time to get the bi-weekly train to Vancouver.

## GENERAL REMARKS.

During the season over 1,200 miles were travelled in moving the main camp by wagon and pack-train. Well-balanced quadrilaterals were obtained with triangles having sides from 30 to 65 miles in length.

It was found that a well-built cairn 10 to 12 feet high made the best target. On all the peaks there was found an abundant supply of loose rock sufficient also for shelter-walls, which were sometimes needed to prevent the transit from being blown over by the gales.

Flags, even when made of stout duck, had a very short life; owing to the persistent gales they were effective only for about three weeks. Cheese-cloth, which is much the lightest material to pack as well as the cheapest, when stretched over a tripod, lasted in some cases all season, but usually had to be renewed more than once.

These targets on the lower hills were hard to pick up from the high peaks. On clear days there was always a sort of bluish haze in the distant valleys which prevented them from being readily visible, except when directly reflecting the sunlight. Cairns, on the other hand, being more sky-line, were readily picked up from any station.

Where cairns were built, satellite stations were used and marked by brass monuments set in cement in a hole drilled in the most solid rock available. Monuments, wherever possible, were set directly under the tripod targets.

The repetition method of observing angles was used, and all angles were read ten times with a 5-inch Berger transit graduated to 20 seconds. The horizon was closed and, if necessary, angles were reread to bring the closure error within the limit. Much more difficulty was experienced in this than in former years when triangulating on the Coast, although fewer angles were read from the stations. This difficulty in closing the horizon is attributed to the very much greater "shimmer" in the air, for here even on a cool day there was always a decided shimmering about midday.

On the high peaks, where extra warmth was needed to offset the cold winds, a "Bishop's" tommy cooker, made from a jam-tin filled with broken-up candles with a piece of gunny-sacking for a wick, was used to make tea from snow and proved very successful.

Following is a description of the country travelled:—

### Chilanko Forks.

At Chilanko Forks, where the season's work commenced, there is the farthest west general store on the route between Williams Lake and Bella Coola. It is a fur-trading post and a good outfitting-point. Adjoining the store is Knoll's ranch, running about 500 head of cattle.

Roads lead from here to Puntzi Lake and Palmer Creek, as well as the main road to Tatla Lake. Several sleigh-roads branch off these roads, leading to numerous natural meadows, where the Redstone Indians cut hay for winter use.

Both north and south of Chilanko Forks are low, broad, gravelly ridges, separating long narrow valleys, usually containing a series of meadows slightly alkaline in nature, which become hard and dry in midsummer. The meadows can in many instances be irrigated and turned into profitable hay land. The ridges are covered with thick belts of jack-pine, with fairly open grass land between, and afford fair grazing.

### Tatla Lake.

Tatla Lake is about 14 miles long and from half to three-quarters of a mile wide. At the east end it is surrounded by high banks, from which the land rises up in fairly steep slopes, covered with scrub jack-pine growing in a gravelly soil.

From Tagitolias Camp, which lies at the foot of a steep descent about half-way between Chilanko Forks and Tatla Lake Post-office, the valley gradually flattens out and increases in width, forming good range land, with many meadows, small lakes, and water-holes, amongst a fairly open growth of jack-pine, through which horses and cattle roam freely.

Bob Graham's ranch lies at the west end of the lake, where there are several excellent hay meadows and a good range country, supporting at present about 600 head of cattle.

A little over a mile from here is a new school and the Tatla Lake Post-office, where a mail is delivered once a month by auto-stage from Williams Lake. The next post-office between here and Bella Coola is at Atnarko, and there is no other school in the district.

### Tatlayoko Lake District.

The wagon-road to Tatlayoko Lake branches off the Tatla Lake Road through a large open meadow of good grass and travels over some rough stony jack-pine country between Tatla Hill and the west end of Eagle Lake. From here it goes to Whitesand Lake, or, as it used to be called, Whitewater Lake, and follows its west shore to the outlet, which empties into Lunch Lake. It crosses this outlet and immediately turns to the right, following the east shore of Lunch Lake for a short distance, while the old road goes straight on past the east side of Cochin Lake to Skinner's ranch, from where a good trail continues to Choelquoit Lake. After leaving Lunch Lake the road drops suddenly down into the valley just south of Quetsin Lake and follows this valley to Tatlayoko Lake, where it ends.

Between Eagle Lake and Whitesand Lake is the divide separating the watershed of the Fraser River from that of the Homathko; but so slight is the divide that one is apt to pass over the road without noticing that such an important change had taken place in the drainage of the country.

From Eagle Lake to the south are many small open meadows, and throughout the timber good fodder-grasses grow luxuriantly almost to the tops of the hills. Small areas of fir-trees standing well apart from each other are found growing down the valleys and on the hillsides up to an altitude of 4,500 feet above sea-level. These fir are of no great height, and although some attain a diameter of 4 feet, the great limbs, which branch out about 20 feet above the ground, prevent them being of much value for lumber.

The valley draining Lunch and Quetsin Lakes is quite narrow, becoming about half a mile in width 2 miles north of Quetsin Lake. From here on it is capable of being drained and converted into hay land. Land was surveyed here for two new settlers who have commenced clearing the low brush of the valley preparatory to ploughing.

Quetsin Lake has been lowered and reduced to about half of its area by a settler at the south end of it, and he is confident of reclaiming the remainder by further deepening the present ditch.

Below this lake the valley narrows slightly and the entry of several mountain torrents has deposited large beds of gravel over what otherwise would have been alluvial soil. Towards Tatlayoko Lake the valley increases to about a mile in width, is well drained, and has less timber, open side-hills with sunflowers and meadows of good grass becoming frequent. Many small streams are available to irrigate these meadows.

The elevation of Tatlayoko Lake is given as 2,717 feet above sea-level by the C.P.R. location survey of 1873–75, which survey follows along the east shore of the lake to the outlet; then down the Homathko, which flows out of the lake, to Bute Inlet.

The lake is about 15 miles long and 1 mile wide and lies between the eastern base of the Cascade Mountains and the high range, terminating on the north in Mount Tullin, which forms the west boundary of Chilko Lake. It is a most beautiful, clear, and deep sheet of water, with many small picturesque lagoons at the mouth of mountain torrents, where yellow beaches have been formed. The thickly wooded slopes of the west shore, rising very steeply to abrupt rock cliffs, deeply serrated and terminating at a height of between 8,000 and 10,000 feet in sharp peaks, contrasts with the less steep and more open terraced slopes of the east side. Here bunch-grass grows amongst the firs, which are now the predominant tree, until the south end of the lake is reached, when cedar and hemlock intermingle.

Neither in the lake nor in its feeding streams or lakes are fish other than suckers found, while in the adjoining watersheds the streams and lakes are rich in trout.

Around Cochin Lake and from there to Choelquoit Lake is a good range country, broken up by several hills and high ridges covered with jack-pine, throughout which there is a good growth of timber-grass and many small meadows. Here horses range all winter and some of the hay stacked in Skinner's yard must be five years old.

### SETTLEMENT.

At the south end of Quetsin Lake the settler who has partially drained the lake has now sufficient hay land to warrant a start in raising cattle. He has been instrumental in bringing in a family, who have erected a substantial six-roomed log house 2 miles lower down the valley, where they have done a large amount of fencing and have raised all the vegetables they require.

The two men for whom land was surveyed to the north of Quetsin Lake have spent over a year in this district before finally deciding where to locate. Two families who travelled from the United States by auto during the summer through several of the States and Provinces of Canada looking for cattle-range are wintering in this valley before definitely deciding on a location.

At Tatlayoko Lake, in spite of the limited local market, a family made a living in dairy-farming and with further settlement should do well. At the south end of the lake there is a small sawmill from which lumber can be purchased for building purposes. It was erected in connection with development-work being carried out on some mineral claims there.

The new settlers are attracted to this district by the good range lands and the mild winters, and figure on bringing under cultivation sufficient of the bottom land in the valley to raise hay for winter feed. The older cattlemen state that a ton of hay per head will bring the stock well through the winter, and that in many winters much less than this will do.

All vegetables, including potatoes and tomatoes, are grown in the valley, where summer frosts are rarely experienced. The snowfall is light, sometimes no more than 6 inches, and never lies long, being removed by Chinook winds.

### KLINAKLINI VALLEY.

The wagon-road leaves Tatla Lake and travels up and down over gravelly jack-pine ridges till it drops down at McClinchy's ranch into the Klinaklini Valley. Here there is a valley about 3 miles in length and half a mile in width, lying east from One Eye Lake. The greater part of this is a wild-hay meadow, where on the part of it irrigated about 200 tons of hay is cut. This place is leased to a family from the Prairies, and they are actively at work adding to the ditches to bring more land under water and at the same time run several hundred head of stock.

More jack-pine ridges, with an occasional meadow with fair grazing, intervene between here and Frontier Ranch. Here again a great deal of labour has been expended in improving a large natural-hay meadow where this year over 100 tons of hay were put up. Some jack-pine land has been cleared and several tons of potatoes were harvested both this year and last year. The owners have now a sufficient area of good hay land to commence raising stock.

From here to Towdestan, the next ranch on the road, is about 25 miles of uninteresting country from an agricultural view-point, but the road crosses the divide separating the Klinaklini Valley from the headwaters of the Dean River.

At Towdestan about 200 tons of hay are put up and stock from farther north is wintered.

### Charlotte Lake to Kapan Mountain.

The country between Charlotte Lake and Towdestan has been surveyed and reported on by T. H. Taylor in the 1921 report of the Minister of Lands.

On the north side of Charlotte (Kapan) Lake the land rises up with an easy slope to a fairly flat plateau and is covered with a thick growth of jack-pine, broken up here and there with swamp meadows and many small ponds and lakes, some of which have no outlet. The plateau extends to the foot of a group of three mountains, of which Kapan is the highest and the farthest north. From its summit a good view is obtained of the canyon through which the East Fork of the Atnarko River flows from Charlotte Lake. From the south side of Kapan Mountain a series of small lakes drain through swamp meadows round the east side of the mountain to the Hotnarko River, which it joins at the crossing of the old Lunos Trail, used between Towdestan and Bella Coola. In the woods there was little timber-grass, but to the delight of the horses there was a plentiful supply of wild bean.

Between the north end of Charlotte Lake to Towdestan are several large swamp-hay meadows. Some are smooth and can be cut with a mower, but others require a great deal of work in draining and levelling off the nigger-heads before they can be used to advantage. About 6 miles of wagon-road has been built from Towdestan to the larger of these meadows.

### Dean River Valley.

About 3 miles north of Towdestan a trail branches off the main road in a north-easterly direction over some open jack-pine and poplar country to Lily Lake and Morrison's Meadows, which description covers a large area of more or less swampy wild-hay meadows, where at present an Indian called Zulin cuts some hay.

Lying to the east from here is an extensive muskeg country carrying belts of scrub spruce and extending to the base of a range of high hills known, from the appearance of several of the peaks, as the Sugar Loaf Range. Practically all of the western slopes of this range are covered with scrub jack-pine, which extend over the summits of the lower peaks (the higher peaks are bare), well down the eastern slopes, where the country begins to be more open, until large meadows, some of them alkaline, are only separated from each other by belts of timber.

This range terminates in the north in Lion and Itinilat Mountains, on whose western slopes is a fairly open grazing country, with a few good meadows, which are separated by the same muskeg and a dense wood of young jack-pine from Schilling's ranch.

Between Towdestan and Abunlet Lake, a distance of 30 miles by wagon-road and trail, the Dean River Valley reaches its greatest width and over 50,000 acres of land have been surveyed. The country is rolling, jack-pine and poplar covered, with fair-sized wet hay meadows scattered throughout, and is suitable for stock-raising.

Anaham Lake is the present end of the wagon-road, and the main trail leaves the Dean River to follow the telegraph-line to Bella Coola, while the Ulgatcho Trail keeps along the east bank of the Dean River past Abuntlet Lake, where a well-used trail branches off to the east and follows through several large swamp-hay meadows till it climbs up over a shoulder of the Ilgatchuz Mountains and crosses over to Kluskus Lake and on down the Blackwater to Quesnel.

On the Ilgatchuz Mountains up to and above timber-line there is good summer grazing, although on the south-west slopes there are areas of dense jack-pine woods and windfall. Between this group and the Itcha Mountains the land lies high, but as seen from the summit seemed to be fairly open and to have good possibilities for summer range.

### Abunlet Lake to Capoose's.

On the west side of Dean River Anaham's Peak rises abruptly out of the floor of the valley and forms a landmark that can be seen from as far off as the Niut Range. From its base rough densely timbered slopes full of windfalls rise steeply up to the Rainbow Mountains, of which Tsitsutl is the highest peak.

On the east side of the river fairly flat slopes covered with jack-pine, but having several large swamp-hay meadows, reach to the base of the Ilgatchuz mountains.

At Capoose's place are some splendid wild-hay meadows along the east bank of the Dean River, and these, with the fertile flats adjoining, can be made into a good stock-ranch.

### CAPOOSE'S TO ULGATCHO.

The trail leaves the Dean River at Capoose's place and climbs up over high gravelly ridges covered with jack-pine, crosses several small streams bordered with spruce and willow-brush, cuts through an odd small swamp, and finally reaches Ulgatcho without having touched on any land of any agricultural value.

### ULGATCHO VILLAGE.

Ulgatcho Indian village is situated on a slope at the north-east corner of Ulgatcho Lake and is a small untidy village. There is a church where the priest holds service once a year, and there are some twenty-odd houses, in three of which are small trading-stores, where the more astute Indians trade off cheap dry-goods and groceries for the fur-catch of their more improvident brethren.

Up till now all their supplies have been brought in by pack-horse from Bella Coola during the summer; the more wealthy Indians going to Vancouver to purchase their stock. When this trail was closed those who ran short of supplies were at the mercy of the storekeeper. This summer, after a big "wawa," they went to work and slashed a track through the woods to Ootsa Lake, which will be a good winter sleigh-road, over which they can haul their supplies more cheaply than from Bella Coola and at the same time trade to better advantage.

In the summer the Indians camp out on various small wild-hay meadows, which they cut with mowers brought in from Bella Coola in pieces on horseback. As the surrounding country, with the exception of these meadows, is a mass of jack-pines, windfalls, and rock, they keep no cattle and only sufficient horses for their needs. If it was not for the exceptionally good trapping, which they jealously preserve for themselves, they would have to leave the country; but as it is they make a very good livelihood with little work.

Each Indian has a trapping district allotted to him by the chief and maintains a trap-trail through the woods, which affords excellent shelter and food for the marten, fisher, fox, and linx. Along the Dean River and in the numerous small lakes are many beaver, and each Indian knows just about what his harvest of beaver and muskrats will be in the lakes. Many fur-buyers come to Ulgatcho as the catch is very valuable.

### ULGATCHO TO MOUNT SWANNELL.

For the first 8 or 10 miles there is nothing to see, except rocky and gravelly ridges with a scanty growth of scrub jack-pine, occasional pot-holes of muskeg, and odd belts of spruce. Then a series of light sandy jack-pine ridges are crossed until the Entiako River is reached. Here the first land of any agricultural value was seen. Fairly open poplar meadows, with easily cleared clumps of willow, growing on a black loam were crossed, but their extent could not be judged. Mr. Merston in his report of 1912 (Minister of Lands' Report) estimates about 1,000 acres below the junction of the Alcatcho with the Entiako River, and a further 600 acres where the Entiako empties into the lake of that name. At the outlet of Entiako Lake there is about another 600 acres of this meadow land, but on the route from here to Mount Swannell there is no land of agricultural value.

### SUMMARY.

The area covered in this season's work is roughly 120 miles north and south by 75 east and west. Practically all of the land in this area is above the 3,000-foot contour, at which elevation it is admitted that the limit of profitable mixed farming has been reached.

The settler in this district must then engage in stock-raising or in dairy-farming.

At the present time transportation is limited to rough roads which do not permit of cheap or rapid transport, and the local market is very restricted, so that dairy-farming cannot now be made profitable. Should the mining industry become established here, and there is no doubt but that with the development of better transportation facilities mines will be developed, then dairy-farming wlil be a profitable occupation.

### Stock-raising.

Cattle are raised profitably at Chilanko Forks, Tatla Lake, and at McClinchy's ranch. These are at present driven to Williams Lake for shipment. When the wagon-road is constructed all the way to Bella Coola, all cattle raised as far east as Tatla Lake could be shipped more profitably from that port.

In a few years' time several more ranchers will have sufficient hay land under cultivation to stock with cattle, and ultimately the whole valley of the Dean River will be an important stock country as far north as Capoose's place.

The hay land from Tatlayoko Lake to Frontier Ranch requires to be irrigated, but there is a plentiful supply of water immediately available, requiring only the construction of ditches to distribute it to the greatest advantage.

Many of the shallow lakes seen can be drained and their beds made into tame-hay meadows. Both timothy-hay and clover can be grown and oats were seen ripe and stooked at Frontier Ranch.

From here north the hay lands require to be drained; the rainfall appears to be more plentiful and sufficient for good hay without irrigating.

The low range land is limited in extent here by dense woods of jack-pine of no economic value. This worthless timber when burnt off is usually replaced by a growth of wild grasses amongst clumps of poplar, and at the same time the swamp meadows become drier, forming good range land.

Above the timber (between 5,000 and 6,000 feet above sea-level) lies much park-like country, where during the summer months excellent pasturage could be obtained. Here there is usually a good breeze sufficient to keep the mosquitoes, black-flies, etc., from worrying the stock too much. On all of the mountains climbed the horses found good feed above timber-line and stayed there willingly till required.

### Sheep.

A small number of sheep were seen at Capoose's (Abuntlet Lake) and at Graham's (Tatla Lake), where they are kept for family needs. While no attempt has been made on a large scale, the country seems to be well adapted for sheep-raising.

### Vegetables.

From Tatlayoko Lake to Klinaklini Valley vegetables grow readily. Beyond there no attempt has been made to cultivate them, as the few families of Indians living in the Dean River Valley usually leave in the early summer and go down towards Bella Coola, where at various places along the river they catch and smoke salmon for winter use; then return to their homes for the haying season.

On account of the frequent summer frosts experienced here it is doubtful if potatoes can be grown, but turnips and carrots have matured at Towdestan without cultivation.

### Climate.

As a rule, summers are warm and fairly dry, with local thunder-storms of short duration. From one month to six weeks of fine days and frosty nights is usually had in the fall. The winters are mild and last about four months. The first snow comes between the end of November and the middle of December, and the usual fall is under 1 foot. Chinook winds remove the snow from time to time.

### Transportation.

Under the heading "The North-west Colonization Survey," published in the 1895 report of the Chief Commissioner of Lands and Works of the Province of British Columbia, a very interesting account is given of the reconnaissance surveys up the valleys of the Homathko and Klinaklini Rivers to locate a short wagon-road to the Coast, and the Klinaklini route was most favourably viewed.

At the present time the best route into the district is by wagon-road from Williams Lake. From Bella Coola a good wagon-road runs up the valley for about 40 miles, and there is every likelihood of this being extended to Anaham Lake to make a continuous route to the Cariboo Road.

Along this route the Dominion Government maintains a telegraph and telephone line and all settlers near have the use of the line for a nominal fee.

GAME.

Practically all the settlers trap in the winter months, as fur-bearing animals are plentiful among the mountains. Marten, fisher, fox, linx, weasel, skunk, coyote, wolf, bear, both black and grizzly, otter, muskrat, and beaver are trapped throughout the district. Deer and moose are fairly plentiful, but soon, unless the caribou are protected from the Indians, they will be but a memory. Mountain-goats are reported to be numerous in some localities and mountain-sheep are occasionally seen.

MINING.

Prospectors have visited the district at various times, but only, so far as I could learn, small areas have been prospected. The "Contact" traverses the country from about Skinner's Mountain to south of Charlotte Lake. Some 20 miles north of this lake lie the volcanic groups of Tsitsutl and Ilgatchuz. During the summer Tatlayoko Lake District was examined by Dr. Dolmage, of the Geological Survey of Canada, and his report is sufficiently favourable to warrant further prospecting here.

I have, etc.,
JOHN DAVIDSON, B.C.L.S.

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## TOPOGRAPHICAL RECONNAISSANCE, LILLOOET DISTRICT.

BY G. M. DOWNTON.

LILLOOET, B.C., January 10th, 1925.

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

SIR,—I carried out during the past season a topographical survey of a certain area in the Lillooet District, together with a number of miscellaneous scattered surveys outside the area topographically mapped.

These miscellaneous surveys have been reported on in detail and do not come within the scope of this report, which deals exclusively with the area over which the above topographical survey has been made.

This area is situated in the south-eastern part of the Lillooet District and is bounded on the south by the Dominion Railway Belt, on the north by latitude 51° 30′, on the east by longitude 121°, and on the west by longitude 121° 30′. It is therefore about 30 miles long and 20 miles wide and contains an approximate area of 600 square miles.

This area was covered in a period of three months, the object of the survey being to gather rapidly as much information as possible with regard to the country, especially as to areas suitable for tilling, areas valuable from a timber standpoint, and areas suitable for grazing. In addition to the above, full information was obtained with regard to all roads and trails throughout the area and sufficient information as to the surface was obtained to produce a map on a scale of half a mile to an inch, showing contours at vertical intervals of 100 feet and the general drainage and appearance of the country.

It should, however, be clearly stated that, owing to the limited time at my disposal, certain portions of the area were not covered in detail, and where this is the case the contour-lines have been shown as form-lines dotted, and information with regard to the position of such form-lines has been obtained partly from photographs and partly from a series of observation stations on prominent known points, from which numerous sketches were made and bearings taken.

To many of these points I took with me settlers well acquainted with the locality and I received much valuable information on the spot by this means.

Up to the present the sole industry in this area has been stock-raising. It is very sparsely populated and will never support a large population, nor will it settle up quickly while more favourable areas close alongside it remain open for settlement.

A large stretch of country eminently suited to dairying lies to the north-east of the area, towards Roe Lake and Bridge Lake, and as this part develops opportunities will doubtless

present themselves for a development of the same industry in the area under discussion, and experiments will be made which may demonstrate the possibilities of a much more intensive development than at present seems possible.

Before going into detail with regard to the resources and possibilities of the country, its general aspect, geological formation, and climate will be briefly described.

### General Aspect.

The whole area is drained by the Bonaparte River, and is, generally speaking, an elevated plateau of a very general elevation of about 3,500 feet above sea-level, except where the Bonaparte River and its tributaries, Loon Creek and the North Fork of the Bonaparte River, have cut deep gorges through the plateau to their present levels.

It is part of the great plateau of the Central Interior and is perhaps one of the flattest parts of British Columbia, and when viewed from the summits of the Marble Mountains, a few miles to the west, presents a sea-like appearance, as the deep ravines of the main drainage system are hidden from view and only the general level of the plateau is visible. It is, in addition, so uniformly covered with timber as to present from the same view-point an unbroken stretch of forest, and probably for this reason the northern part of it has been termed the Green Timber Plateau.

### Geological Formation.

The southern part of the area has been examined geologically by Dr. G. M. Dawson, and his report is contained in Vol. VII. of the Annual Report of the Geological Survey of Canada. This is illustrated by the Kamloops Map-sheet accompanying the report.

This map shows the whole southern part covered with rocks of the Upper Volcanic group of the Tertiary era, chiefly basalts and basalt breccias several hundred feet thick, and this formation is exposed in a gorge near the 59-Mile House on the Cariboo Road known as the Chasm, where the vertical cliffs of basalt present a most striking and picturesque appearance, and it is presumed that the topography of the plateau in general is due to such basalt-beds.

These rocks are again covered by boulder-clay and glacial silts which attain considerable thickness on the plateau, but which thin out at the edge of the plateau along the Bonaparte River.

Possibly, also, the whole of the ravine of the Bonaparte River was filled with boulder-clay and glacial drift during the later period of glaciation and again excavated to its original depth by the cutting action of the river, leaving level benches or terraces at varying heights along the sides of the valley.

On the Green Timber Plateau this boulder-clay can be examined in gravel-pits along the Cariboo Road and in the railway-cut along the Pacific Great Eastern Railway, which crosses the north-western part of the area.

The above formations occur all over the area except in the extreme south-west, where rocks of the Lower Cache Creek series outcrop on the slopes of Hart Ridge, and along the valley of the Bonaparte River in this vicinity, and some extensive clay-banks are visible on the west side of the valley here, also plutonic rocks, chiefly granitic, outcrop near the valley-bottom at the forks of the Bonaparte River in the extreme east of the area.

### Climatic Conditions.

The area above mentioned lies in the Dry Belt of British Columbia and is cut off from the moisture-laden west winds by the lofty summits of the Coast and Cascade Ranges, which intervene between this part of the Province and the Coast. The annual rainfall seldom exceeds 15 inches, rendering irrigation necessary on the agricultural lands in the valley-bottoms, and large areas on the plateau are in a semi-arid condition suitable only for pasture, except along natural drainage depressions where relatively small areas can be flooded by damming streamlets and devoted to raising crops of wild hay. Some experiments have been made in dry-farming on the upland areas and these will be touched on later in the report. Records of temperature are scarce, but the annual average of the area is about 40°, with a winter mean of 20° and a summer mean of 60°. The lowest recorded temperature is about —50° and the highest about 102°. The diurnal range is very great in summer, but the plateau lands are more free from summer frost than the valley lands, and these only occur in calm periods.

### SOIL.

The soil generally over the whole area is light in texture, mostly sandy clay loams, except in many low-lying depressions mentioned later on, where decaying vegetation has mingled with other sediments to form rich black muck soils, but these areas are so scattered as to form but a small percentage of the total.

### MAIN FEATURES.

The country under discussion, though described as a plateau, falls naturally into four distinct plateau areas, divided from each other by the main drainage-valleys.

The largest of these lies north-west of the valley of the main Bonaparte River and the North Fork and is known as the Green Timber Plateau. Another small plateau area lies south-east of the North Fork and is bounded on the south by Young Lake and the Main Bonaparte Valley above the Forks. A third plateau area, known as the Bonaparte Plateau, lies south of the main Bonaparte Valley and is bounded on the south by Loon Lake and Creek; and the fourth area in the extreme south is formed by the northern slopes of the Arrowstone Hills and only in the eastern part presents the typical plateau-like appearance.

The main drainage-valleys consist of that of the main Bonaparte River; that of the North Fork, which enters the main river near the eastern limit of the area; that of Loon Lake Creek, which enters the main river in the south-western part, and the three smaller valleys of Clinton Creek, 57-Mile Creek, and Chasm Creek, all of which join the main river within a distance of 3 miles of one another near the point in the western part of the area where the main valley takes a sharp turn to the south in its course to the Thompson River.

### TIMBER.

As mentioned above, the country is thickly wooded with the exception of comparatively small areas on the plateaus occupied by shallow lakes, dry grassy glades, and wild-hay meadows, and some areas in the valley-bottoms either covered with low willow-growth or under cultivation.

Two types of timber, Douglas fir (*Pseudotsuga taxifolia*) and jack-pine (*Pinus contorta*), together form probably 95 per cent. of the forest-growth and it is difficult to say which of the two types predominate.

Generally speaking, the fir is confined to the higher rocky ridges and the southern shady sides of the lower valleys, while the jack-pine occupies the depressions on the plateau lands above 3,300 feet, and although the above conditions of distribution hold at the present time, it appears beyond question that the whole of the area was formerly covered by the Douglas-fir type of forest, and this has been completely destroyed by fire over large areas and replaced by jack-pine, and although the country is thickly wooded throughout there is very little merchantable timber, and this is so scattered and comparatively inaccessible as to make it doubtful if it can ever be utilized.

The Douglas fir in the Interior differs considerably from that on the Coast; its growth is infinitely slower and the trees generally are so scattered as to allow of a full development of limbs from near the ground, and it is rare to find a tree from which can be cut sawlogs of good sound timber.

The jack-pine growth is very variable, and over large areas where the soil is poor and rocky it is short and scrubby and practically worthless; in other places the trees have attained a mature growth and thick stands occur. In these stands the trunks average 8 to 10 inches in diameter and rise to a height of 30 or 40 feet clear of limbs, and are valuable for tie-timber and make good logs for building and fencing. The type in this condition is sometimes known as lodgepole pine. I have been informed on good authority that experiments have shown that a very good grade of newsprint paper can be made from 100 per cent. jack-pine pulp, and this fact alone gives the jack-pine stands of this Interior Plateau an appreciable prospective commercial value, dependent on their proximity to convenient transportation.

Considerable areas of jack-pine, notably along the Cariboo Road north of the 70-Mile House, have been so badly ravaged by fire as to have left nothing standing except a few charred trunks, and in some spots the windfalls are so thick as to render the country impenetrable. The type has a wonderful reproductive ability owing to the fact that the cones can stand a severe fire without injuring the seed. The heat causes the cones to open and shed the seed over the newly burned ground, and burned-over areas become quickly covered with young seedling trees.

In addition to the two types above mentioned, there is, especially in the more northerly part of the area, a considerable quantity of aspen-poplar (*Populus tremuloides*), and along the north shore of Green Lake this is, in some places, the only forest-growth, but it is scattered generally over the whole area and is especially noticeable growing up in open patches where recent fires have destroyed the jack-pine. It seldom attains any size and generally succumbs to fungus attacks when quite small.

The only other forest type in noticeable amount is the western yellow pine (*Pinus ponderosa*), which is confined to the valley of the Bonaparte River, Loon Lake Creek, and the valleys of Clinton Creek, 57-Mile Creek, and Chasm Creek. This type occurs here in clear stands between the elevations of 2,000 and 2,700 feet above sea-level, and only in sunny locations. At higher altitudes than this it becomes mixed with Douglas fir and finally ceases altogether at about 3,400 feet. With the exception of one point on the North Thompson River, the few scattered trees on the southern edge of the Green Timber Plateau in the vicinity of Fly Creek represent the most northerly limit of this type in British Columbia. It is of insufficient amount and too inaccessible to be of much value commercially and is now being attacked by the western white-pine beetle (*Dendroctonus monticolæ*).

Other species which occur in small amounts are the Rocky Mountain juniper (*Juniperus scopulorum*), which is found on the east side of the Bonaparte River 4 miles south of the Mound Ranch; mountain-alder (*Alnus tenuifolia*), which is found in the river-bottom in the same locality; western birch (*Betula occidentalis*), on the south side of the Bonaparte River Valley above the old Jameson Ranch (Lot 786); and Englemann spruce (*Picea Englemanni*), which occurs along some of the drainage hollows on the plateau, also along 83-Mile Creek and Stony Creek.

## Green Timber Plateau.

Over a large portion of the Green Timber Plateau, embraced within the limits of the area surveyed this year, the surface is level or undulating and the development of the drainage poor and in some places non-existent. The practical result has been the formation of numerous shallow lakes in the lower-lying depressions, the area of which has been increased by beaver-dams.

Depending upon the amount of precipitation and general climatic conditions, these lake areas increase and decrease periodically, at times covering large areas and at others, such as the present, drying up and allowing the grasses to creep gradually out over the once inundated ground.

If kept dry for a long enough period these areas would probably gradually become covered with forest-growth, for in some places the stumps of trees may be found in these open spots, indicating a much drier condition at some former period; but at present these open lake areas penetrate the timber in all directions and their limits are sharply defined by the thick timber-growth, which ceases abruptly at the point where the water normally reaches.

The whole area has very recently been subjected to a period of drought, commencing about 1919 and continuing practically up to 1923, but the very marked increase in the rainfall during the past season may indicate a change in conditions. Under this condition of drought these lake areas have contracted and grasses are rapidly encroaching on the dried lake-beds, and in many places long, narrow grassy glades, with occasional depressions filled with stagnant water, mark areas not long ago covered with water, and forming a continuous narrow lake, or a series of narrow lakes, only connected in the spring when the snow is melting and draining from the higher ground.

These glades or runways abound all over the north-western part of the area and can be traced in some cases for miles, and along them in the area between the timber and the water's edge or edge of drying mud marking the present limit of vegetation are various grasses, each species occupying a definite position with relation to each other, depending on the amount of moisture each species requires for its habitat.

These varying species-bands are very noticeable and their varying palatability for fodder can be discerned by the close cropping of one species and apparent neglect of the other by cattle which wander up and down these runways.

These runways form the chief feeding-grounds for cattle during the whole year, except when the drift into the jack-pine in the fall in search of the milk-vetch which grows everywhere in the timber above an altitude of about 3,400 feet above sea-level.

Outside the runways the timber is thick and continuous, especially in the jack-pine stands, but in the stands of Douglas fir the country is more open and park-like, and although of a general level is locally very undulating and broken.

The drainage being poor and the lakes stagnant, the waters of many of these become more and more highly impregnated with the various salts in solution in the surface waters draining into them, and as the process of evaporation continues the excess salts are deposited in white encrustations round the edges of the lakes, which in some cases contain so highly concentrated a solution of salts as to be poisonous.

Such, briefly, are the runways which are so conspicuous a feature of this area and which are supplied with water only from surface drainage.

Rather different to these are the wild-hay meadows which exist in similar depressions, but are formed along the route of definite permanent streams, however small, originating in springs.

These streams, slowly seeping down along similar depressions, have been checked by beaver-dams, and being checked have spread laterally and formed in many cases wide areas which have become filled with sediment and decaying vegetation, forming a good bed for future cultivation. By cutting through these dams and draining the meadows and again placing movable dams in the cut to hold the spring run-off and flooding the meadows, large crops of wild hay have been cut by settlers, and perhaps the best instance of this may be seen along the course of 83-Mile Creek, which rises at the extreme north-west of the area under consideration and eventually empties into Green Lake.

This creek has so slight a fall along most of its upper part that the flow at normal times is almost imperceptible, and this, coupled with the fact that wide areas along its course are only very slightly above the level of the creek, has afforded a good opportunity for the beavers, and they have been very gradually the means of creating hundreds of acres of wild-hay meadows. These have been drained and cut for many years, but it is only within the last year or two that a step has been taken which may have an important bearing on the winter-food problem for cattle. J. F. DuBois has recently drained an area here and, having disked it, has sown timothy and raised crops averaging 2½ tons to the acre. His example is now being followed by others.

The above conditions of drainage and surface conditions generally hold over the whole north-western part of the area and continue south-eastward to within a short distance of the huge ravine formed by the main Bonaparte River, but as this ravine is approached the slope of the plateau becomes more pronounced and the drainage is better developed, with a result that there are fewer meadows and runways.

Large areas in this part of the Green Timber Plateau are so thickly strewn with volcanic boulders as to be impenetrable on horseback or to cattle, and this condition is aggravated by the windfalls caused by fires amongst the jack-pine. Such areas must be regarded as valueless from every point of view. Other areas of considerable magnitude, though free from rocks, are so full of windfalls as to render them useless from a grazing standpoint, at least until such a time as another fire sweeps through, and if this occurs among areas of windfall the frequent result is such a complete burning-off of the humus as to render the soil unfit to support plant-life for a considerable time, but where this does not occur grasses cover the area quickly and provide good pasture.

### GREEN LAKE.

Proceeding eastward from the Cariboo Road in the more northerly part of the area, Green Lake is approached, and this forms the drainage-basin of the whole northern part of the Green Timber Plateau south of the northern limit of this year's operations. This lake itself in normal times drains into the North Fork of the Bonaparte River. It is 10 miles long, with an extreme width of 1¼ miles. The water has a greenish tint and is slightly alkaline, a condition which is likely to become more pronounced owing to the fact that the water is below the level of the outlet and evaporation alone in the last few years has accounted each year for a larger amount of water than drains into it, with a consequence that the water-level is steadily lowering and this season stands about 12 feet below high-water mark.

I am informed that in the year 1897 the water of Green Lake was above normal high-water mark and that the numerous runways which converge to Green Lake at the west end were so full of water that it was possible to go from the 70-Mile House on the Cariboo Road in a boat without portaging at any point. This argues a considerable difference in the amount of precipitation in certain periods, but a combination of circumstances favouring the run-off may have

a marked effect in the amount of water in the lakes even in the course of two or three seasons, for, given an unusually wet summer so that the ground is soaked, or a spell of wet weather in the late fall followed by a period of intense cold, the ground will freeze to a considerable depth quite quickly. If this is followed by a heavy snowfall it seems reasonable to suppose that the bulk of the snow will run off quickly in the spring without soaking into the ground. On the other hand, with a mild winter followed by a late cold spring, the snow will gradually melt and soak into the ground with little or no run-off. Such conditions are liable to occur at any time, and it is evident that dry spells and wet spells alternate fairly regularly.

On both the north and south sides of Green Lake the country is more hilly and the drainage well developed.

The country for about 4 miles along the north shore and stretching back for some distance from it beyond the railway is very rocky and mostly covered with a dense growth of small jack-pine and few meadows exist, but the remaining 6 miles of country along the north shore of the lake rises gently from the water, with groves of poplar and jack-pine and many open grassy glades, and along the lake at least appears to be tillable. This class of land stretches back some 3 miles from the lake-shore and contains some good meadows.

I was unfortunate in not having an opportunity to visit J. E. Firrell's ranch near Watch Lake, but he appears to have had considerable success in dry-farming methods, and year after year, in spite of drought, has raised good crops of rye and oats.

One mile east of Green Lake and about 5 feet lower in elevation lies Little Green Lake, and at the south-west end of this are a series of swampy hay meadows. North of this lake is an area of open grassy land some of which is tillable and under certain conditions might be dry-farmed, but the rocks in part of this are so near the surface as to render this impossible. East of Little Green Lake and north of Lake of the Woods is a similar open area, but here again rocks are too close to the surface. Both of these areas make good spring range, as they have a southerly aspect and are clear of snow probably earlier in the year than any other land in this neighbourhood.

An area half-way along the south side of Green Lake should be investigated, and I regret that I was unable to visit this. Surveys were made here in 1917, and the surveyor who made these surveys reports as follows: "This area presents dairying and grazing possibilities, having ample summer feed, good water, and shelter. Soil is black loam 3 to 18 inches deep, with clay subsoil generally free from stones. . . . Numerous springs of good water exist. Nolan Lake has wholesome water. Timber is mostly poplar mixed with some pine, the latter predominating on the slopes back from the lake."

South of the east end of Little Green Lake the country rises in a succession of terraces and these are evidently of basaltic formation. They culminate, farther west, in a low range of hills, the most conspicuous of which is locally known as Jim's Mountain and is the highest elevation on the Green Timber Plateau. East of this mountain lies an area which should be examined carefully. It is hardly known except by hunters and trappers, but there appears to be a considerable area which might lend itself to agricultural development. All this land was once covered with either fir or jack-pine, but recently a succession of fires have swept through it and opened up an area which can be easily cleared. It was described to me by A. J. Whitley, of the North Fork of the Bonaparte River, as a tract of land which had been so thoroughly cleared by fire that two men working together could probably clear up an acre a day. At present a strong growth of wild grasses is growing on this area, and from experiments he has made on other land near his ranch, land from which, in fact, he has recently removed a dense growth of jack-pine, he states that he is convinced that large crops of fall rye can be raised on it. It is not rocky and the soil appears to be deep.

One such area lies south of the east end of Deep Lake and another from the east end of this lake north-eastward towards Little Green Lake. Deep Lake, hitherto not marked on any existing map, is about 2 miles long and has an average width of between a quarter and a half a mile. It thus covers an area of about 500 acres and seems to be fed by springs, evidence of which may be seen during winter at the east end, where the ice is prevented from forming thickly by the comparatively warm spring weather. The west end has been dammed by beavers and the water was up to the top of the beaver-dam at the end of last September and was trickling out.

The formation of the ground at the west end of the lake lends itself to the construction of a small dam, and the water thus held might be utilized to bring an area to the north of the

west end of the lake under cultivation, or carried down towards Nolan Lake, if there happened to be an area in this vicinity which could be profitably brought under cultivation.

Possibilities for storage of water on a small scale exist at the west end of Jim's Mountain, where there are two small lakes, one of which is situated in the north-east part of Lot 1612 and the other about half a mile farther east. Both of these lakes are on the same watershed and both have been dammed by beavers. The eastern lake has a slightly greater elevation than the western one and the latter discharges by a small creek which flows down towards Tin Cup Lake through Lot 1612. This creek does not reach Tin Cup Lake above ground, but sinks into the ground about half a mile west of the westernmost lake. If both these lakes were developed for water-storage a considerable area on Lot 1611 might be brought under cultivation.

The country lying on the Green Timber Plateau immediately west of the canyon on the lower part of the North Fork of the Bonaparte River is densely wooded and very rough and contains no land suitable for settlement, with one exception, this being Lot 3853, situated 2 miles north-west of the forks of the Bonaparte River. This should be carefully examined by any settler who visits this locality, as it contains land on it which might form the nucleus of a small dairy-farm. There is a fine spring in the western part and a wild-hay meadow containing about 30 acres lies about 1 mile due west of it on unsurveyed Crown land which might be utilized in connection with this lot.

On the east side of the canyon of the North Fork the plateau continues to the east, and this is bounded on the south by the South Fork of the Bonaparte River and on the north by the North Fork.

This plateau must be considered as a continuation of the Green Timber Plateau and stretches on to the east far beyond the eastern limit of this year's operations.

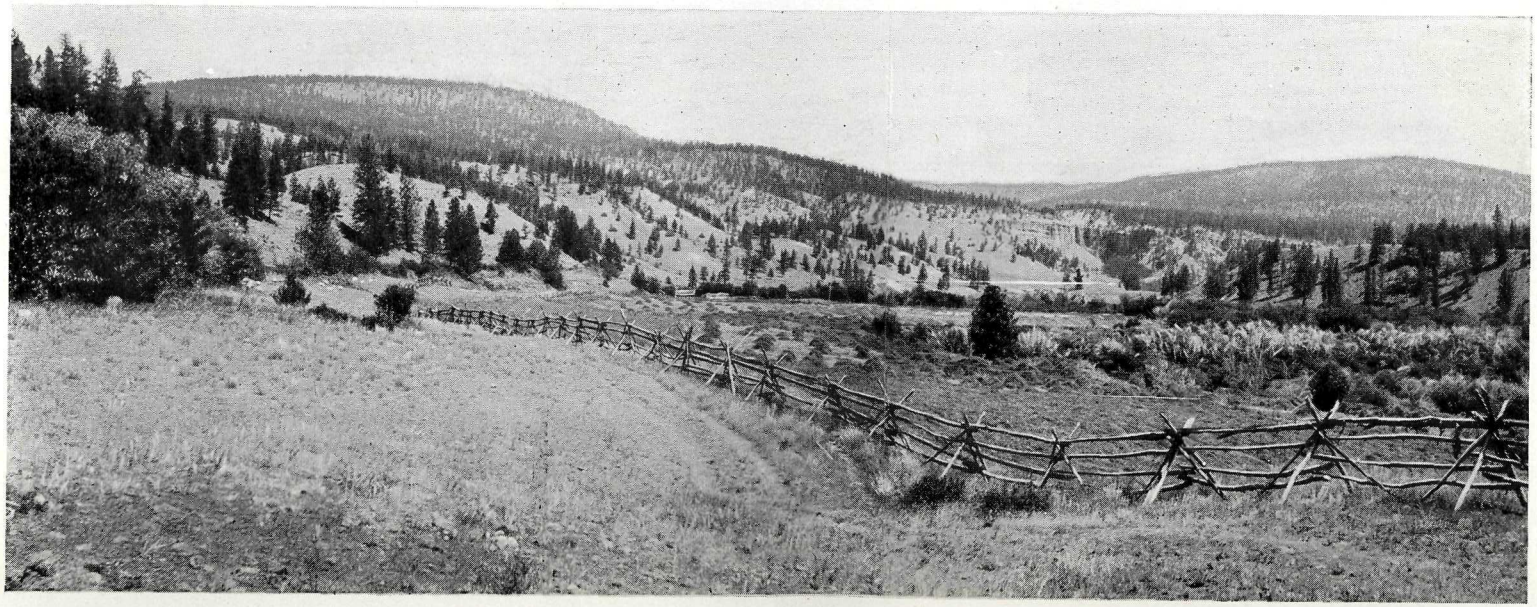
The part of this plateau which lies immediately east of the canyon is very rugged and wild, but becomes more level farther east. This area is also densely wooded and not rocky, and there is an area covered by Lot 4964 and northward for some distance from this lot which appears to be tillable and which seems to have good soil. How much of this area will eventually be brought under cultivation it is impossible to conjecture, but Mr. Boulé last year dry-farmed a considerable area on Lot 4964 and obtained a good crop of rye hay. It is unlikely that serious attempts to clear large areas of jack-pine land will be made until increased settlement leads to attempts to secure more land for cultivation in the immediate neighbourhood of homesteads, and experiments demonstrate the possibility of reclaiming such areas for dry-farming, although it is only fair to state that the few experiments already made indicate that in normal years success along these lines with fall rye may be anticipated if the ground is well prepared beforehand. On this part of the plateau also success has attended the cultivation of timothy on meadows formerly covered with swamp-hay, and wherever timothy has been tried it appears to do well; it is also interesting to see timothy growing rankly and strongly along the sides of roads where strayed seeds have fallen from wagons passing along them, indicating that even with no preparation of seed-bed this grass flourishes as if the region and climate were favourable to it.

### BONAPARTE PLATEAU.

South of the area above described and separated from it by the deep valley of the main Bonaparte River is the Bonaparte Plateau. This is densely and uniformly covered with Douglas fir and jack-pine, except at the western and south-western end, where it descends in a fairly gradual slope to the Bonaparte River and to Loon Lake Creek. On these lower western and south-western slopes are some stands of western yellow pine, but this type does not at any point reach the general level of the plateau.

There are very few meadows and these are small and widely scattered; a few small lakes or ponds lie towards the western end of the plateau and these have good water and hard shores. There is a small area on the lower northern slopes near the forks of the Bonaparte River, part of which has been successfully brought under cultivation without water, but this area is touched on when describing that river-valley. Two open areas of small extent exist on the upper part of the plateau, respectively at Rush Lake (Lots 3833 and 4923) and at the Ellahee Meadows (Lot 120). At both of these places there are fine unfailing springs and these form good watering-places for cattle. A small amount of wild hay can be cut on Lot 4923 and a considerable area was cut in former years from Lot 120, but recently the fences have been broken down at the latter place and the meadows badly trampled by stock.

Typical meadow land, Bonaparte Valley.



James Bishop's Ranch, south end of Chasm.

This plateau falls abruptly on its south-eastern side to the valley of Loon Lake and Loon Lake Creek, and all along this south-eastern side where the thicker growth of jack-pine and fir on the plateau merges into the more scattered growth of yellow pine on the lower slopes the grazing is good and is open early in spring and late in fall.

Considerable bands of wild horses range all over this plateau and on the Green Timber Plateau farther north, and J. F. DuBois has an ingeniously constructed corral about a mile south of Lot 3833 where he catches these. Another of these corrals is situated on the south edge of the Green Timber Plateau just north of Lot 1657.

The Bonaparte Plateau lies almost entirely within the area surveyed this year and has a length of about 22 miles and an average width of 6 miles, practically the whole of which must be classed as grazing land.

### South of Loon Lake.

South of Loon Lake the hills rise again to a considerable ridge lying in a north-east and south-west direction. This ridge culminates about 2 miles south of Loon Lake and then falls again to Hihuim Creek, only the western 3 miles of which lies within this year's area. The northern slope of this ridge facing Loon Lake has within the last few years been the scene of a devastating fire, and almost the whole of the slope presents a bare and brown appearance. This country is very inaccessible and must at present be classed as useless. The ridge reaches its highest elevation due south of the north-east end of Loon Lake, and this is the greatest elevation in the area surveyed this year. From this point eastward the country slopes rather sharply down and then flattens out again into the typical plateau formation, and continues right through to the valley of Deadman Creek.

The whole of this area is very densely wooded, and east of a line drawn about due south from the north-east end of Loon Lake is well watered with springs, but much of it is devoid of trails and so impenetrable from windfalls that travelling is most difficult, and this fact renders it almost valueless from the point of view of grazing.

It has been only partially examined this year, but sufficient was seen to make it appear probable that there are immense storage possibilities here for purposes of irrigation along Upper Loon Lake Creek.

Having thus described the general characteristics of the plateau land within the area, there remain for description the main valley of the Bonaparte River, the North Fork of the Bonaparte River, and Loon Lake and Creek, also the smaller tributaries, Clinton Creek, 57-Mile Creek, and Chasm Creek.

### The Bonaparte River.

At the point where the Bonaparte River crosses into the Dominion Railway Belt on the southern limit of this year's operations the altitude of the river is 1,960 feet above sea-level.

From this point to Young Lake, at 3,100 feet above sea-level, where the river enters the eastern limit of the area, is roughly 30 miles; we therefore have an average fall per mile of about 38 feet, but for long distances it is much greater than this and at other points much less, and at one point in the vicinity of the Mound Ranch there is only about 5 feet fall per mile for a distance of 4 miles. In this distance the river flows through the most fertile section in the area. The valley-bottom here reaches its extreme width of about a quarter of a mile and the hills fall back, and this gives the valley a wide and open appearance. Elsewhere almost along its entire length the river-valley is almost in the nature of a canyon, at some places opening out slightly and at others closing in between abrupt walls.

The agricultural lands in the valley, therefore, are in no place of great extent and for long stretches are non-existent, but here and there spots scattered along the valley have been gradually settled and at the present time constitute practically the only settlements existing in the south-western and central part of the area.

Noticeable among these small areas of agricultural activity is the Whyte and Calder property at the extreme south of the area on Lot 41, where the Bonaparte River crosses into the Dominion Railway Belt. Messrs. Whyte and Calder have, at considerable expense and in the face of great difficulties, constructed an irrigation-ditch along the west side of the Bonaparte Valley about 3 miles long and have brought a considerable acreage under cultivation. Their activities at present are concentrated on stock-raising, but there is an admirable opportunity here for a good dairy-farm, given reasonable access to a creamery, with probably much better returns than at

present. This is equally true of the small but gradually increasing area farmed by Fred Baker a mile farther north in this valley.

About 8 miles farther north ample water for irrigation is provided by 57-Mile Creek and Clinton Creek, and full advantage of this has been taken by James Bishop, whose ranch is situated at the junction of 57-Mile Creek and the Bonaparte River, and who has brought about 100 acres of land under cultivation within the last ten years, a large percentage of which is devoted to the growing of alfalfa, of which he raises two crops annually and pastures the third, at an elevation of 2,300 feet above sea-level.

South of Mr. Bishop's ranch lies the Mound Ranch, owned by Herman Rossi, where there are large areas devoted to alfalfa and also to timothy and clover.

The old Jameson place at the junction of Fly Creek with the Bonaparte River, at present leased by Edward Mobbs, and a considerable area between this place and the forks of the Bonaparte River appear capable of considerable development, and during the past season Mr. Andrews on Lot 3848 raised a crop of oat-hay on upland land without water, averaging 2½ tons to the acre, and the previous year, which was a drier season, raised 2 tons per acre on the same land. An irrigation-ditch has recently been surveyed along the south side of the Bonaparte River from Young Lake to bench land south-west of the forks, on part of which Mr. Andrews raised his crops, and this ditch, though probably rather costly to construct on account of its length, which is over 4 miles, would have the effect of bringing a good deal of land on the south side of the valley here under irrigation.

There are several small areas along both sides of the Bonaparte River in the south-western part of the area and along the north side of the river in the central and eastern parts of the area which consist of open or semi-open stretches of grass land. These are most noticeable on the east side of the Mound Ranch, where open, rounded grassy slopes occupy the area immediately above the actual river-bottom meadows.

The most characteristic plant of these open tracts is bunch-grass (*Agropyron tenerum*) and this is accompanied by wormwood. Nearly all these open areas are overgrazed owing to the fact that the cattle when untended stay in the open on the more palatable grasses rather than range in the timber where the grasses are not so much to their liking. These areas are also free of snow early in the spring and late in the fall owing to their situation.

Along the north side of the valley east of the forks of the Bonaparte up to Young Lake there is a considerable area of good grazing land, and south of the river here on the lower slopes of the Bonaparte Plateau is an area which should be carefully examined with a view to possible settlement of at least one family. There is an area of poplar land here with possibilities for irrigation, but at present no means of easy access to it by road or trail. It lies in a basin about a mile east of Grant's Mountain and is probably most easily reached by crossing the river at the point where Mr. Boulé's hay-road crosses it on Lot 3860, and following the road for a short distance and then following down the valley about half a mile back from the river-bank.

### LOON LAKE CREEK, LOWER AND UPPER LOON LAKE.

The valley of Loon Lake and Loon Lake Creek stretches right across the south-eastern part of the area and falls naturally into three parts, that occupied by Loon Lake Creek below Loon Lake being one part, that occupied by Loon Lake the second part, and that occupied by Loon Lake Creek above the lake being the third part.

The valley of Lower Loon Lake Creek is 5 miles long and contains a small amount of agricultural land, and has only two settlers at present, with room possibly for two more. There is unlimited summer range for stock, but settlement here is limited by the fact that, in addition to the two small ranches now existing, only two other places can profitably be put under irrigation and cultivated to provide winter feed for stock.

That part of the valley occupied by Loon Lake is 8 miles long and contains no land capable of being brought under cultivation, as the hills approach close to the lake on both sides; the grazing on the north side of the lake, however, is good.

That part of the valley occupied by Loon Lake Creek above Loon Lake is rather different and needs some consideration.

The only settler in this part owns the whole of the valley lands and hitherto has used the valley entirely as pasture, cutting small wild-hay meadows all over the surrounding country to provide winter feed for his stock. This valley could, by a careful handling of the water-supply

in the hills to the south-east, provide homes for three if not four families, a large area all down the valley being so placed as to be easily irrigated from reservoirs in the southern hills. This part of the valley is about 5½ miles long.

### North Fork of the Bonaparte River.

Entering the area from the east, the North Fork of the Bonaparte River flows south-eastward through a narrow valley for a distance of 5 miles, along most of which distance there is a narrow strip of willow-covered bottom land, some of which has been cleared up. There is only one settler in this distance and room for at least one other family, and possibly two. The one settler who is here is quite prosperous. At 5 miles the river suddenly falls into a deep and gloomy canyon, turns due south, and only emerges from the canyon just before connecting with the main river 6 miles farther south. The fall in the first 5 miles is very slight, but from the point where it enters the canyon to its junction with the main river it has an average fall of about 80 feet per mile.

The only other valleys in the area are those of Clinton Creek, 57-Mile Creek, and Chasm Creek, only one of which, 57-Mile Creek, has any extent of tillable land within the surveyed area of the map; the other two flowing in deep ravines, with very little or no bottom land at any point.

### Roads.

Having thus indicated the general features of the area, its surface, climate, and limitations, a brief sketch of the roads throughout the area can be given.

The north-western part is traversed by the Cariboo Road, the main trunk road of the Central Interior. This road enters the area at a point 45 miles north of Ashcroft, on the Canadian Pacific Railway, and crosses out over the northern limit at a point 27 miles farther north.

From this road only two well-travelled side-roads branch actually within the area surveyed, one of which goes off to the east from the 70-Mile House and the other to the west 1 mile farther north.

Both these roads are passable automobile-roads, but neither are in good condition and they need considerable attention.

The road to the west goes through to Meadow Lake and joins the Clinton–Canoe Creek Road near this point and affords access from the Green Lake area to Dog Creek, Canoe Creek, and the Chilcotin.

The road eastward from the 70-Mile House divides 5 miles north-east of this point, one road going along the north side of Green Lake and the other, known as the New North Bonaparte Road, striking due east and, passing between Jim's Mountain and Tin Cup Lake, drops into the valley of the North Bonaparte River and continues on to Bridge Lake and Lac des Roches.

Of the various branches from the road round the north side of Green Lake, only three are at all passable for automobiles, and this only in good weather; they are, in fact, little better than wagon-trails. There are a few wagon-trails at various points, and it is worth noting in this connection that the country generally is so open and free from underbrush that it is possible with a minimum of clearing to drive a wagon off the roads through the timber in very many places without attention to any roads, and that some wagon-trails thus made in time become recognized roads. Much of this nature is a wagon-trail which leaves the North Bonaparte Road 2 miles north-east of the 70-Mile House and traverses the southern part of the Green Timber Plateau, and eventually ends at the forks of the Bonaparte River. This road, known as the Curry Road, is only passable for automobiles for about 9 miles, but could with very little work be improved into a good route to open all the country round the forks, and even beyond it on the plateau to the east of the North Fork.

The above roads with wagon-trails leading off them are the only present means of communication with the Cariboo Road and the Pacific Great Eastern Railway, which, roughly speaking, parallels the Cariboo Road through the area, but recently Edward Mobbs has, unaided, cut a road on a good grade out through the timber from Lot 4906 on the Bonaparte River to within 3 miles of the big bend on the Cariboo Road at the 52-Mile post from Ashcroft, and this road, when completed, will open an easy route to this part of the Bonaparte River and to the land on the south edge of the Green Timber Plateau.

Farther south a good wagon-trail which is passable for a light car throughout its length leaves the Cariboo Road half a mile north of the point where the Cariboo Road crosses 4-Mile

Creek on a trestle bridge, and swings round the flank of the mountain to the ranches on 57-Mile Creek, half-way between the Bonaparte River and the railway. This road ends here and a pack-trail connects with it to Chasm Creek, where there is one small ranch.

Farther south again a road enters the area down Clinton Creek and connects the Mound Ranch with the town of Clinton. This road is passable for automobiles in good weather, but the grade is so steep at one place on Clinton Creek as to render it dangerous to any one not acquainted with the locality.

This road branches at the Mound Ranch, one branch going 1½ miles up the valley on the west side to James Bishop's ranch on the Bonaparte River, and the other branch crossing the river and climbing on to the Bonaparte Plateau, and eventually reaching Allen Baker's ranch on Loon Lake. Two wagon-trails branch from this on the plateau, but these are unimportant.

One other road only exists within the area at the extreme south-west. This leaves the Cariboo Road at a point 21 miles north of Ashcroft, and following up the west bank of the Bonaparte River enters the area 2 miles north of its junction with the Cariboo Road and continues up to the mouth of Loon Lake Creek, where it joins two pack-trails, one going north to the Mound Ranch and one north-east up Loon Lake Creek.

In addition to roads mentioned above, there are a large number of wagon-trails and some recognized foot-trails, all of which are shown on the accompanying topographical map, and the whole area is covered with innumerable cattle and wild-horse trails, in some cases so well worn and permanent as to deceive any one unacquainted with the locality.

Two trails of historic interest traverse the area but are now little used. One of these, leaving the Cariboo Road near the present 49-Mile post from Ashcroft, follows the eastern edge of the Chasm for about 2½ miles and then drops steeply down into it to a meadow at present occupied by Mr. Johnson's ranch (Lot 4921) and continues down the Chasm to the Bonaparte River. This trail is of interest as being part of the original route to the Cariboo goldfields in early days, and large pack-trains used to come by this route and turn out their horses to feed in the meadow at the bottom of the Chasm, escape from which is difficult except along the trail.

The other trail is known as the Old Brigade Trail and was followed by pack-trains of the Hudson's Bay Company on their way from Fort Kamloops to the Northern Interior. The only piece of this trail still remaining and recognized as such passes up the east side of Fly Creek from the Bonaparte River and emerges from the forest at the west end of Green Lake, although a trail from Savona to Loon Lake which enters the area 1½ miles north-east of Hihium Lake is probably also a part of this old trail.

## MINERAL DEPOSITS.

The only mineral deposits at present known within the area topographically surveyed this year are contained in some saline lakes situated in the vicinity of the 70-Mile House on the Cariboo Road. These lakes contain brines consisting predominantly of sodium carbonate, and two of them, where the brine has gradually concentrated until the saturation-point has been reached, have begun to crystallize out and are being worked at a fair profit. The exact location of these lakes is shown on the map. One mineral spring, probably containing magnesium, exists in the valley of Upper Loon Lake Creek and effervesces strongly when first gathered in a drinking-cup, but goes flat if corked up. This spring comes out of the bank of Upper Loon Lake Creek on Lot 139.

## WILD GRASSES.

The number of different varieties of wild grasses in the area is very large and it is impossible here to enumerate more than the commonest.

By far the commonest is the well-known pine-grass (*Calamagrostis suksdorfii*), which grows everywhere in the timber and ranks second in the list of pasture-grasses for value on account of its great abundance. It only heads out and seeds apparently after a fire and during this period it is unpalatable, this doubtless being a provision of nature to ensure its reproduction.

Next in abundance and high in food value is a variety of bunch-grass (*Agroparon tenerum*), which replaces the pine-grass in open dry glades, the pine-grasses being unable to survive without shade. These two grasses alone constitute the bulk of the wild grasses available for pasture.

One other grass met with in considerable quantity in the drier parts of the open runways in the north-west part of the Green Timber Plateau, where the ground is slightly alkaline, is that commonly known as salt-grass (*Dystichilus spicatum*), and is recognizable by the sharp

thorn-like shoots which develop from the spreading roots and are able to pierce through the hardest crust. This grass has a high value in the grazing-list and is almost impossible to trample out on account of the fact that it propagates the species from the root-stock.

Conspicuous in this area and almost exclusively covering large areas recently occupied by lakes, the mud of which is slightly alkaline, is a grass known as *Panicularia*. This grass has a leeching effect on the soil and if cut from these areas would eventually absorb the alkali in the soil. This grass is palatable when young, but has not a high food value when cut for hay. This is generally the first vegetation that encroaches on the lake areas, except in some places where a red plant known as *Dondia depressa* first appears in the salt encrustations on the edge of drying lakes.

One grass which I am told is not indigenous to this country, but which is apparently increasing in amount year by year, is foxtail (*Hordeum jubatum*). This is fairly good pasture-grass until it heads out and ripens, at which time the sharp seed-covering causes physical injury to sheep and cattle by piercing the membrane of the mouth and setting up inflammation. It is almost impossible to eradicate it and it is almost always found in belts round drying lakes in this area at that distance from moisture which best suits its growth.

By far the commonest growth in wild-hay meadows, where the water is sweet, or at least free from alkali, is sedge (*Carex*) of various kinds, and this makes good hay; it is easily recognizable from the fact that it has no joints and may thus be distinguished from grass.

Many claim that this is a good milk-producing food and for years it has formed the only winter food for stock in this area.

Recently experiments have been carried out in these meadows with timothy (*Phelum*) and red-top (*Grostis*) and large crops have been cut, and it is probable that this procedure will gradually supersede the growth of sedge in wild-hay meadows, the increased tonnage thus obtained being worth any extra trouble that may be entailed.

Other common grasses seen, mostly along the sides of roads, are various kinds of brome (*Bromus marginata* and *Bromus Porterii*); some June-grasses (*Agrostis*, one particular species being *Argrostis hyemalis*); *Stipa comata*, mostly in open overgrazed areas where it takes the place of bunch-grass; Canadian blue-grass (*Poa compressa*); Mulhemburgia, chiefly seen in patches along the north side of the Bonaparte River.

In connection with open areas in the immediate neighbourhood of ranches where in connection with the dairying industry it may be desirable to improve the pasture by the introduction of tame grasses, the following would probably give good results: Italian brome (*Bromus Inermis*), Canadian blue-grass, June-grass, and timothy.

From the amount of self-sown white Dutch clover which I have seen growing along the edges of roads and even creeping out on the hard road-bed itself, I would imagine that this plant also would do well in this locality.

I have seen Italian brome growing luxuriantly on unirrigated land along the lower course of the Bonaparte. I have also seen it growing to a height of 5 feet on the edge of a hill of old manure near an abandoned stable on the north side of Mount Begbie, near the 72-Mile post from Ashcroft, on the Cariboo Road. This was accompanied at the latter spot by bunch-grass (*Agroparon tenerum*) so rank and tall as to be almost unrecognizable as such, showing the immense value of spreading manure over areas in close proximity to ranches which are required for use as tame pastures. It would seem that such remarks were hardly necessary, but at one ranch I visited this year there was a heap of manure lying outside a barn which I judge from its size must have been the accumulation of years, and not one atom of it had been spread over the pasture on the side of which the barn stood.

In addition to grasses, various weeds may be mentioned. Commonest of these and growing nearly all over the area in the timber over 3,400 feet is milk-vetch (*Astragulus campestris*). This is said to be injurious to cattle and sheep and to produce knock-heel. This disease is an acute form of indigestion and cattle taken in hand and provided with a change of diet and plenty of fresh water can be cured. It is probable, therefore, that this plant is not, in moderate amount, harmful, but a continuous diet of it supplemented by water containing a certain amount of alkali, which does not take the place of salt, may possibly produce the disease, and if cattle are provided with plenty of salt and good water they probably should take no harm. Considering the almost universal distribution of this weed over this part of the country, and the fact that cattle

have ranged through this country for years, it seems hardly likely that this weed has any very serious effect on them.

Another fairly common weed is silver cinquefoil (*Potentilla Anserina*), growing in the open dry areas which are periodically moist from seepage from higher ground.

Another common weed in open areas and generally accompanying bunch-grass is wormwood (a species of *Artemisia*). This is good winter feed for stock as it contains a large amount of oil.

One plant of universal distribution but of no known value is kinnick-kinnick, a small creeping plant with small glossy leaves and with a tiny pink flower producing bright-red berries in the fall. This occurs almost everywhere under the jack-pine and chokes out the grass; light grass fires do not usually kill it, but afford it an opportunity to spread farther.

Many other plants are distributed over this area, but the commonest are contained in the above list.

### FUR AND GAME.

No fur-bearing animals are now plentiful, though in the past it has been a good trapping country. A few muskrat are caught every winter, and on the southern slopes of Jim's Mountain and in the canyon of the North Bonaparte black bears seem to be fairly plentiful, and I saw a fine brown bear this year on the north shore of Pressy Lake. Deer used to be very plentiful on the south side of Loon Lake, but within the last few years have greatly decreased in numbers, but now seem to be again on the increase. It appears that deer do not as a rule frequent the country where cattle run in any numbers, but there are generally some deer to be found on the northern slopes of the Bonaparte River Valley in the spring, especially in the neighbourhood of the Chasm and east of it, and they are fairly plentiful in the vicinity of Tin Cup Mountain and Jim's Mountain.

Moose-tracks have been seen recently on Jim's Mountain and there are probably a few of these here. Coyotes are plentiful and bold all along the North Fork of Bonaparte River, and are fairly common all over the area.

Willow-grouse are plentiful and in the fall of the year there are considerable numbers of mallard, teal, pin-tail, and canvas-back ducks all over the Green Timber Plateau, although these have decreased in numbers since the lakes have been so reduced by drought. Geese are fairly common but much fewer than formerly. This area is well known for its duck-shooting.

### GENERAL REMARKS.

As before mentioned, settlement is thin and industry almost entirely confined to stock-raising. The demand for cattle is not brisk and good prices can only be obtained for first-class beef. The heaviest demands for beef come from the construction camps and these do not exist at present in the Province. There is a steady demand for beef in Vancouver, but the buyers look for their supply chiefly from producers who provide them with a consistently good grade of beef and are in a position to accept at their own price the supplies of small producers with a poorer grade of cattle, who must dispose of their produce at any price. I do not presume to offer a solution of the problem.

Only by producing a grade of beef which is so superior as to create a strong demand for it can prosperity now come to the beef industry, and I believe that prosperity to this section will come, not through the medium of stock-raising, but through dairying and mixed farming.

Mention was made, earlier in the report, of an area lying north-east of the present area, in the vicinity of Roe Lake and Bridge Lake, which was eminently suited to dairying, and upon the early settlement and prosperity of the last-named section depends to some extent the prosperity of the area farther west, as, with a flourishing industry developing in the eastern area, transportation routes and markets will improve and settlers will from experiment discover means of getting the best results from land which from conditions of climate and situation has hitherto been considered unprofitable.

Given an easy opportunity to dispose of cream at a reasonable price which will give a fair margin of profit, better and steadier returns can be obtained from dairying by settlers starting in a small way than from stock-raising, and there are also profitable side-lines in hogs and chickens where milk is plentiful.

The problem of carrying on the beef industry alongside a dairying industry has been solved in other localities by the introduction of dual-purpose Shorthorns, and there seems no reason why the same should not be done here.

There has been, and probably always will be, friction in a country where increased settlement arouses the fear among those already settled that the range will be curtailed, and this area is no exception. Some settlers in this area are genuinely anxious to see increased settlement; others are genuinely anxious to keep settlers out. The new settler will come in touch with both points of view, but on the whole he will find the residents friendly and helpful.

The country being wholly devoted to stock-raising, the most important problem has always been to secure by some means or another enough winter feed for stock, and settlers travel considerable distances from their homesteads to cut wild-hay meadows for this purpose. As settlement increases these are leased to secure them legally against others who want them, and at the present time it is difficult to know, when looking for land in this area, how to choose the locality to the best advantage when most of the best meadows are owned or leased by one or other of the present settlers. A list of places which are at present unoccupied has, however, been given at the end of this report, which may serve as a guide to those looking for land and may save them wasting time.

I am of the opinion that any settler desiring to pre-empt land in this area should on arrival have at his disposal at least $2,500, and in the case where the settler intends to purchase outright instead of pre-empting, as would be necessary where the property is held by private owners, that sum should be increased by the amount of the original purchase price of the land. Too many failures in the past have been due to the fact that settlers pre-empted land with little or no cash to tide them over the first two or three difficult years until their land commenced to produce and they were able to dispose of some stock.

It is especially difficult at this particular time to indicate the lines along which an incoming settler might work. I am inclined to advocate dairying, and would mention that at the present time the Quesnel Creamery is offering a good price for cream and is paying the freight on the railway. The railway company has recently substantially reduced the freight rate on cream to Vancouver, and doubtless as soon as the number of cows in the district warrants such a step a creamery will be established at some central point.

Several settlers in the area north and east of that here described are regularly shipping out cream to Lone Butte Station, and in most cases these settlers are farther from the railway than any point of this area. I am inclined to think that the time is coming when dairying will become the chief industry in the Lillooet District east of the Cariboo Road and stock-raising of secondary importance.

Improvement in stock, in equipment, and in methods of farming must necessarily be a slow process, but good land there undoubtedly is and the area does not appear to differ from large areas in Northern Europe, where dairying is carried on profitably, although the general standard of living in the older countries is undoubtedly lower.

Regarding the question of wild range, there is far more of this than is necessary to supply the needs of the number of cattle for which winter feed can be found, so that the question of overstocking the range, unless cattle are shipped in from the outside in large quantities for the summer season, is never likely to become a serious matter, especially as the cattle are hardly ever tended in the summer, but allowed to roam at will with little attempt at salting or tending, so that while many areas which should be kept for early spring or late fall ranges are now overgrazed, wide areas which would provide excellent summer range are not touched at all.

With so large an expanse of grazing land available and the areas where winter feed can be raised relatively small, the question is raised as to whether, under careful management and scientific methods of farming, areas at present considered as grazing areas could be devoted to the raising of fodder, and on this question turns the future prosperity of the country.

Experiments carried out in this area have demonstrated that success attends the cultivation of fall rye. One settler with twenty-five years' experience in what is, possibly, one of the driest spots in the area makes the statement that fall rye is the salvation of this section, and it would seem that in any year, except an exceptionally dry one, good crops of rye and oats can be raised over a considerable area of upland land here without water. Such areas are not continuous and only experiment will prove the extent of them.

### Dry-farming.

Up to the present it has not been considered profitable to attempt to clear any upland land where there was no prospect of obtaining water for irrigation, and almost all dry-farming that has been attempted hitherto has been done either on already open or semi-open land formerly

under grass, or on land which was formerly irrigated but on which, owing to drought, the water has failed. Under the former catagory falls land on the south side of the Bonaparte River near the forks, where, as mentioned earlier in the report, Mr. Andrews raised, both last season and the season before, large crops of oat-hay without water; also land cultivated by Mr. Boulé north of Young Lake. Under the latter category falls land cultivated by S. and R. T. Graham near the west end of Green Lake. On these areas dry-farming methods have been successful in normal years; also in former years an area at the 70-Mile House on the Cariboo Road was similarly dry-farmed successfully, and a large part of this, it is interesting to note, was land originally covered with jack-pine which was cleared off. A similar area of jack-pine was recently cleared by A. J. Whitley and a crop of rye raised in the first year, but the success of this crop was due to a wetter season than usual.

If this part of the country as a whole develops as a dairying section, the question of clearing off selected areas in the neighbourhood of homesteads for raising fodder and for tame pastures is likely to come more and more to the fore. A high elevation is necessary for the success of dry-farming methods and practically all the area is favourably situated in this respect. It is claimed that jack-pine land will not produce a crop for the first two years on account of the sourness of the soil due to the presence of humic acid from decaying pine-needles. This sourness may to some extent be modified by raking up and burning the mat of these needles which exist on such land. Forest fires do this, and in many cases ground fires work over large areas, only scorching the lower parts of the trunks of trees, but such fires in addition frequently destroy the humus and thus effectually destroy the value of such areas either for cultivation or grazing for a number of years; but if in clearing land the pine-needle mat is raked off and the felled trees carefully stacked and burned the humus is not destroyed, and the clearing of the mat of pine-needles before ploughing or disking removes a considerable quantity of humic acid which would otherwise be absorbed into the soil beneath.

Methods of clearing such land came under my notice this year and the results justify mention here. One successful settler, Mr. Holland, at Roe Lake, outside the present area, but where the conditions of clearing are similar, described his methods to me as the result of forty years' experience of clearing wild jack-pine and poplar land. Briefly he proceeds as follows: He first cuts off the trees at ground-level with a saw, piling and burning the brush in heaps so as to avoid destroying the humus, and with the trees thus cut and cleared off he is able to disk the land immediately, as the stumps, thus cut, do no interfere with the disk. A crop can thus be sown in the first year and subsequently cut without difficulty. In the meantime, in proper season, the stumps are fired, using a special method of boring to promote burning. By this means and by the natural decay the stumps disappear or can be ploughed out in about three years, but with the advantage that the ground has been sweetening during this period and crops have been possible from the first year. This method he quaintly termed "sleeping out the stumps." This settler has great faith in the future of the country from the point of view of dairying and mixed farming and his methods of farming might with advantage be studied by intending settlers. His experience is at the disposal of any one asking for it, and his place at Roe Lake, if only as a demonstration of what can be done, is a great asset to the country.

Although all his land is dry-farmed, it is not taken as an example of what may be done in the area which I covered in the past season, as Mr. Holland's land is situated several miles farther east and in an area where the rainfall is greater than it is farther west, and only his clearing methods are cited as being possibly helpful.

I am of the opinion that the rainfall increases with every mile traversed eastward from the Cariboo Road, and that consequently the rainfall is greater in the east than in the west of the area topographically mapped this year. If, therefore, areas on the Cariboo Road have been dry-farmed in the past, it is an indication that areas farther east in this area, given equal conditions of soil, may also be handled successfully.

### DRINKING-WATER.

In an area such as has been described above the question of good drinking-water is of vital importance. All wells and springs that I have been able to locate have been shown on the map, as well as lakes where the water is fit for cattle and which have edges sufficiently solid for cattle to approach without danger of miring. Over wide areas no wells have been dug, but in certain

localities the wells which have been dug seem to indicate that good water can be obtained at a shallow depth in similar localities.

Water in the vicinity of the 70-Mile House can be obtained at a depth of 10 feet, and as there is a wide area of similar land in this vicinity at the same elevation it is probable that water lies not very far below the surface over all the lower-lying parts of the adjacent country. The water at the 70-Mile House is slightly alkaline.

Within 200 yards of a soda-lake in the north-west part of Lot 1507, and close to the railway-track, a well has been dug and good drinking-water obtained at a depth of 18 feet. This water is said to be perfectly free from alkali. The well was dug in a small draw where there is a good growth of willows, and evidently a good spring has been struck. Some springs occur in unexpected places; one, for instance, almost on the summit of Jim's Mountain in a tiny meadow whence it flows northward in quite a fair-sized streamlet.

It is not the intention to give information as to springs, wells, and streams which has already been given on the map, but to indicate generally that water is in most parts near the surface and not difficult to obtain.

## Summary.

Summarizing my impressions of the area as a whole, I would say that, with improvement in roads leading out to the railway, this area will develop into a dairying section which, though never capable of supporting a large population, will provide room for a considerable number of families. Time and experiment only will prove how much of it can be profitably brought under cultivation, but quite a large area may prove to be productive. The secret of success lies in the class of settler who comes in. Successful colonization requires to-day the same qualities of patience, energy, and hardihood which have marked the development of Canada in the past. This country is no exception to the rule.

I believe that we are on the eve of considerable development all through the Eastern Lillooet District, which has been delayed by the war and the subsequent years of depression. Signs are not wanting that the near future will bring a large number of settlers to this area, if the number of inquiries from settlers, some of them with considerable means, is an indication in this direction. Of this influx, the particular area covered this year will to some extent share, but no settler should attempt the experiment without capital.

The land laws of the Province as at present enacted are designed with the express purpose of assisting the settler who is genuinely anxious to make a home and with a view to discourage speculation. The settler who is whole-heartedly anxious to develop his own land for a home and wishes to see the country round him settle up will find no hardship in the provision for yearly improvements of his holdings required under the "Land Act," for he would in any case, if in earnest, make such improvements in the making of his home, and his time spent in yearly improvement will by the time he applies for his certificate of improvement be realized in the increased value of his land.

## List of Unoccupied Land.

In the following list all land not marked as alienated is vacant Crown land. Where marked as alienated, it is privately owned but at present unoccupied.

Lot 4384, 1 mile south of the mouth of Loon Lake Creek (alienated).
Lot 4336, Lower Loon Lake Creek.
S.W. ¼ of Lot 3004, Lower Loon Lake Creek.
Lot 3837, Upper Loon Lake.
An unsurveyed area lying immediately east of Lot 786, Bonaparte River, opposite the mouth of Fly Creek.
Lot 5317, Bonaparte River.
Part of Lots 3851 and 3852, Bonaparte River (alienated).
Lot 119, Bonaparte River (alienated).
An unsurveyed area lying south-west of Lot 3860, Bonaparte River.
Lot 3853, plateau north-west of the forks.
An area of unsurveyed Crown land between Lot 3853 and Lot 4905 (some meadow land).
N.E. ¼ Lot 4905.

LIST OF UNOCCUPIED LAND—*Continued.*

S.E. ¼ Lot 4905 (alienated).
Lots 3861 and 3862 (alienated).
Lot 4655.
Lot 1379, North Fork of Bonaparte River.
Lot 3890.
Lot 3891 (alienated).
Lots 3880 and 3894.
E. ½ Lot 1611.
An area between Lot 4633 and Lot 1609. This area might be drained and rendered productive.
Land along the south side of Green Lake, between Lot 4632 and Lot 4539.
S.W. ¼ Lot 1606.

The above areas represent, probably, the best land at present unoccupied in the country surveyed during the past season. They are not arranged in order of value and no attempt has been made to compare their value with other unoccupied areas in the adjacent country not covered by the accompanying map. This list may serve, however, as a guide.

POSSIBLE DRY-FARMING AREAS.

Certain additional level areas free from rocks not included in the above list may in the future be experimented with when it may have been demonstrated that dry-farming is a profitable enterprise; some of these areas are very easily cleared.

An area south of the east end of Deep Lake.
An area between the east end of Deep Lake and the west end of Little Green Lake.
An area lying on the west side of Fly Creek about 1 mile north of Lot 786.
An area lying north of Lot 1658 (on the south edge of the Green Timber Plateau).

A LIST OF SETTLERS.

The following is a list of the present settlers, in alphabetical order, actually in residence in the area, and the land which they either own, lease, or hold under pre-emption record, or are working under arrangements with the owners:—

Anderson, William, Lots 1385, 1386.
Andrews, Bert, Lots 3848, 3849.
Baker, Allan, Lots 88, 89A, 96, 97, 119, 120, 139, 140, 729, 730, 86, 1229, 3834.
Baker, Fred, Lots 4385, 5162.
Berg, Andrew, Lot 4926.
Bishop, James, Lots 1096, 1666, 3769, 3774.
Bishop, William, Lot 2633.
Bishop, William H., Lot 4636.
Boulé, Harvey A., Lots 4964, 2322.
Boyd, John G., Lots 3412, 727, 726, 3782 (E. ½), 3791, 3790, 3792, 1500, 1498, 3419.
Calder, W. S., Lots 41, 3675.
Cunningham, Mrs., and family, Lots 570, 4420, 3268, 1110, 493.
DuBois, J. F., Lots 3832, 4637.
Eden, Stanley, S. ½ of S. ½ Lot 1919, 2083, 1917, 4510, 4477.
Farmer, S. H., N. ½ of S.E. Fr. and Fr. S.W. ¼ Lot 3785.
Firrell, James E., N.W. ¼ Lot 1918, S.E. ¼ Lot 4504.
Graham, S., Lot 398, S. ½ Lot 3397.
Graham, R. T., Lots 728, 3401.
Haines, William, Lot 3886.
Hutchison, David B., Lots 3863, 3864, 4910, 4904, S.W. ¼ Lot 1513.
Johnson, Charles, Lot 4921.
Kearton, William S., S.W. ¼ Lot 1610, N.E. ¼ of S.E. ¼ Lot 1610.
Liden, Gustave E., Lots 3775, 3777.
Miller, S. E., Lot 3842, part of Lot 3843.
Mobbs, A. Edward, Lots 4906, 786, 5219.

Morgan, Thomas, Lot 3835.
McGillivray, John, Lots 1395, 1805, E. ½ 1913, 4471.
McGillivray, John, Jr., E. ½ Lot 1913, 4471.
McGillivray, William, Lots 1399, 1400.
Nelson, Benjamin, Lot 3776.
Porter, C. Mathew, Lots 277, 656, 350, 473, 474, 681, 4640.
Prest, Thomas, Lot 3889.
Prydatock, Stefan, Lots 4536, 4633, 5129.
Riley, James, Lot 4930.
Scheepbauer, Jacob, Lots 1387, 5130, Block A, Lot 1628.
Spencer, A. E., Lot 4925.
Thorson, John, Lot 3836.
Walters, Guy, for Herman Rossi, Lots 158, 159, 160, 872, 873, 3770, 3771.
Whyte, W. S., Lots 41, 3675, 4929.
Whitly, A. J., Lots 1382, 1630, 3882, 1394.

In conclusion, I desire to express my thanks to George V. Copley, Assistant Grazing Commissioner, for his assistance in identifying wild grasses and for his advice regarding different food values of grasses and weeds, and in general with regard to dairying possibilities in the area surveyed, and I also wish to gratefully acknowledge the ready help and courtesy of many settlers throughout the district who assisted me in various ways throughout the season.

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

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## BLUE RIVER, KAMLOOPS DIVISION OF YALE DISTRICT, AND CRANBERRY LAKE, CARIBOO DISTRICT.

By L. S. Cokely.

Courtenay, B.C., December 18th, 1924.

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

Sir,—My first work in the vicinity of Cranberry Lake was the subdivision of the townsite of Blue River. This is a station on the Canadian National Railway 140 miles north of Kamloops and adjacent to Blue River, a tributary of the North Thompson River. This station will probably be made a divisional point on the railway, there being plenty of land available here for railway purposes. At present all trains change engines and crews here; in consequence of which there is now quite a settlement made up of employees.

As there was no land available near the railway for townsite purposes except Crown lands, it was considered advisable to subdivide a portion of the same. Accordingly 100 building lots and a few larger lots were laid out. As the townsite is located on a jack-pine flat, all these lots are good building lots and they are all easily cleared. There is no soil, the surface being composed entirely of gravel and boulders of small size.

Several tracts of good timber, hemlock, spruce, and cedar, are standing in the neighbourhood, which so far have been spared from serious fires. No mining is engaged in, but there are several prospects showing values in copper and iron which are indicative of mineral wealth, but the locality has never been extensively prospected.

Game is plentiful as one gets back from the railway; moose, grizzly and black bear, caribou, goats, and deer are to be secured. But as there are no roads and no trails and the timber is rather dense, it is quite a problem to reach the hunting-grounds and a greater task to bring out any game. As a result tourists do not frequent the district.

The climate is hot and dry in the summer, but the air is invigorating as the altitude is over 2,000 feet. The winters are cold, with snow lying to a depth of about 3 feet.

### CRANBERRY LAKE.

My next work was the subdivision of the bed of Cranberry Lake, which has dried up. This lake is 200 miles north of Kamloops, right on the summit between the McLennan and the Canoe Rivers, due south of Mount Robson. The McLennan is a tributary of the Fraser and the Canoe a tributary of the Columbia River. Before the railway was built it was possible to take a canoe up the Fraser and McLennan Rivers, portage about 3 miles to Cranberry Lake, proceed up Cranberry Lake, and portage another 2 miles to the Canoe River, and proceed down the Canoe and Columbia Rivers.

In recent years Cranberry Lake has been gradually drying up and at present it is practically dry. This has been brought about by two reasons: First, the killing-off of the beaver which kept the outlet dammed; and, second, by diverting the waters which formerly flowed into the lake for irrigation purposes and returning same to the Canoe River. The western portion of the lake-bed contained many very old stumps, which would indicate that this part was not always a lake but had been included through the work of the beavers.

The area of the lake is about 750 acres, and this should prove first-class hay land as soon as the soil is sweetened. The soil consists of silt, with an occasional strip of sand. There are no stones. Twenty lots were laid out which average 40 acres; they are all very level.

The rainfall is light and in the surrounding territory irrigation has to be employed, but I hardly think irrigation would be necessary on this area, as the soil is heavy compared to the adjoining land, which has a light soil, with much sand and gravel, and which dries out very quickly. However, should irrigation prove advantageous, there are several streams which could be utilized.

As the altitude is over 2,500 feet, frost is liable to occur in any month, so the agricultural possibilities are accordingly limited. Very little land is under cultivation here, but where water is available the land appears productive.

The Canadian National Railway passes about a quarter of a mile from the lake and the nearest station is Swift Creek, which consists of a post-office and section-house. There are a very few scattered settlers, but none are farming on an extensive scale.

The country was never heavily timbered and during the past few years most of the available timber has been cut or destroyed by forest fires; one bad fire occurred this summer which destroyed several square miles of timber. The timber consists of jack-pine on the flats and spruce, hemlock, cedar, and a few scattered firs on the side-hills.

Not much mineral wealth is showing in this locality, but one of the largest mica-mines in the Province is located a few miles to the west, although it has not been operated lately.

Game is very plentiful; deer abound, also moose and caribou. On the higher ridges goat can be secured and back from the railway grizzly bear range. One day while working a bear appeared followed by three cubs, which is a rather unusual sight.

Owing to the high altitude the summers are cool, with little rain, and the winters are rather severe, with snow to a depth of about 2 feet.

I have, etc.,

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

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## McGREGOR RIVER, CARIBOO DISTRICT.

BY H. McN. FRASER.

VANCOUVER, B.C., May 27th, 1924.

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

SIR,—Survey of McGregor River was made in accordance with your instructions. The traverse was commenced from the north-east corner of Lot 3043, which lies about 4 miles up the McGregor from the junction of the McGregor and the Fraser Rivers, and carried up the river for 40 miles.

The McGregor was formerly known as the Salmon River or the North Fork of the Fraser. It empties into the main Fraser about 40 miles north-east of Prince George.

The general direction of the river, looking up-stream, is north-easterly for a distance of about 36 miles to the mouth of the Herrick River, where it turns south-easterly. There are two canyons on the river, which I shall term the Lower and Upper Canyons. The Lower Canyon is about 4 miles long and commences about 18 miles from the mouth of the river, its walls rising to a height of about 200 feet. The Upper Canyon is about 6 miles long and commences about 13 miles above the head of the Lower Canyon, and its walls rise for the most part perpendicularly to a height of about 300 feet.

The river seems to be sluggish for a distance of about 12 miles from its mouth, but beyond that the grade increases slightly and the stream becomes swifter. In the Lower Canyon the water runs moderately fast, probably about 6 miles an hour. Above the Lower Canyon the river again becomes slower up to about a mile below the Upper Canyon. From the mouth to the foot of the Upper Canyon the river is easily accessible in boats in the summer, except during high water.

### Topography.

The topography of the country adjacent to the McGregor River on the north side is very low and flat up to the foot of the Lower Canyon, and I am informed by the trappers that there are muskegs all along this side, which are more or less persistent, right to the foot of the Lower Canyon. About 2 miles below the mouth of Seebach Creek a range of low hills, about 800 feet high, was noticed lying about 3 miles from the river and continuing up-stream to the mouth of Otter Creek. These hills come steeply out to the river just above the Lower Canyon, where their altitude is about 1,000 to 1,200 feet. On the east side of Otter Creek, between it and the Herrick River, there is a lone hill about 3,000 feet high, which might be described as being about 2 miles from the McGregor and about 3 miles from the Herrick River.

On the east side of the Herrick and McGregor Rivers, above their junction, there is a range of high mountains lying from 1 to 2 miles to the eastward.

On the south side of the McGregor, commencing at its mouth, the topography is flat, the land adjacent to the river being very swampy up to within 2 miles of the foot of the Lower Canyon, at which point, I am told by the trappers, the country lying more than ½ to 1 mile from the river is rough and broken. Above the Lower Canyon there is a range of mountains, the foot of which lies about a mile from the river and the height of which is approximately 5,000 feet. These mountains continue on up the McGregor seemingly to its source, but only just out to the river about 5 miles above the Upper Canyon. Between the mountains and the river, up to the foot of the Upper Canyon, there are swamps extending all the way.

### Timber.

The timber is composed mostly of spruce and balsam, with a sprinkling of birch. There are flats immediately adjacent to the River which are timbered with cottonwood and poplars. The timber is of better quality and more dense on the upper reaches of the river than on the lower, with the exception of the balsam in the vicinity of the Upper Canyon, where it seems to be affected by butt-rot, many of the trees being dead to a height of 20 feet.

The timber on the mountain-sides, with the exception of the valleys of the streams tributary to the river, is generally of poor quality and scrubby. There is no evidence of bush fires in any part of this country.

### Climatic Conditions.

The winters are usually moderately cold, and I found an average depth of about 6 feet of snow, showing that the snowfall is heavy, and I am told by the trappers that the rainfall in the summer is correspondingly large.

### Game.

Moose are very plentiful indeed, as are also black and grizzly bears. We saw quite a number of grouse and one flock of ptarmigan, and I was told by the trappers that the sloughs along the river were breeding-grounds for large flocks of ducks. The vicinity of the McGregor River also abounds in fur-bearing animals, such as fisher, marten, mink, ermine, and skunk. Timber-wolves are plentiful and are becoming a decided menace to the game, as they have rapidly increased in numbers in the last few years.

I have, etc.,

H. McN. Fraser, B.C.L.S.

## MIDDAY VALLEY, YALE DISTRICT, AND ARROW LAKES, KOOTENAY DISTRICT.

BY O. B. N. WILKIE.

VICTORIA, B.C., January 20th, 1925.

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

SIR,—Your instructions authorized me to survey certain parcels applied for in Midday Valley, near Merritt, and also to lay out land suitable for settlement in the same vicinity. After completing the work in Midday Valley we were instructed to move to Arrow Lakes, where our work consisted of making ties to isolated or floating Crown-granted or other surveys in the vicinity of Pingston Creek, Cariboo Creek, Snow Creek, McDonald Creek, and Kuskanax Creek, all situated on the Upper Arrow Lakes. Considerable delay was experienced in this latter work owing to the difficulty of locating the survey posts, as most of the surveys were made between twenty and thirty years ago and were usually on the mountain-side several miles from the lake at elevations ranging up to 8,000 feet.

The original lines were run in many instances at a period when fires had burnt the hillside bare. This same hillside may now be a dense second-growth forest without sign or trace of a line having been measured, or perhaps a trapper's blaze may take your attention and only lead you to where he had set a trap. Other delays arose from finding posts had been burnt, or rotted away, or destroyed by slides. Besides the fact that the locator's description of his location is often miles in error and leads in many cases to much loss of time trying to find the property. Generally trails will be found leading to the different groups, but these with a few exceptions had to be cut out and repaired in order to follow same.

Most of the original locators were out of the district. However, when possible, I obtained one of them to show locations they knew and thereby saved considerable time hunting for posts. The country covered was mostly steep, timbered mountain land.

The weather during the season was wet to the end of July, then dry until September, after which we had a wet fall. Snow was encountered on the summits in September.

At the end of the season a small parcel under application was surveyed at Twobit Creek, Lower Arrow Lake. The following is a short description of the localities visited:—

### MIDDAY CREEK VALLEY.

In this vicinity twelve lots were surveyed for settlement. This valley is situated about 15 miles from Merritt, in Yale District, and is reached by the Kettle Valley Railway or wagon-road from Merritt.

The best part of the land in the valley is held as Indian reserve, the land adjoining being mostly timber licences which have been logged off. This area of expired licences was subdivided for settlement, the land for the most part being gravelly clay, with fairly large patches of poplar, willow, and alder bottoms.

The surface is somewhat undulating and would be benefited by irrigation. Stock-farming is the chief occupation, settlers growing hay on the cultivated land, while the adjacent hills afford excellent summer pasture. The elevation of this valley is about 2,500 feet above sea-level.

### UPPER ARROW LAKE.

This lake is one of the largest stretches of water in British Columbia. The upper lake reaches from Arrowhead, where the Columbia River empties into it, to a point about 15 miles south of Nakusp, where it narrows, and lower down enlarges for 25 miles into what is termed the Lower Arrow Lake, emerging into Columbia River. The Upper Arrow Lake averages 3 miles in width. The land on each side consists of many tracts of agricultural land and large areas of timbered mountain land and mineral-bearing country. The areas having fair-sized settlements are Arrowhead, Galena Bay, Beaton, Fosthall, Nakusp, and Burton. General farming, fruit-farming, and dairying is general in these places. Besides farming, there is considerable lumbering in the form of making ties, telegraph-poles, shingles, and lumber.

Several mills have been built along the lake. Two are situated at Nakusp. C.P.R. boats ply regularly along the lakes between Arrowhead and Castlegar.

### Pingston Creek.

Pingston Creek (called after Captain Pingston, said to be the first boat captain on the lake) is a swift boulder-strewn mountain stream, about 40 feet wide, lying for the most part in a deep canyon. A sawmill operated by water-power is built near its mouth. A road terminating in a trail climbs the mountain on the south side of Pingston Creek to the summit, where a deposit of zinc has been found. The country adjacent is held for timber limits, the timber being principally fir, cedar, hemlock, balsam, spruce, poplar, and alder.

### Burton.

Cariboo Creek, Snow Creek, and Trout Creek are all mountain streams that join each other at Burton City. In this vicinity exists a large area of agricultural land, a considerable acreage of which has been laid off in 10- to 20-acre parcels and set out in fruit-trees. Burton is located near the narrows in Arrow Lakes and is a fair-sized progressive community. General farming, dairying, fruit, and bee-culture is carried on. Lumbering and mining is also a source of occupation. A road has been built 10 miles up Cariboo Creek. Some shipments have been made from the mines, principally from the Milly Mack Claim, owned by Mr. Forster, of Windermere.

A large number of mineral claims have been Crown-granted in this vicinity. Most of these claims, as well as other surveys, have now been tied in the regular system of survey, so that their relative positions can be placed on the maps correctly.

The land in the vicinity of Burton is chiefly clay, varying to a gravelly clay.

After completing our work in these valleys we moved to McDonald Creek to make further ties. Owing to the lateness of the season, bad weather, thick brush, high elevation, and uncertainty of finding posts this work was postponed for a future period.

### Vicinity of Nakusp.

We then moved to Kuskanax Creek and camped at the hot springs about 9 miles from Nakusp, where we laid out a small parcel of land near the springs for park purposes. These springs are about 3,000 feet above sea-level and are reached by trail from Nakusp.

Nakusp is a fair-sized town with good schools, electric lights and water service, hospital, sawmills, stores, and is the centre of considerable agricultural settlement. It is situated on the east side of Upper Arrow Lake, about 40 miles from the head, and is the terminal of a branch of the Canadian Pacific Railway from Kaslo, on the Kooetnay Lake, as well as a route from Nelson via Slocan Lake.

After completing our work at Twobit Creek on the Lower Arrow Lake the party was disbanded and the camp outfit stored at Merritt, the point of organization.

I have, etc.,

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

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## SLOCAN AND KOOTENAY LAKES, KOOTENAY DISTRICT.

By H. D. Dawson.

Kaslo, B.C., November 27th, 1924.

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

Sir,—Survey operations were carried out along the shores of Slocan Lake and in the adjoining mountainous country between this lake and the Kokanee Park, or more particularly in the 8-Mile, 10-Mile or Enterprise, 12-Mile, Springer, and Lemon Creek country, also on the shores of Kootenay Lake and some small works in the Lower Duncan River, Woodberry and Coffee Creek Valleys.

The bulk of the work consisted of tying in a number of floating surveys on both shores of Slocan Lake and a very large number of Crown-granted mineral claims to the triangulation control system and photo-topographical survey being carried out by A. C. T. Sheppard, D.L.S., working under instructions from the Canada Geological Survey. It was therefore necessary that I should confer with Mr. Sheppard and ascertain the location of his triangulation and camera stations on the ground.

I left Kaslo with a small crew on June 18th and set up camp at Silverton, on the Slocan Lake. It was desired that I should locate the original lot surveys situated on both shores of the lake between New Denver or Lot 485 and 8-Mile Creek or Lot 12455, and for the purpose of tying in these corners make a triangulation survey and tie it in to the main triangulation control above mentioned.

Slocan Lake is about 25 miles long and from ½ to 1½ miles wide, lying in a more or less north-and-south direction and situated approximately midway between the Kootenay Lake to the east and the Arrow Lakes to the west, from which it is distant about 25 miles. The elevation of its summer surface is 1,730 feet above sea-level and it lies in a deep depression, the mountains on either side rising sharply to 7,500 feet, whilst the ridges, extending farther back, rise to peaks of 9,000 feet and over. These peaks are considerably above timber-line and often rise through fields of ice and snow, which fields on the north and east slopes remain throughout the summer. The area is in the midst of the Kootenay Wet Belt; there is frequent rain during the summer and the snowfall in the winter is heavy. There are a large number of short rapid streams and the vegetation is dense and heavy.

It was the discovery of the numerous rich Slocan mineral deposits in 1891 which first brought this country into popular notice, and since then many millions of dollars' worth of silver, lead, and zinc ores have been produced, and there are several mines shipping regularly at the present time, the most noteworthy being the Silversmith, of Sandon. This industry is the first in importance in the district and the Annual Reports of the Minister of Mines will give a great deal of information concerning it.

The second industry of importance is that of lumbering, of which cedar-pole making takes a prominent part. There are a number of sawmills and one planing-mill in the neighbourhood, and several logging camps producing fir, tamarack, hemlock, cedar, spruce, and white-pine logs, of which the last named is at this time the most valuable, it being used in the match-making industry. Small quantities of railway-ties are hewn, but there is not, as far as I am aware, any shingle-manufacturing carried on in the immediate vicinity. Unfortunately the white pine, which, although the most valuable, forms only a small proportion of the total forest stand, is being very heavily attacked by the blister-rust beetle, which will cause death to the tree in two or three years. In particular we remarked a section of the Lemon Creek country in which last year no dead standing white pines were to be seen, but which this year is seen to be dotted all over with patches of reddish-brown foliage as seen from high ground opposite and which denotes that these trees have been killed recently. The beetle is said to propagate best on the black-currant bush of both the wild and cultivated species, and efforts to combat the trouble are being taken by destroying these bushes.

At New Denver there is some ground planted to fruit, but the chief agricultural land of the district is situated along the banks of the Slocan River, draining the lake at its south end, and there is considerable ranching being carried on, hay, fruit, and dairying being the chief branches. Most of the suitable land has already been alienated from the Crown, and new settlers would generally be under the necessity of buying or renting from private parties. There should be little difficulty in picking up a partly improved ranch with a house and other buildings at a reasonable figure, although, on the other hand, there are instances where the owner refuses to sell, except at a figure altogether too high to allow of a reasonable return being made on the capital expended.

On Mondays, Wednesdays, and Fridays throughout the year the Canadian Pacific Railway runs a passenger-boat twice each day up and down the lake from Slocan to Rosebery, connecting in the morning at Rosebery with the train from Kaslo to Nakusp and in the afternoon with the same train on its return trip. Also, on these days a train comes up the Slocan Valley line from Slocan Junction on the Kettle Valley line, arriving at Slocan shortly after noon and connecting with the boat before it leaves on its afternoon run north. In addition, an automobile jitney service is run daily several times each way between Slocan and Nelson. There is also a jitney service between Silverton, New Denver, and Sandon. On the "non-train" days freight-cars are transported on barges up and down the lake, there being ways at Slocan, Silverton, and Rosebery; New Denver being connected with the two latter places by good roads. The bulk of the freight consists of incoming mining and logging supplies, provisions and feed, whilst ores and concentrates, poles, ties, and sawn lumber constitute the chief outgoing freight. There is also in the winter some amount of through traffic between points on the main line Canadian

Pacific Railway and Nelson and other Southern British Columbia points, navigation on the Lower Arrow Lake being then suspended.

There are small sections of sandy beach at the mouths of some of the small creeks on the west side of the lake, whilst the larger creeks on the east side have deposited considerable areas of gravel and boulder-wash, upon which the towns of Silverton, New Denver, and Rosebery have been built. It is also probable that the flat ground on which Slocan is built was formed in the same way by Springer and Lemon Creeks and which has since become covered by the present good loam and clay soil. On the east shore the southerly 10 miles is steep and precipitous, but elsewhere the shores slope evenly up direct from the water's edge, and though steep are heavily covered with timber and underbrush.

There are some natural fish-spawning grounds in Bonanza Creek at the north end of the lake, and it is considered that the fishing should be better than it is. Probably the reasons are the amount of concentrating-mill slimes which are poured into the lake by Silverton or 4-Mile Creek by the Standard Mill direct and by Carpenter Creek, and also the fact of the C.P.R. boat making nine trips per week on a comparatively small lake and a moderately large number of motor-boats, all of which assist in contaminating the waters, especially along the east shore.

The climate is healthy. The summer temperature seldom rises above 95° in the shade and the ordinary hot day has a temperature of about 90°. The unbearably hot nights as known in the East are unknown here, and throughout the summer the nights are cool and blankets will always be needed for comfort in sleeping. On the other hand, summer frosts do not occur and produce is not thereby damaged. The extreme winter temperature seldom falls below 10° below zero, and even zero weather for any period longer than a few days is rare. Snow falls early and remains until late in the spring in the hills, but on the lake-shores it seldom settles before early in December and has usually melted before the end of March. The lake does not freeze over except in sheltered bays or in exceptionally cold winters, but even then the boat, pushing the barge ahead, is able to keep open its passage. The annual rise and fall of water in the lake is from 6 to 8 feet.

My work on the lake-shores presented no particular difficulties, although in some cases some care had to be exercised to find or re-establish the old lot corners, especially where logging operations had been carried out, and except for the last day or so forest-fire smoke did not trouble us.

I then moved camp to Dodd's ranch near 8-Mile Creek, this being the first of a series of fourteen moves made in the mountain country above mentioned. There are in this area very numerous deposits of high-grade galena and argentite ores and medium-grade free-milling gold ores, the last named mostly in the Lemon Creek Valley. In the earlier days many scores of claims were located, worked, and surveyed. But little attempt was made to tie in the surveys with existing surveys, except where they actually adjoined, owing to the great additional expense incurred in carrying out the work in a country at once so rough and so densely covered by timber and undergrowth. Altogether there are about 220 Crown-granted mineral claims and in the lower altitudes many thousands of acres of land surveys, and advantage was taken of the presence on the ground of the Canada Geological Survey carrying out triangulation and photo-topographical work as above mentioned to accurately tie in all these surveys and groups of surveys.

This work was accomplished by finding the most suitable corners, generally two to each group, clearing out timber along the line of sight to two triangulation stations, taking magnetic bearings and dip-angles to them, and erecting a flag over the post. Flags consisted of a vertical flag-pole with large white flag tacked thereto, and supported by a substantial tripod nailed to the pole and the feet securely forced into the loose soil, or in harder ground weighted down with rocks, and tacking on the tripod facing the stations strips of white and red flagging material. Location by means of the three-point system was very rarely possible, owing to practically all the corners coming in positions where it was only possible to be seen from two stations, and, indeed, often considerable time was spent in retracing up the boundary-lines in order to find a post or position in the vicinity where even two stations might be seen, and then only after some hours spent in felling timber. In cases where flags were not erected immediately over a corner post traverses were run to connect. It was found to be poor economy to stint in the matter of flagging material, and it was always advisable not only to cut out good wide

swathes along the lines of sight, but also to open up round the flag itself in order to let in lots of light. Under these circumstances, whilst the flags were very readily picked up from the stations in good atmospheric conditions, yet in bad weather, in rain, impending rain, or fog, or even when sighting almost into the sun, and with the given magnetic bearings and dip-angles reversed to confine the area to be searched, it was frequently a matter of very great difficulty to locate the flag. In ordinary triangulation and photographical work the stations are erected on exposed ridges or summits, or on other prominent points of vantage, and can thus be readily picked up even in comparatively bad weather. It was always advisable to use red in addition to white, as although under certain conditions the red is almost invisible, yet when, as later was the case, snow covered the ground, then the red was always the first to attract the attention when searching for the flag through the instrument.

In this way eighty-three corners were opened up and flagged and located, of which number eight were also used as stations from which to locate other flags. Forty-seven sub-stations were erected and occupied. And for the purpose of cutting in these flags thirteen of Mr. Sheppard's stations were occupied. The work in the mountains occupied three months and during this time we tramped 630 miles and climbed a total of 193,700 feet in altitude.

The weather at first was very good, with just sufficient rain to keep down smoke, but by the middle of September it became bad, and snow fell day after day above 5,000 feet, with, of course, rain at lower levels. The accompanying low clouds, swirling around the higher country, impeded our work and the rough conditions caused a good deal of extra physical strain. In climbing up to the stations we would quickly become soaked from head to foot from the wet brush and snow, and having arrived at the station it would be absolutely essential to light a fire as quickly as possible, otherwise it would have been quite impossible to have endured the raw biting winds and the excessive evaporation of the high altitudes whilst waiting for the fogs to roll off and doing the instrument-work. Once the clothing became dry it was then possible to stay with the job.

Car-load lots of ores shipped from this locality have sometimes run as high as $1,500 per ton, and shipments of from $400 to $600 per ton have been frequent. The deposits, however, are usually small and narrow and these high tonnage values are obtained by carefully sorting the ores, the waste being thrown out on the dump. Consequently there are dumps which pay for being again turned over and sorted or milled. Such work has been going on on the Ottawa dump for a number of years. Owing to the roughness of the country, the long snowy winters, and the distance the properties are from shipping-points the expenses are high. Not only has the ore to be brought out many miles by pack-train or rawhiding to wagon-road and then teamed down to the railway or wharf, but mining supplies, provisions, and a large amount of miscellaneous freight has also to be taken up to the property, and as the older prospectors pass out few of the younger generation take their places, preferring to go elsewhere for what appears to them to be greater opportunities. There is no doubt, however, that with advance in labour-saving appliances, more efficient machines and explosives, and better methods of beneficiation and treatment of the ores, many of these deposits will again be opened up and on a more economical basis bring no small profits to many an enterprising individual.

For the first 5 miles up Springer Creek the valley is steep and deep, but above this it widens out and in the basin there are probably 1,000 acres of very good grass, and during the summer months it would be possible to run a fair-sized herd of cattle profitably. It is said this was tried on a small scale some years ago with some success, but at that time excitement over mining was high and not sufficient attention was then given to the possibilities of this business.

### NORTH END OF KOOTENAY LAKE.

From here I moved to Lardeau, at the north end of Kootenay Lake, and to Lot 219, some 4 miles up the Duncan River on its east bank. It was desired that I should re-establish the north and east boundaries of this lot, the north-east corner post or position of which could not be found, and there being considerable doubt as to whether the present lines purporting to be the boundaries in question were the correct boundaries or not. The lot was originally surveyed in 1890 and all original evidences have since disappeared.

There are parts of the valley of the Lower Duncan River that would form some exceptionally fine hay and ranching land. The northerly portion of this Lot 219 has a subsoil of fine river-silt without a rock in it, as seen exposed along the banks of sloughs 8 or 10 feet deep.

Occasionally, in other parts, there is rocky and boulder wash and poor soil, if any; but these areas are generally well defined and it is possible to avoid them. A good deal of the land is liable to flooding at high water, but this may and likely will be remedied in the future. Much of the land in the valley is held under timber licence or otherwise alienated from the Crown. There are at the present time a number of ranchers located. As in the Slocan, there are in this valley also very numerous deposits, generally of silver-lead and gold, but for the same reason as mentioned above, few of them are at present being worked. One prospector has staked on a molybdenum and bismuth lead. The time will certainly come when the deposits will be opened up and profitably worked.

On my way out at Lardeau I made a number of small ties in the Lardeau Townsite, and also surveyed a reserve for a "stake anchor light" for the Department of Marine and Fisheries.

I then moved back to Kaslo and tied in two of Mr. Sheppard's Kootenay Lake triangulation stations to the nearest surveyed lot corners, and then moved south again and camped at the mouth of Coffee Creek, where it was desired to tie in two more of Mr. Sheppard's stations and to make a number of further ties.

### Kootenay Lake.

The Kootenay Lake is one of the best-known portions of the Interior of British Columbia, and has been frequently referred to and described in previous reports of the Minister of Lands and many other departmental publications that it appears to be unnecessary to enter into any detailed report upon it.

The climate is practically identical with that of the Slocan Lake outlined above. The main lake does not freeze over, although the West Arm may in severe winters become frozen.

The shores have a number of settlements and practically all the agricultural land has been already alienated from the Crown, although there are a few surveyed lots open.

The Kootenay Lake cherries are amongst the finest grown anywhere and the apples are gaining a desirable reputation in the world's markets. Both cherries and apples were exhibited at the Wembley Empire Exhibition in London and gained favourable comment.

Points on the lake south of and including Kaslo are well served by daily passenger-boats both ways, run by the Canadian Pacific Railway. Crawford Bay and points north of Kaslo are served twice per week. Kaslo is the eastern terminus of the Kaslo–Nakusp Railway, and there is a train service three times a week, leaving Kaslo in the morning and returning in the evening.

Fishing in the lake is very good, chiefly trout and salmon. Salmon up to 22 or 23 lb. have been caught. Hunting of both large and small game is also very good.

The lake owes its first settlements to the discovery of high-grade mineral deposits in the vicinity of Nelson and Ainsworth, and mining is still the most important industry carried on. Full reports may be found in the Minister of Mines' publications.

At the north end of the lake at Argenta, in the valley of the Duncan River, and at Kaslo lumbering operations have been conducted for a good many years, with the ups and downs usually connected with this business in the Interior, but it is a business which will undoubtedly grow.

The district is rather badly in need of roads, and in spite of the great cost in a rough country great efforts are being made to link up the various settlements, and to afford facilities for tourist automobile traffic which it is believed will bring a large amount of business to the district.

Whilst at Coffee Creek the weather set in again so badly and delays were so frequent that, although some small works yet remained to be completed, I decided to close down operations for the season, and I therefore returned to Kaslo and disbanded my party.

I have, etc.,

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

## BLUEBERRY CREEK, KOOTENAY DISTRICT.

BY A. L. MCCULLOCH.

NELSON, B.C., January 20th, 1925.

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

SIR,—Blueberry Creek is a tributary of the Columbia River situated about 11 miles north of the City of Trail, 18 miles in length, and has a drainage area of 60 square miles. There is a considerable area of commercial timber on the upper stretches about Sheep Lake, elevation 4,300 feet, and a limited area on the lower portions of the creek surveyed by me, but in the main the creek watershed has been pretty well burnt over in recent years. The creek, being of some size, has eroded the valley to a considerable depth below the bench lands.

The lands surveyed by me may be divided into three groups as follows:—

Group 1 comprises the lands near the Columbia River, consisting of five lots of a total area of 280 acres, adjoining improved ranches, and while containing but small areas of arable land, are in demand by ranchers as grazing land and for firewood. These lots are readily accessible by existing logging-roads through them to the school and the C.P.R. station at Kinnaird, at distances of from 1½ to 2½ miles, also by the same means are about the same distance from school, post-office, stores, and railway-station at Blueberry Creek Post-office.

Group 2 comprises lands along the main Blueberry Creek, comprising fifteen lots of a total area of 1,080 acres, mostly of typical Kootenay sandy loam soil, somewhat stony in places and with rock-outcrop in some sections. There is considerable area of bench land south of the creek; the bench lands north of the creek having been previously surveyed. Most of these lands are covered with timber, that north of the creek being scattered trees of large size of pine, fir, and tamarack in open country. South of the creek there is a considerable area of medium-size pine, fir, cedar, tamarack, etc., with very little underbrush.

Nine of these lots have Blueberry Creek running through them; five others have tributary streams through them, and only one lot of 40 acres on which there is not ample water for domestic purposes and for stock.

These lands are situated from 2½ to 5 miles from the motor-road, railway-station, school, post-office, and stores at Blueberry Creek Post-office, to which access is had by means of logging-roads, a distance of 2½ miles to the most easterly lot of the group; thence up the creek by a good pack-trail on the north side of the creek, which can later be widened to a wagon-road.

Most of the lands surveyed in this group are south of Blueberry Creek, and on account of the depth of the erosion of the creek are rather inaccessible to the trail and the probable road-location on the north of the creek.

Group 3 consists of four lots of a total area of 335 acres on Judkin Creek, a tributary of Blueberry Creek. The basin on Judkin Creek forming the principal arable portion of this group was formerly known as the Judkin pre-emption, but was abandoned by him during the war. This basin is well watered with springs. These lands are covered with a moderate stand of timber of fir, pine, cedar, tamarack, etc., and are at present under a reserve by the Forestry Department.

The climatic conditions are very favourable for ranching, a precipitation of 30 inches annually, with an average rainfall from April 1st to October 1st of 12 inches. The winters are moderate, the temperature rarely going to zero, but with considerable snowfall in the winter.

I have, etc.,
A. L. MCCULLOCH, B.C.L.S.

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## KIMBERLEY, KOOTENAY DISTRICT.

BY B. A. MOORHOUSE.

CRANBROOK, B.C., November 15th, 1924.

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

SIR,—Work consisted of resurvey and subdivision of all those parcels of land lying to the east and north of the town of Kimberley, situated in close proximity to the road locally known as the "Old McGinnity Trail," which have reverted to the Crown after having been logged over by the Otis-Staples Lumber Company, of Wycliffe, B.C.

These expired timber licences have a combined area of approximately 5,375 acres, and lie on a fairly level plateau commencing about 3 miles east of Kimberley by wagon-road and extending some 2 to 4 miles in an easterly direction and about the same distance north and south. Considerable of the area surveyed adjoins land already occupied and in many cases cultivated, and the lands to the south comprise the northern extent of what is locally known as St. Mary Prairie, a large open area where grain and other produce is grown extensively. This prairie has been under cultivation for many years, and during the wet cycle of years from 1914 to 1920 was productive of large crops of wheat, oats, and other grains, and it is also well known for its potato and garden products.

During the last two years (dry seasons) considerable exploration-work has been done in order to secure, if possible, an adequate supply of water for irrigation of the cultivated lands in this district from the hills to the north and west. If this project materializes the lands surveyed this season and reported on herewith will become the hinterland of the present farmers of St. Mary Prairie, and I have no doubt will be eagerly sought after once an irrigation system is assured. Even without irrigation considerable of this area is very suitable for the growing of grain, potatoes, and other vegetables, all of which are assured of an excellent market in the growing town of Kimberley, only 3 or 4 miles away.

To the pioneers of the East Kootenay District the "Old McGinnity Trail" brings back memories of the years before Cranbrook was, and old Fort Steele was the city of the district. This trail was built in the period of the mining boom of the seventies and for years was used to haul ore from the North Star Mine (south of Kimberley) to Fort Steele, where it was shipped down the Kootenay River to Jennens, Mont. Shortly after, the now famous Sullivan Mine at Kimberley was staked and has since developed into the largest silver-lead and zinc mine in the world. At this mine alone 1,000 men are employed and it is worked most of the time in three eight-hour shifts.

There has also been built in connection with the Sullivan Mine a $2,000,000 concentrator, which employs a large number of men, and since its commencement of operating has worked the twenty-four hours in three shifts.

The town of Kimberley has a population of 2,500 and is growing very rapidly; it has domestic water and electric-light supply, the power for this and the requirements at the mine and concentrator being supplied from the East Kootenay Power Company at both Bull River and Elk River Falls.

Such is the busy mining centre of Kimberley, near which these lands are located, providing a market close at hand for all the hay, vegetables, poultry, and farm produce that could be produced, and also during the winter creating a large demand for cordwood, which can be obtained in quantities from most of the lots surveyed.

The Canadian Pacific Railway runs daily trains to Kimberley and Marysville, and none of the lots are more than 5 miles from a station. There is also a post-office at Marysville and every kind of store, churches, schools, and theatre and post-office at Kimberley.

To the north are the large lumber camps of the Otis-Staples Lumber Company, where large crews of loggers are employed most of the year. Also the camps provide another market for farm produce.

Regarding the soil, this varies from a rich black loam to sandy gravel, which is the predominant formation of most of the land. There are small areas where bed-rock is found and some stony patches, though grasses grow abundantly, with small bushes as undergrowth.

The stumps from logged-off timber are scattered all over the land, and there stands some tall semi-dead fir, pine, and tamarack up to 2 inches in diameter, with considerable 6-inch jack-pine, etc. In the lower damp places dense tall willows and poplars are to be found, showing evidence of underground water.

The cost of clearing the lands for cultivation varies as to the timbered extent of the lot, though in most cases the fuel-supply taken off would compensate greatly towards the full cost of this work. From $30 to $50 per acre would be the cost of clearing the more densely timbered lots.

The annual rainfall in the Kimberley District is rather more than that of Cranbrook, the western and northern hills causing more precipitation, this being about 18 inches annually. A heavy snowfall is usual also; at the present time there is 3 feet, with a likelihood of having double that amount before winter closes.

During the season black bear and deer were seen by the surveyors and fish can be obtained from Cherry Creek. Grouse and chicken were very plentiful up to September 15th; but they seem to take to higher altitudes then.

Cranbrook, a city of 3,500, is to the south-east of the lands surveyed, about 20 miles by motor-road and railway, and has an altitude of 3,020 feet above sea-level, whilst the lands surveyed range from 3,400 to 3,700 feet above sea-level. Kimberley lies about 3,600 feet.

A few prospective locators came to visit the land during the course of survey, and also inquiries were made about it from the Government Agent at the Land Office at Cranbrook, thus showing that when this land is opened up some are ready to take the first choice, which is always the most profitable.

I have, etc.,
B. A. MOORHOUSE, B.C.L.S.

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## HARRISON LAKE AND LILLOOET RIVER, NEW WESTMINSTER DISTRICT.

BY H. IDSARDI.

VANCOUVER, B.C., November 12th, 1924.

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

SIR,—Work was commenced at the north end of Harrison Lake on June 9th. This is the period of high water, and I found that it was not possible to start with the triangulation of Harrison Lake owing to the water being backed up in the willow-bush at the head of the lake and preventing us from laying out a base-line. A start was therefore made on the traverse of the road running up the Lillooet River from Douglas Townsite at the head of Little Harrison Lake.

Douglas Townsite is a place of some historical interest and was laid out by the Royal Engineers about 1860. Nothing now remains of the buildings which once stood there, except portions of a stone wall where the Magistrate's house had been and a grass-plot with paths marked out by rows of stones. My instructions called for a definition of the boundaries of the townsite, and, since no posts could be found, the boundaries were run in correct relation to the topographical features as shown on the original plan.

The traverse up the road is 28 miles long and continues to the lower end of Little Lillooet Lake. Connections to existing surveys were made along the way and little difficulty was experienced in finding old corner posts owing to the absence of fire and logging operations. Transportation by wagon was readily furnished on short notice by Indians at different places, who proved quite reliable and were always on the spot when wanted.

The road is one of the oldest in the Province and was built in the early sixties by the Royal Engineers at the instance of Governor Douglas for the purpose of asserting his rights to the country and maintaining law and order among the miners, who at that time were making their way in large numbers to the goldfields of the Cariboo. Heavy freighting was done on the road in those days by twelve-ox teams, and later on considerable use was made of it by the Pemberton Indians for hauling supplies up to 1913, when the Pacific Great Eastern Railway commenced operations. There are still to be seen relics of the old days in the shape of the remains of log cabins which served as stopping-places along the road, the most notable of these being at Little Lillooet Lake, where there was a small settlement. At this point supplies were taken up the lake 4½ miles on a paddle-wheel steamer and portaged 1 mile to Lillooet Lake, when they were again taken by steamer 16 miles to the head of the lake, where the road continues on to Pemberton.

The rapids between Lillooet Lake and Little Lillooet Lake are about half a mile long, about 300 feet wide, and the drop is 13 feet. Canoes and gas-boats can be taken up by poling and lining, but the old paddle-wheelers could not get up, and an attempt was made to drown the rapids by constructing a dam some 300 feet long at the lower end of Little Lillooet Lake, so that steamers could get up and avoid the portage. Remains of this dam are still to be seen and reflect the pluck of the old-timers in trying a hold a river as large as the Lillooet with a dam such as they could build.

Our work on Lillooet Lake consisted of connecting traverses on Lots 825 and 4101, which were made in record time owing to the mosquitoes, which were almost unbearable, and it was only by wearing veils made of mosquito-net and cotton gloves that we could stand it at all.

### Lillooet River.

Lillooet River Valley extends in a north-westerly direction from the head of Harrison Lake. The valley, which averages half a mile in width, is upwards of a mile wide at the lower end, but narrows rapidly and in many places the mountain-sides extend to the river-bank. The river is about 1,000 feet wide at its mouth and narrows down to an average width of 300 feet. It rises about 20 feet in the mile on an average, reaching an elevation above mean sea-level of 360 feet at the top of the falls at Skookumchuck on Indian Reserve No. 4, and an elevation of 655 feet at Lillooet Lake. Harrison Lake is at an elevation of approximately 35 feet.

Agricultural land is very scarce and the best of it is covered by Indian reserves. There are no white settlers and very little cultivation is done by the Indians, who grow a little hay and a few potatoes on land cleared by white men in the early days.

Timber consists of fir, cedar, and hemlock, averaging about 3 feet, but reaching a much larger size on bottom land, where it is better nourished than on the steep rocky mountain-sides. Stands of jack-pine up to about 10 inches are to be found on level sandy stretches along the road, resembling the Upper Country more than the Coast. Logging operations are carried on during the winter by the Harrison Bay Company with horses on Indian Reserve No. 10, where there is a good stand of fir and cedar, and the logs are driven down the river in the spring freshets and boomed up on Harrison Lake.

Cottonwood logs have also been handled in this way, but have been cut farther up in the neighbourhood of Pemberton. There is considerable fir and cedar timber in the valley of good quality which could be taken out by driving the river, but it is scattered and good logging shows with donkey-engine are scarce, while the rough rocky ground makes it impossible to operate profitably in a small way with horses, except in a few places. There is good fir and cedar timber on Lot 1274 on Gowan Creek, but a crooked canyon makes it impossible to get logs down the creek, although bolts would probably go through all right. Good fir and cedar are also found on Lot 940 on Snow Cap Creek at the head of Glacier Lake, and could be taken out without serious difficulty.

The only other operation in the valley is on the Indian reserve at the head of Harrison Lake, where there is a bolt camp run by the Harrison Bay Company, which also owns the store at Tipella, on the west side of the lake. Some years ago logging operations were carried on with donkey-engines at Spring Creek, about 3 miles above Tipella, and this valley, which is about 14 miles in length, rising on an easy grade south-westerly to the Stave River, seems to be the only place for an operation of any size and is feasible as a railway proposition, according to those who know the country.

Mining operations for gold are carried on in a small way at different places. There is a group of five Crown-granted claims on Gowan Creek owned by Jack Grant, of New Westminster, who, with a partner, worked for four months driving a tunnel on his property this summer. Farther up the road below 25-Mile Creek are the Iron King and White Star Groups, which have been worked at different times. Twenty-five-mile Creek seems to be the gold-hunter's favourite spot, for gold has been taken out of the gravel and the impression seems to be general that the mother lode is not far away.

### Fire Mountain.

Fire Mountain lies about 15 miles north-west of Harrison Lake and is the most prominent peak seen when looking up the lake at the upper end. It rises to an elevation of about 7,500 feet and can be seen from the Lillooet River Valley nearly as far up as Little Lillooet Lake.

Fire Lake, which is at an elevation of about 3,400 feet, lies on the southerly slope of the mountain and is reached by a horse-trail 8 miles long running up Fire Creek; the total distance from Tipella to the east end of the lake being 13 miles.

Our work on the mountain consisted of a survey of the lake and tying in mineral-claim surveys and mineral monuments. These monuments were planted in 1897 and 1898 by Livingstone Thompson, who lost his life by drowning when the steamer "Clallam" was wrecked in 1904 before his plans were completed. One of the monuments on the mountain and a couple up the valley have since been found and tied in by surveyors, but the numbers on the posts

indicate that there are many still unaccounted for. It was the intention to have future surveys tied to these monuments, and we were fortunae enough to find four more on the mountain and three up the valley.

We began our work by finding and flagging the corner posts and mineral monuments up on the side of the mountain, so that they could be seen and tied in by triangulation from the traverse run on the south shore of the lake. The locality lent itself well to this scheme and the connections were quickly made, with the exception of a few shots at the west end of the lake, where we were held up by fog and rain. Some of the claims were not so easy to tie in and required traverses, and it happened that these claims were the most difficult to find owing to the very scanty information in the original field-notes regarding their location. In cases of this kind information from local people was of great assistance, for they were familiar with the names of many of the claims and could direct us to trails leading to places where work had been done on the properties, and after that it was mainly a question of finding topographical features on the ground that were shown on the plans and pacing from these to where the lines and posts should be.

The most important claims on the mountain are in the Money Spinner Group, where operations for gold were carried on in 1898, with a very complete plant consisting of a stamp-mill and aerial tramway 2,400 feet long. There is a tunnel 400 feet long driven on the Money Spinner Claim, and from there the ore was carried down in steel buckets on the aerial to the mill 800 feet lower. This aerial consisted of an endless cable supported at intervals by A frames and passing around cast-iron sheaves at each end, which must weigh close to 2,000 lb. each. These sheaves or pulleys were made in sections, bolted together to facilitate transportation, but even at that considerable labour was necessary to get them in place. The buckets held about 2 cubic feet and would help the aerial to work as a gravity system, although power may have been applied at the lower end from the mill. All this equipment is lying in a wreck in the woods where it fell.

The mill consisted of a boiler-house and engine-room, with blacksmith-shop, assay-room, and other mining outfit. The bunk-house is close by and accommodated the men at the tunnel, as well as the millmen. The buildings are all of rough yellow-cedar lumber cut on the site and the remains of the sawmill-carriage are still to be seen.

The boiler, 44 inches in diameter by 11 feet long, is still in its setting of brickwork, and the engine, an 8 by 12, is still in place and protected from the weather, for the engine and boiler house is still standing, while the adjoining building which housed the mill machinery has collapsed under the weight of snow.

Sleighs were used to haul the boiler and engine up the trail, but much of the equipment came up on pack-horses. The cable for the aerial was made up in coils, each of suitable weight for packing on a horse, but not cut in separate lengths, and was loaded on a pack-train in this way, the horses having to keep about the same distance apart on the trip.

Vancouver capital was mainly interested in this mining venture and it is regrettable that so much money was wasted through what appears to be lack of competent engineering advice. It seems as if the showing at the tunnel was not large enough or thoroughly enough developed to justify the installation of a plant such as was put in, for it operated only a very short time after the surface showing was taken out.

Gold has been taken from the mountain at different times by men operating in a small way, and their work is in evidence at many places. Prospectors continue to go up every season and do a little work, and I frequently saw new staking-posts, showing that their interest in the country is still continued.

### HARRISON LAKE.

Our work here consisted of a triangulation of that portion of the lake lying north of the Dominion Government Railway Belt and connections to existing surveys and mineral monuments.

A base-line approximately 1 mile long was laid out on the driftwood at the head of the lake and chained in accordance with the instructions for such work. Two triangulations were necessary in the line, one at the Lillooet River, which is a 1,000 feet wide at its mouth, and the other at Tipella Slough, and one deflection angle had to be made. The low water in August was a great help and allowed us to keep outside the willow-bush and work on that part of the driftwood that was aground. High winds were frequent and it was generally impossible to land from a boat on the driftwood, making it so that to cross the river meant a roundabout trip.

The work had to be planned accordingly and we could generally arrange to spend a day on one side of the river or the other.

Smoke was troublesome during the first part of September, making it difficult at times to take long shots, and heavy rains set in after the 20th of the month, which slowed up the work a little. I was surprised to see how rough it could get on the lake at times, and was thankful that we had a good sea-boat with a cabin, for an open boat would almost certainly have swamped in some of the blows that came up suddenly and overtook us while crossing the lake.

Beacons of the usual type, made of poles 12 to 15 feet long, cut in the woods and white-washed, were erected at triangulation stations and the instrument set up underneath. Holes were drilled in the rock for cementing in the bronze monuments and were located by plumbing down from the intersection of the poles. A check base-line approximately 1 mile long was measured along the beach near the Railway Belt and consisted of a traverse of eight courses. The bearings of these courses only varied by 15° at the most from the bearing of the base-line, and the deflection angles were read by the repetition method, the same as at triangulation stations, so that it seems as if the error created by having the base-line made up of courses instead of being straight should not be appreciable.

The shores of the lake are, for the most part, very rocky and steep, especially on the east side. The slopes are heavily timbered with fir, cedar, and hemlock, and logging operations have been carried on along the west side near the Railway Belt, where there is a fairly good piece of country, broken in places by rock bluffs, but containing much light soil where timber can thrive.

Doctor's Point, a well-known landmark on the lake, is situated on the west side about 8 miles above the Railway Belt, and so named on account of having the figure of a man crudely painted in red and white on the rock bluff. The old-time Indians are supposed to have been responsible for this and to have believed that the doctor controlled the winds on the lake according to his moods. Nothing was evident to support this superstition, with the possible exception that at times it might be blowing heavily above the point and be comparatively quiet on the lower side.

### Game.

Black bear were numerous in the valley this season and a young one wandered into the camp one morning. Berries were scarce on the hills and caused the bears to come down earlier than usual and hunt for salmon along the river. Grizzlies are common at 25-Mile Creek and three of them came into the Indian village at Skookumchuck one afternoon. In the ensuing scramble for a safe place two of the local braves collided with such force that both were thrown to the ground, and all were put to shame by a visiting Indian from Pemberton, who shot one of the bears and frightened the others away.

Deer and goat are to be found, but are not plentiful. A few marten and mink are trapped by the Indians, one of whom has a trap-line running up from the head of Glacier Lake. Grouse were fairly plentiful, especially at the higher elevations.

Much assistance was given us during the summer by Albert Purcell, of Douglas, who was always ready on short notice with a gas-boat, wagon, or pack-horses, and his knowledge of Fire Mountain helped us to find and tie in some mineral claims which would otherwise have been difficult to locate.

I have, etc.,

H. Idsardi, B.C.L.S.

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## NEW WESTMINSTER DISTRICT.

By M. W. Hewett.

Vancouver, B.C., September 11th, 1924.

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

Sir,—Surveys were made in New Westminster and Lillooet Districts. The first camp was made at Daisy Lake Station, where I subdivided Lot 3114 (surveyed some eight years ago by John Elliott) into four new lots of approximately 20 acres each, and surveyed the vacant Crown land lying to the east of the Cheakamus River and to the west of Lot 1953 and Daisy Lake, dividing it into four small lots.

On completion of this work we proceeded by train to Mons Station, on the south end of Alta Lake, and I surveyed a small leasehold on the east side of Alta Lake in the north-west corner of Timber Licence 9434 and vacant Crown land on the east side of Alta and Nita Lakes and west of Timber Licence 9434 and north of Lot 4749, cutting the latter into two small lots.

From here, by courtesy of the railway officials, we moved by gasolene hand-car to the premises of the Green River Lumber Company near the crossing of the Soo River. Here I moved the boundary-line between New Westminster and Lillooet Districts (established by C. T. Hamilton in 1912) 38.7 chains to the north, marking it by posts on the railway, the old Pemberton Trail, and the east and west banks of the Green River, and tying into it Lot 3626 on the east side of Green River and Lot 760 on the south side of the Soo River.

Leaving here, we returned to Daisy Lake to make additional ties to mineral claims on Daisy Lake, and thence west to Vancouver.

Leaving Vancouver the following day, we proceeded by launch to Vanguard Bay, on the north side of Nelson Island. Here I made a triangulation of the mouth of Jervis Inlet, tying Lots 2090, 3009, 2558, 2695, 4121, 1486, 1489, and 2939, and surveying as Lots 5414 and 5415 two islands in the northern entrance of Blind Bay. I also attempted to tie the south-east corner of Lot 1489 to the south-west corner of Lot 2700, but was unable to satisfactorily identify the post of Lot 2700.

Work here was hindered to some extent by smoke. Proceeding to Agamemnon Channel, I tied Lot 2006 by triangulation to my last season's survey of Lots 5401 to 5408.

From here we proceeded to Secret Cove, where our launch left us. Here I reran the north and east boundaries of Lot 1478, using as north-east corner a post established by J. H. Bushnell from the original bearing trees, which are still standing, one being dead; the other on being opened showed over thirty years' new growth over the old blaze. I also corrected the south-east corner of Lot 2309, the north-west corner of Lot 2394, and the post of a subdivision of Lot 2394, made last spring by John Elliott.

I also laid out a new lot, 4661, on Secret Cove, and Lot 5416, in the south-west corner of Timber Licence 38783, to replace the remainder of the former Lot 4661.

The next work was on Redonda Island, where I reran the south boundary of Lot 698 from the south-west corner on Deceit Bay to the south-east corner, picking up the north-east corner of Lot 2241 and the north-west corner of Lot 2098. The post at the last-named corner was found at the distance shown by N. Humphrys in his notes of Lot 2241, the top being badly charred by this summer's fire. Both bearing trees were found, but one being charred and illegible, and neither agreeing altogether as to bearings or distances with H. A. Youdall's notes, I verified the corner by running south 20 chains, finding there the original post marked and legible and the original bearing trees at the end of a well-blazed line.

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

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## NEW WESTMINSTER DISTRICT.

BY NOEL HUMPHRYS.

VANCOUVER, B.C., October 24th, 1924.

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

SIR,—The season's work comprised the following:—

(1.) Subdivision of Lot 1392, N.W.D., Bargain Harbour, into thirty-two lots of from 3½ to nearly 10 acres each, averaging approximately 5 acres each.

(2.) Tie survey from T.L. 38806, Siwash Creek, Salmon Arm, to T.L. 35234 on McNab Creek, Howe Sound.

(3.) Tie-line from T.L. 3940P and 979P (Lots 3271 and 3272), West Creek (Siwash Creek), to T.L. 42405 and 4, and 37258, Rainey River, Howe Sound.

(4.) Relocation of Lot 353 and group of old Crown grants adjoining on Mount Donaldson, between Siwash Creek and Clowhom Lake, and tie-line therefrom to T.L. 44703, Siwash Creek.

(5.) Tie-line from Lot 353 above to T.L. 36407, Copper Creek (Clowhom Lake).

(6.) Survey of beacon-site for Department of Marine, portion of Lot 343, Texada, south point of Texada Island.

(7.) Tie-line from Lot 1306 to Lot 1307, near Bliss's Landing, Malaspina Peninsula.

Leaving Vancouver on July 6th, camp was established on the island in Bargain Harbour (Lot 2568) as being the most convenient spot from which to subdivide Lot 1392. Water for camp had to be fetched in a boat first from the spring on the mainland shore between Lots 1392 and 2815, and later, as this ran dry in daytimes, from Wharnock's spring on Lot 1362, Francis Peninsula, the summer of 1924 being unusually dry.

### Bargain Harbour.

Lot 1392 consists generally of broken but low rocky country, being a series of granite ridges and small bluffs, with shallow soil or none at all, interspersed with numerous small valleys or draws, which as a rule contain good soil and are covered with a dense growth of alder and maple. The eastern portion of the lot rises steeply in a series of almost perpendicular bluffs in places and is of little value. The shore-line from the lagoon on Pender Harbour side (north-west corner of Lot 1392) around Canoe Pass, Oyster Lagoon, and Bargain Harbour is very irregular and broken, with numerous rocky points and small bays and indentations. I have endeavoured, however, in subdividing the lot, to give each block a bit of beach or a bay suitable for boat-landing, a good building-site, sufficient land for a garden, and, wherever possible, a likely spot to dig a well.

All the blocks front on either Pender Harbour Lagoon, Pender Harbour, Bargain Harbour, Oyster Lagoon, or Lillie's Lake, with the exception of Block 26.

Provision for access to blocks not fronting on deep water has been given by means of 40-foot road allowances from Lillie's Bay to Lillie's Lake and around west shore of lake, along the telegraph-line from a point a short distance from the south-west corner of Lot 1392 to the south-east corner of Lillie's Lake and along the east shore of the lake, and from Bargain Harbour between Blocks 11 and 12 to Oyster Lagoon, along east side of Lagoon, and to Pender Harbour Lagoon between Blocks 5-1 and 18-19.

As a summer resort Bargain Harbour is indeed a lovely spot. There are endless nooks and bays for boating and splendid sailing on adjacent waters of the Strait of Georgia, with many small sheltered gravelly beaches providing good boat-landings and ideal bathing-spots, while, as is well known, the waters in and around Pender Harbour and Bargain Harbour are unexcelled for sea-fishing, and the numerous lakes near by are plentifully stocked with trout. The convenience to Vancouver, with excellent daily steamer service, is another factor of value.

There are natural oyster-beds at Oyster Lagoon, which, I am informed, were pretty nearly cleaned out by Japanese fishermen, but appear now to be rapidly increasing. These oysters are of good colour, slightly larger than the Olympia oyster, and very palatable.

As indicated in my opening remarks, there is a considerable lack of natural water-supply in and around Pender and Bargain Harbours and vicinity.

The water in Lillie's Lake becomes very warm and somewhat stagnant in dry seasons. I found seepage, however, at many places along the shore, and am convinced that excellent water-supplies may be obtained in shallow wells near the shore on practically every block in the subdivision. This is indicated by the fact that Mr. Donley, who owns the island (Lot 2568) on which I camped, lived there with his family for a number of years and obtained an excellent and constant supply of good cold water from his well, which has now caved in; and the island is, naturally, a good deal drier than the mainland.

The subdivision of Lot 1392 will make ideal summer homes for city people, and will provide, in addition, good home-sites for fishermen, many of whom are already located at different spots around Pender Harbour.

I found, in doing the work, that it was economy to use two small parties and two instruments, as on account of the irregular shape of the lot there was a lot of running around to do and numerous small intersections and traverses to make. The ground being generally rather rough and covered with windfall and thick brush, it was slow work cutting line.

The resurvey of the boundaries, as seen by the map, is considerably different from the original survey. This may be largely accounted for by the fact that (the original survey having

been made by a compass) the local attraction all over the lot and more especially along the shore is excessive and very variable. It is as much as 25° in places.

There is, however, little or no visible sign of mineral, save for occasional indications of iron-stain in the granite rocks.

The greater part of Lot 1392 has been partially logged and burned over at least twice, so that most of the ground is now covered with occasional groups of scorched scrubby fir, hemlock, and some cedar, with much old windfall, and a dense undergrowth of salal, second-growth fir and hemlock and cedar, alder, some maple, wild syringa, and various berry-bushes.

There is a good trail along an old skid-road from Lillie's Bay to Lillie's Lake, and numerous old skid-roads, which afford ready access to various parts of the lot. There is also a good trail along the Government Telegraph Line, which runs from a point on the south boundary 2½ chains east of the south-west corner to the south-east corner of Lillie's Lake and from the lake north-westerly to Pender Harbour.

The shores of the lake are generally swampy for a short distance, and the lake itself, though deep, is full of vegetable matter and old logs and trash. There are plenty of small trout in the lake.

The natural outlet is northerly to Pender Harbour, but in wet seasons there appears to be an overflow southerly to Lillie's Bay on Bargain Harbour. In the dry season there is no outlet running and the lake-water becomes very warm and somewhat stagnant. The lake does undoubtedly, however, provide a good natural reservoir, and probably the seepages at different places around the shore have their origin there.

The eastern portion of the lot, a strip of 9 chains along the east boundary, is left in one piece as Block 33, and consists of steep rocky mountain-side covered with a fairly thick growth of scrubby and generally faulty fir timber of little or no value.

A more detailed description of the property block by block will be found in the detailed report accompanying the plan of subdivision.

In addition to a resurvey of the boundaries and subdivision of Lot 1392, I relocated the small portion of the Indian reserve (No. 24) on the point on east side of Canoe Pass, no sign of which could be found, and made a resurvey, renewing corner posts and rerunning boundaries of the larger portion of Indian Reserve No. 24 on the west side of Canoe Pass.

Canoe Pass goes completely dry at every tide and is navigable for the average gas-boat with a 9-foot tide or over.

The subdivision of Lot 1392 entailed running approximately 8 miles of boundary-lines and traverse, not including short tie traverses for setting some of the shore posts, and intersections along road allowances and the setting of about 140 posts. All posts are made of cedar and are approximately 4 inches square and 3 feet or more above the ground, and I have set stone cairns around all but a few which are in soft ground.

### SIWASH CREEK.

Work at Bargain Harbour being completed on August 3rd, I moved my outfit to Siwash Creek, near head of Salmon Arm, by gas-boat through the Skookumchuck Narrows and made camp there. The next few days were spent fixing trail, packing in supplies, and searching for old lines and corner posts. I obtained the services of J. P. Hatt, who was with Mr. Hewitt on Mount Donaldson last year, and after some difficulty we located a route up the mountain from the Siwash Creek side, and Mr. Hatt showed me what purported to be one of the three bearing trees for the north-west corner of Lot 353, and also two old bearing trees east of Copper Lake, which, as suggested by Mr. Hewitt, proved to be the B.T.'s for the half-mile post on the south boundary of Lot 353.

Camp was moved to the old trapper's cabin on Siwash Creek about a mile west of the east boundary of Lot 1283, and while I climbed up the mountain with part of my party to make the tie from Lot 353 to T.L. 44703, the rest of the party, under G. L. Tooker, continued cutting trail up the valley and searching for necessary information, boundary-lines, and posts for a possible tie over to Rainey River and packed in supplies.

I completed the tie from Lot 353 to T.L. 44703, checking up the old bearing trees and connecting the alleged north-west corner of Lot 353 to half-mile post on south boundary, and found same to check almost exactly.

A new post with rock cairn was set for the north-west of Lot 353 and also for the distance post on the south boundary, though I am of the opinion that both posts and cairns are apt to be swept away again any time by the numerous snow-slides which pass over both points.

### Crater Lake.

The tie to T.L. 44703 was completed on August 17th. There appears to be only the one accessible route up to Crater Lake from Siwash Creek, by way of the old trail to the meadows (many parts of which have been obliterated), and thence right up the bed of Slippery Creek and Canyon to its outlet at Crater Lake. Even this is very precipitous and experienced considerable difficulty in getting a line down. It is remarkable the work which was accomplished by the old mining company around the year 1876. They constructed a first-rate horse-trail from Salmon Arm to the meadows on Slippery Creek to an elevation of 3,100 feet. From there they apparently packed everything right up the canyon same way I ran my traverse. I found a large anvil, blacksmith-bellows, tools, etc., boxes of dynamite and black powder, etc., at Copper Lake. A cabin of logs was built at the outlet of Crater Lake and lumber for finishing it was whip-sawed out near by. The whip-saw and many tools are still there.

The cabin is roofed with cedar shakes and they must have packed these up the mountain at least a mile, as that is about as near as any red cedar can be obtained.

I found very little trace of mineral on the mountain-top. The country is generally a granite formation, with numerous sharp granite boulders and crumbling rocks everywhere; frequent lava-beds and outcroppings occur. In only two places did I see an intrusion of the greenstones (locally termed the "Britannia formation"), and although there are occasional strata on the surface of white quartz, and notably the quartz on the hill at Copper Lake, where they had their blacksmith-shop and forge. The quartz is badly leached out and worn down by glacial action and appears to carry no mineral at all.

There is considerable copper-stain around Copper Lake and the water is coppery and unfit to drink, and on the west side of the lake, where about 100 feet of tunnel was driven, there is an occasional small bunch of ore carrying copper, and some nice specimens of bornite may be found.

But it appears to me to be only in small bunches and streaks in the granites. It is rather remarkable that so much work should have been done and money spent on such poor showings in a country which to the average miner can hold out little or no hope of ever producing anything approaching a mine, when there are so many much better-looking showings to be seen around the shore and much more accessible.

### Siwash Creek to Clowhom Lake.

On August 19th I moved camp to near the forks of Siwash Creek and commenced traverse following day from the south boundary of T.L. 38806 southerly through the low "Pass to Howe Sound" shown on Kirkland's map of the timber surveys. This pass had been indicated as going through to Rainey River by Mr. Hatt, but as soon as I got over the summit I found that it led through to the headwaters of McNab Creek. The elevation at the summit is only 1,850 feet above sea-level, and the pass consists of a narrow gateway only about 3 chains wide, between high mountains on either side. These two high peaks are readily identified, being similarly sharp points at their summits, and are each approximately 4,900 feet high. I named them East and West Peak respectively.

We cut a good trail from our camp at Trapper's Cabin up Siwash Creek to the forks and up the South Fork a short way, then over the divide through the pass and down McNab Creek. It is well blazed and on an easy grade all the way. I moved camp again over the divide to McNab Creek not far from the north boundary of T.L. 35234, completed tie to T.L. 35234 on August 23rd, and moved the outfit back to the Trapper's Cabin the following day.

A few days were then spent searching for any pass and trying out possible ones to Rainey River, and it was only after trying out two or three probable ones that I came to the conclusion that there really is no pass from Siwash Creek to Rainey River. The lowest divide I found to be West Creek, which is the first creek flowing into Siwash Creek near its mouth from the south.

While part of my party were investigating as above I took Anderson and two local men (two of my party having left) up to Clowhom Lake, and climbed up Copper Creek to a camping-place on north side of Mount Donaldson, and commenced making the tie from Lot 353 to T.L.

36407 on Copper Creek. I had to triangulate from the summit from a base previously set out while I was tying the north-west corner of Lot 353 to distance post on its south boundary down to the upper part of East Fork of Copper Creek, the bottom of the valley immediately below, a drop of 2,000 feet, not being visible from the summit.

It is impossible to run a line down to Copper Creek and the so-called trail goes straight up the mountain-side in a series of short switchbacks, and it was a difficult and laborious job packing up supplies, outfit, and instruments.

Triangulation and traverse down Copper Creek to T.L. 36407 was completed on August 4th and I moved back to camp at mouth of Siwash Creek.

From September 4th to 10th were spent fixing a trail up West Creek and over the divide to Rainey River; camp was moved to near the summit at an elevation of 2,345 feet and a traverse made over the divide, which consists of a steep ridge of rock, timbered on both slopes in most places, at an elevation of 3,150 feet.

Traverse was carried down to the headwaters of Rainey River, and down the river, and tied in to T.L. 42405, 42404, and 37258 from Lots 3271 and 3272, Siwash Creek. The lithograph map of the district is very nearly correct here.

### THE COUNTRY TRAVERSED.

With regard to the country travelled over, the valley of Siwash Creek is heavily timbered with fir and cedar and the usual proportion of hemlock and balsam. The fir runs out about a mile up the valley, but the valley generally and the hillsides to an elevation of 2,300 to 2,400 feet are remarkably well timbered with fine cedar of exceptionally good quality. Above this elevation and in places lower there is a good quantity of yellow cedar or cypress. Mountain-sides above 2,000 feet generally are precipitous and rocky and in most places inaccessible.

Soil in the valley is generally deep and good and runs up the hillsides higher than usual. No doubt after the valley is logged there will be considerable areas of excellent agricultural land, though I should say the chief value of the valley is from a timber standpoint. I saw practically no sign of mineral in Siwash Creek or its tributaries, but the headwaters of Rainey River are decidedly interesting from a geological standpoint.

There is a lot of greenstone and lime and also quartz float found in the upper reaches of Rainey River. Much of this float is heavily mineralized with iron pyrites and copper, and it appears to have come from a contact which is plainly visible on the side of a steep mountain just south of the head of the South Fork. This granite-lime-greenstone contact might be well worth investigation.

While looking for the best route from Siwash Creek to Rainey River I ran a traverse up the large creek which flows through T.L. 34669 from the south boundary of T.L. 34669, south and east. This looks like a low pass, but the main creek turns sharply eastward and ends in a lake surrounded by high granite cliffs and slides.

We climbed to the top of the divide and got a connection by triangulation, but on looking down Rainey River it was obvious that it would be impossible to descend, as the sheer cliffs were quite inaccessible.

The work done, however, will doubtless be of some use for mapping the country, which here shows considerable mineral possibilities.

On August 11th I returned to Pender Harbour with a reduced party. I then went back to Lot 1392 and ran in a road allowance from Bargain Harbour to Oyster Lagoon and on to Pender Harbour Lagoon. The following day I went over to Texada Island and surveyed the beacon-site for the Department of Marine, portion of Lot 343, and on September 13th moved north to Bliss's Landing and made tie from Lot 1306 to Lot 1307, Malaspina Peninsula, completing the season's work and returning to Vancouver on September 20th.

The summer of 1924 was remarkably fine and, considering its dryness, very free from smoke.

It only rained about four times during the season and each time either at night or on Sunday, so that no time was really lost on this account. I experienced some delay on my first trip up Mount Donaldson on account of fog, but had beautifully clear weather for the tie to Copper Creek. During the season we renewed old trail or cut new to a total of about 10 miles all told.

I have, etc.,

NOEL HUMPHRYS, B.C.L.S.

## POWELL RIVER, NEW WESTMINSTER DISTRICT.

By G. K. Burnett.

New Westminster, B.C., January 7th, 1925.

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

Sir,—Surveys were carried out in vicinity of Powell River, a thriving town situated on the Mainland and about 75 miles north-west of Vancouver. It is reached by boat, having an excellent service of three steamship lines—namely, Union, C.P.R., and Grand Trunk Steamship Companies. The paper-mills of the Powell River Company are located here and give employment to the inhabitants of the town and adjacent settlements. During the year the company raised its dam on Powell River and greatly increased the storage capacity of Powell Lake. It also added to its wharves and warehouses and I am informed that the intention is to add to the mill in the near future. This will mean that more men will be employed, and consequently there will be an increased demand for small holdings within easy reach of town. In spite of the large number of homes that the company has constructed for the employees during the past year, there is still a shortage of accommodation in town and many are building on Crown land adjoining the property of the company.

### Michigan Subdivision.

Our first camp was located on Malaspina Strait, about 2½ miles south of Powell River, at a settlement locally known as "Michigan," which derives its name from the fact of its having been the camp-site of the Michigan Logging Company a number of years ago. The work carried out at this point consisted of subdividing Lot 5167 and a portion of Lot 5306, Group 1, N.W.D., into small holdings, ranging from ¼ to 1 acre in area. In all, we laid out 107 lots of ¼ acre each and fifty-six larger lots.

The area subdivided fronts on Malaspina Strait and rises gradually to an elevation of 200 feet at its east boundary. The land has been logged off and, for the most part, burnt over and is conveniently situated with regard to Powell River. The main road from Myrtle Point to Powell River, a good gravel road, passes through the subdivision and affords ready access to town. A great deal has been done during the past year to improve and extend this road, and it carries, even at the present time, a heavy traffic. There are several springs near the north-east corner of this area which flow all year and which would be capable of supplying water for domestic purposes to the settlement.

At the present time there are fourteen families settled on lots in this subdivision, some having built substantial homes in anticipation to its being thrown open to settlement. It is probable that these lots will be eagerly sought by persons employed in Powell River who desire to own a home within easy reach of their work.

### Cranberry Lake Subdivisions.

Our next camp was located at Cranberry Lake, a body of water about half a mile long by a third of a mile wide, lying about 2 miles east of Powell River. There is a plank road running from the north end of this lake into town, which is kept in fair shape and carries considerable automobile traffic.

On Lots 5304 and 5305, lying between Cranberry Lake and the property of the Powell River Company, there are seventy families living on the subdivision lots which were thrown open in 1921. If some means of supplying water to the higher lots could be found there is no doubt that this number would be immediately increased, as the settlement is very popular owing to its proximity to town.

### Lot 5542, Group 1, N.W.D.

To the south-west of Cranberry Lake and adjoining the easterly boundary of Lot 450, the property of the Powell River Company, we subdivided Lot 5542 into forty lots of approximately 5 acres each.

The fir timber was logged off this lot about thirty-five years ago and the cedar has recently been removed as shingle-bolts. The northerly part of the lot has been burnt clean, with only the stumps and some logs remaining; the southerly part has also been burnt over, but has grown

up in a dense stand of fir and hemlock about thirty-four years old. Water for domestic purposes may be obtained by means of shallow wells, and, as the greater part of this area lies within 20 feet of the level of Cranberry Lake, there should be no difficulty in obtaining water for gardening. The soil is sandy with a clay subsoil on the northerly part. Adjoining the lake the land is composed of decayed vegetation, with muskeg in places. I am informed that this portion of the area subdivided is suitable for growing cranberries. There are two families living on this area, but neither one has made improvements of any account.

At present the road from Powell River through Lot 5305 is constructed to within half a mile of the north boundary of this subdivision. From the end of this road there is a rough wagon-road running to a point opposite the south end of the lake and used by a logging outfit who have their camp at this point. It is probable that the road surveyed through this area, and upon which thirty-six of the lots front, will eventually become one of the main roads leading into Powell River.

LOT 5452, GROUP 1, N.W.D.

On the east side of Cranberry Lake we surveyed a portion of Lot 5094 (formerly a portion of "J" lease) as Lot 5452 and subdivided it into sixteen lots of approximately 2 acres each.

Each of these lots has a frontage on the lake and rises gradually to a road laid out along the easterly boundary. There is an abundant supply of spring water along the foot of the hill near the east boundary and one stream flowing through the property into the lake. All of the lots lie between the level of the lake and 20 feet above the same. The soil is composed of decayed vegetable matter, with some sand washed down from the hill to the east. There is a small amount of merchantable timber which is now being logged off, the land being covered with a small growth of cedar, hemlock, alder, and maple.

At present there are three settlers on this area, one having been there since 1920. This squatter has about 3 acres cleared and under cultivation and has built a good house.

LOT 11, BLOCK 3, D.L. 5304, GROUP 1, N.W.D.

In the previous subdivision of Lot 5304, carried out in 1920, a 4-acre portion was laid out as a cemetery-site and shown as Lot 11, Block 3, on the plan. For various reasons this site was not considered satisfactory for the proposed purpose and we received your instructions to divide it into 1-acre lots. These instructions were carried out and four lots surveyed, two of which front on the main road leading to Powell River.

This property adjoins Lot 450, the property of the Powell River Company, and has a gentle rise to the north from the road. The soil is sandy and may be easily cleared. Owing to their location and the access provided by a main road, these lots are very desirable and should be easily disposed of.

LOTS 1357 AND 5094, GROUP 1, N.W.D.

Our next work consisted of subdividing Lots 1357 and 5094 (formerly a portion of "J" lease) into district lots. This work was commenced from the Cranberry Lake Camp and completed from camps on Wolfshon Creek.

A large proportion of this area consists of stony or gravel ridges, rising to a height of 600 feet above sea-level in places, with two parallel ranges of low rocky hills running north-west and south-east and rising from 600 to 800 feet above sea-level. Between these two ranges Wolfshon Creek flows in a south-easterly direction from Haslam Lake to Lang Bay. This stream is about 50 feet wide and, while readily fordable during the summer months, carries a large volume of water during the rainy season.

Along Wolfshon Creek and to the west of the westerly range of hills we found land suitable for farming and laid out seventy-eight district lots of from 40 to 90 acres each, depending on the location and nature of the soil. The hills and gravel ridges were not considered suitable for farming and were laid out in 160-acre lots. Fifteen of these larger lots were surveyed, the area being suitable for grazing. In some places natural reforestation has commenced, and the question is whether this land, which is not suitable for farming, would not be better employed in raising another crop of timber than any other crop. There has been a fine stand of timber on this land in the past and there appears to be no reason why a second growth should not be produced if afforded protection.

There are three small lakes in the area surveyed—namely, Duck Lake, West Lake, and East Lake. Duck Lake has an area of about 100 acres and lies in the valley of Wolfshon Creek, about

2 miles south of Haslam Lake. It is a shallow, swampy lake through which Wolfshon Creek passes, being also fed by streams entering on the east. West Lake lies in the south-west angle of the area surveyed and covers about 200 acres. It is surrounded on three sides by low hills and ridges and is drained by a small stream to the west. It appears to be quite deep and was probably a very beautiful sheet of water before the timber was removed from the surrounding country. East Lake covers about 25 acres and lies in the south-east portion of the area surveyed. It is surrounded by low, wet land and does not appear to be very deep. It is the source of Kelly Creek, which flows southwardly and empties into Douglas Bay.

### Timber.

On the area immediately south of Duck Lake the first logging operation appears to have removed only the fir timber. There is still a considerable amount of cedar, which should make good bolts and might interest a small outfit. On the remainder of the area surveyed there are isolated portions from which the timber has not been removed and from which it would now be impossible to take the logs at a profit.

### Soil.

As mentioned before, there are gravel ridges running through the area surveyed. Between these ridges there is soil formed from the wash from the higher ground and a certain amount of vegetable matter. Along Wolfshon Creek there is some flat land with rich soil formed by the river. In dividing up this land our purpose was to include a proportion of this good soil in each lot surveyed. To the west of the westerly range of hills the area surveyed lies in a basin forming the source of the stream flowing into Myrtle Point. This basin has a black muck soil of varying depth, with a sand subsoil. It is rather wet at present but can be readily drained.

### Transportation.

Practically all the area surveyed has been logged into Myrtle Point and the grades, from which the steel has been removed, are still in good condition. These grades will provide temporary roads to every parcel surveyed. There is also an old railway-grade following the east side of Wolfshon Creek and leading to Lang Bay which could be cheaply made into a really good road. Eventually roads will have to be constructed to Powell River, as this is the logical market for produce raised in this district.

### Produce.

At the present time there are no farms in operation on a sufficiently large scale to give an idea of what the land will produce and the amount per acre. The climate, soil, and general conditions would indicate that anything can be raised here that is raised on the highland farms of the Fraser Valley. What orchards there are produce excellent fruit and we found patches of blackberries of the cultivated varieties which were doing very well. A noteworthy feature was the large number of bee-trees found and the swarms of bees seen. One tree cut into yielded about 50 lb. of strained honey and another one about 30 lb. There is a flourishing growth of fireweed over the whole area which probably accounts for the bees.

### Weather.

The season was exceptionally dry and from May 7th to September 20th very little rain fell. During this period one and a half days were lost owing to rain, being practically the only heavy rain we had. After the weather broke on September 20th we had five days of almost continuous rain, followed by fairly good weather, with frost, until the end of our season on October 21st.

### Game.

Deer were plentiful all season and grouse, willow and blue varieties, abounded. There are trout in all the lakes, but we had poor success with our fishing until after the first rains in the latter part of September, when the salmon commenced running in Wolfshon Creek and were followed by the trout. The salmon did not appear to be able to get above the first falls in Wolfshon Creek, the stream below the falls being absolutely alive with fish and none being observed above.

GENERAL.

While working along Wolfshon Creek we made Camp 2, of the Bloedel, Stewart & Welch Logging Company, our headquarters. Our supplies were brought to Camp 2 from Myrtle Point over the logging-railway of the company and every possible assistance given to us without charge. Thanks to the courtesy of this company, our transportation problems were greatly simplified. At the present time the company is operating a camp on Haslam Lake in addition to the main operation on Lot 913, lying to the east of the area embraced in our survey. The company has a beach camp and booming-ground at Myrtle Point.

Owing to the extremely dry season we had two very bad bush fires. The first one started on the west side of Cranberry Lake and ran through to Duck Lake, where it was caught; another branch of this same fire ran up the east side of Haslam Lake and then jumped the lake to the west side. The second fire came late in the season. It commenced about a mile south of Duck Lake and extended south and west, reaching a point about a mile south-east of Cranberry Lake.

I have, etc.,

G. K. BURNETT, B.C.L.S.

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## ESTEVAN PENINSULA, NOOTKA DISTRICT.

BY L. S. COKELY.

COURTENAY, B.C., December 16th, 1924.

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

SIR,—The Estevan Peninsula just south of Nootka Sound differs from the general character of the west coast of Vancouver Island in that it is low-lying and nearly level. The peninsula is about 10 miles long and about 4 miles wide; the altitude of nearly the entire area is less than 250 feet. The land is exposed to all the storms of the open Pacific, as there is no shelter to the west. No landing can be made from the sea on the west coast except in very calm weather, and then only in two or three places on account of the very heavy surf rolling in. On the east side lies Hesquiat Harbour, which affords indifferent shelter except in the more severe weather. Here there is no wharf or landing facilities.

The Canadian Pacific steamer "Princess Maquinna" calls at Hesquiat from Victoria three times a month in the summer and twice a month in the winter, weather permitting. No other boat calls in the district.

The entire area is timbered with inferior-quality spruce, cedar, and hemlock; large spruce grow along the shore. No logging operations have been carried on anywhere on the peninsula. The interior is sparsely timbered with scrub hemlock and cedar, with open patches of muskeg. Salal is very dense along the shore, but a mile inland there is not enough to seriously impede travelling.

The interior lands and particularly the muskegs could be cleared at a reasonable expense; then if drained and sweetened the area might be made productive, but the soil is shallow, with a subsoil of gravel and rock.

In contemplating any agricultural development on this coast the first consideration is adequate drainage, which is a most important point, as any portion that is not properly drained will produce only inferior crops. As this section is nearly level, drainage might easily become difficult and expensive, if not prohibitive.

The climatic conditions would adapt the district especially to raising hay. All root-crops would do well and fruit could be raised successfully. Grain would not mature properly. Agriculture has not been attempted; no land has been cleared and there is practically no settlement. There are only four settlers on the land, none of whom depend on agriculture for a living.

At Estevan Point is located a powerful lighthouse consisting of a concrete tower 125 feet high. Here is located the Estevan Radiotelegraph Station, a large station and one of the most important on the Coast. It handles all the business with the ships at sea on the Pacific. The radiotelegraph employees and the light-keeper and family form a community of about twenty-five people. A post-office has been established at the station, but so far there is no school, nor is there a store in the district.

All the building material and equipment used in the lighthouse and the radio-station and the employees' quarters was landed at a point 2 miles north of the site and conveyed over a small tram-line on which is operated a gasolene-car.

There is no settlement at Hesquiat except the Indian village. The Hesquiat band have their main reserve here. The band numbers about fifty and their sole occupation is fishing. There is a Roman Catholic Mission at Hesquiat which is open occasionally. In the mission grounds is a small and productive orchard, and years ago cattle-raising was attempted by the mission, but the scheme was finally abandoned and as a result a band of very wild cattle roam the interior. These are seldom seen as they are much wilder than the deer, which are plentiful. No other game is present.

For many years nearly the entire peninsula was held for speculation by a land company, but it has finally reverted to the Crown and is now available for settlement. It is subdivided into sections of a mile square. On account of its inaccessible position and exposed location it has not been attractive to settlers.

I have, etc.,

Leroy S. Cokely, B.C.L.S., D.L.S.

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## SALMON RIVER VALLEY AND VICINITY, VANCOUVER ISLAND.

By L. S. Cokely.

Courtenay, B.C., December 16th, 1924.

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

Sir,—My first work on the east coast of Vancouver Island was at Hardy Bay. As last season I submitted a report on this district, I shall only mention the changes which have taken place in the meantime.

Up to the present the townsite of Port Hardy was located on the east side of the bay, but this year a new wharf has been built by the Government on the west side and the Port Hardy–Coal Harbour Road extended north a mile to the new wharf. A townsite has been laid out adjacent to the wharf and the town will be moved across the bay. The Trans-Island Highway, the Port Hardy–Coal Harbour Road mentioned, is nearing completion and should be ready for use with one more season's work.

The settlement of the district is about the same as last year. Logging is practically the only industry outside of fishing.

From Hardy Bay I went to Green Point Rapids on Cardero Channel and made a very small survey. To get from point to point in these northern waters is most inconvenient; launches must be relied on and during stormy weather delay is unavoidable.

A few years ago Green Point Rapids was a thriving little community engaged in logging, but now the timber limits have been logged over, the sawmill closed down, and only one bachelor remains. Very little agricultural land is in the vicinity.

### Salmon River Valley.

My next move was to Salmon River, which is situated about 40 miles north of Seymour Narrows. This is one of the largest valleys on Vancouver Island, being some 12 miles long with an average width of 3 miles. Extensive tide-flats comprise the lower 2 or 3 miles, but from there on up to the head the land is high and dry and very good. The hills on either side of the valley rise abruptly, with very little bench land.

The valley was very heavily timbered with large Douglas fir and cedar, but it has been logged over and the logging-railway, which ran 10 miles up the valley, has been converted into a wagon-road, which as a result has a very good grade. The road crosses the Salmon River three times; one crossing being made with a suspension bridge having a span of over 200 feet.

Small timbered areas still remain and during the past season logging operations were carried on in various localities. A small sawmill is operated about midway up the valley.

On account of there having been a heavy stand of timber the land is very expensive to clear, as it is difficult and costly to deal with the large fir-stumps, which may have a diameter of 12 or 14 feet at the surface of the ground. I would judge that clearing would average about $300

per acre. The land is very fertile and is well adapted to hay and all root-crops, as well as fruit. Clearing is too expensive to utilize the land for grain-growing extensively. In common with other parts of the Island, mixed farming is to be recommended. A good market for all produce exists in the logging camps, especially the large camps at Rock Bay, 20 miles to the south.

The Union Steamship Company runs two boats a week from Vancouver which call at Salmon River; this is the only means of transportation except by small boats.

The district is settled by a good class of English and Canadians, all of whom are very optimistic in regard to the future of the valley. They all appear to be making a comfortable living. One locality in the valley is settled entirely by French-Canadians. The people are very progressive. Two community halls have been built in different parts and this year two agricultural fairs were held. I was present at the second, which was quite a success. The settlement begins up the valley about 3 miles from the wharf; another mile up is located a good general store, the post-office, which is known as Sayward, and the telegraph-office.

In the opinion of the settlers the great need of the valley is road communication with the rest of the Island. It is their desire that the Island Highway be extended north from Campbell River, which would mean the construction of 50 miles of road. As nearly the whole of this road would pass through unlogged timber limits which are privately held, there is at present no prospect of any settlement along the route.

In common with other parts of the Island, the valley enjoys a mild climate; the summers are bright without excessive heat and the winters are mild, with little snow. The lowest temperature apt to be experienced is about 10° above zero and a foot of snow is the average maximum in the winter. The rainfall is not excessive, being somewhat less than at Vancouver. Most of the rain comes in the fall and November is generally the month with the greatest precipitation.

As the district has been settled for some time, game is not abundant, except deer, which appear to thrive in contact with civilization. Grouse and pheasants are fairly numerous. The Salmon River is a good trout-stream, as are some of its tributaries.

I have, etc.,

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

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## COAST TRIANGULATION, KNIGHT INLET, RANGES 1 AND 2, COAST DISTRICT.

BY H. H. ROBERTS.

VANCOUVER, B.C., December, 1924.

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

SIR,—I have the honour to send you a summary of the work done during the past season and a short description of the physical characteristics, transportation facilities, industries, game, and climatic conditions of the area in which survey operations were carried out. The season's work consisted of the following:—

(1.) Triangulation of Knight Inlet from the head to the easterly end of last year's work near Adeane Point.

(2.) Monumenting of main triangulation stations between Adeane Point and Tomakstum Island. The angulation of this portion of the inlet was done last year.

(3.) Triangulation of Knight Inlet from Tomakstum Island westerly to surveys in vicinity of Lady Islands, and ties to Georgina and Trafalgar Geodetic Stations.

(4.) Ties by shore traverse and triangulation between timber licences on easterly side of Gilford Island fronting on Tribune Channel and timber licences on the Mainland on the opposite side of same channel.

The triangulation of Knight Inlet is controlled by three base-lines. A good site was selected near Franklin River at the head of the inlet. This line is a little over 113 chains in length and is one of the sides of the main triangulation. The methods adopted in the measurement are similar to those described in my report for season 1923.

The second base-line is situated in Glendale Cove and was measured in 1923, and reference to it was made in the report for that year. This base is 54 chains long and five triangles intervene between it and the sides of the main triangulation.

The third base-line was measured on the southerly shore of Gilford Island, to the north-west of Doctor Island, and near the westerly end of the work. Its length is a little under 17 chains. As some of the triangles used in transferring from this short base to the sides of the main triangulation were not very well conditioned, some of the accuracy attained in the measured line was probably lost. Had better weather conditions prevailed during the last month of the season, the triangulation could have been extended to the head of Port Elizabeth, where a longer base-line could have been measured and without recourse to a base-net. The short base-line, however, serves as a good check on the work.

### Knight Inlet.

The upper end of Knight Inlet, for a distance of about 6 miles from the head, is situated in Range 2, Coast District. The remainder of the inlet is in Range 1 of same district.

The entrance to Knight Inlet is about 180 miles from Vancouver and is at the eastern end of Queen Charlotte Sound. It is the longest inlet between the sound and Vancouver and one of the largest on the whole coast of British Columbia. From its mouth to Glendale Cove Knight Inlet is an almost-straight reach easterly in direction, with a length of about 40 miles; from Glendale Cove to the head, a distance of about 30 miles, it follows a winding course and its general direction is northerly. The many islands which block the entrance to the inlet make the approach from Queen Charlotte Sound somewhat difficult. The entrance proper is between Slope Point on Gilford Island and Warr Bluff on Village Island, and at this point the inlet is about three-quarters of a mile wide. The portion of the inlet lying northward of Village and Turnour Islands, between them and Gilford Island, was not included in the work of the season.

Lady Islands, situated between Turnour and Gilford Islands, consist of two islands, of which the larger is 1¼ miles in length and contains nearly 200 acres. The smaller island has an area of 40 acres. The islands are timbered with fir and hemlock.

### Gilford Island.

Gilford Island is the largest island of the archipelago on the easterly shore of Queen Charlotte Sound. On the south it is bounded by Knight Inlet, on the west by Retreat and Cramer Passages, while Tribune Channel forms its northerly and easterly boundaries. This island is 18 miles long in a north-easterly direction and 11 miles wide at its easterly end, gradually tapering to a width of 2 miles near its western extremity. The westerly portion is comparatively low; but in the southerly, easterly, and northerly parts of the island mountains exceeding 2,000 feet in elevation rise almost precipitously from the shore-line. The highest mountain is Mount Read (4,820 feet) in the north-easterly part of the island.

The Georgina Geodetic Station is situated on a knoll a short distance below the summit of a mountain 2,330 feet high on the eastern end of the Georgina range of hills on the south-east corner of Gilford Island. Like practically all the other mountains on this island, this mountain is heavily timbered, and a considerable time was spent in clearing and cutting down trees before triangulation stations on the inlet became visible.

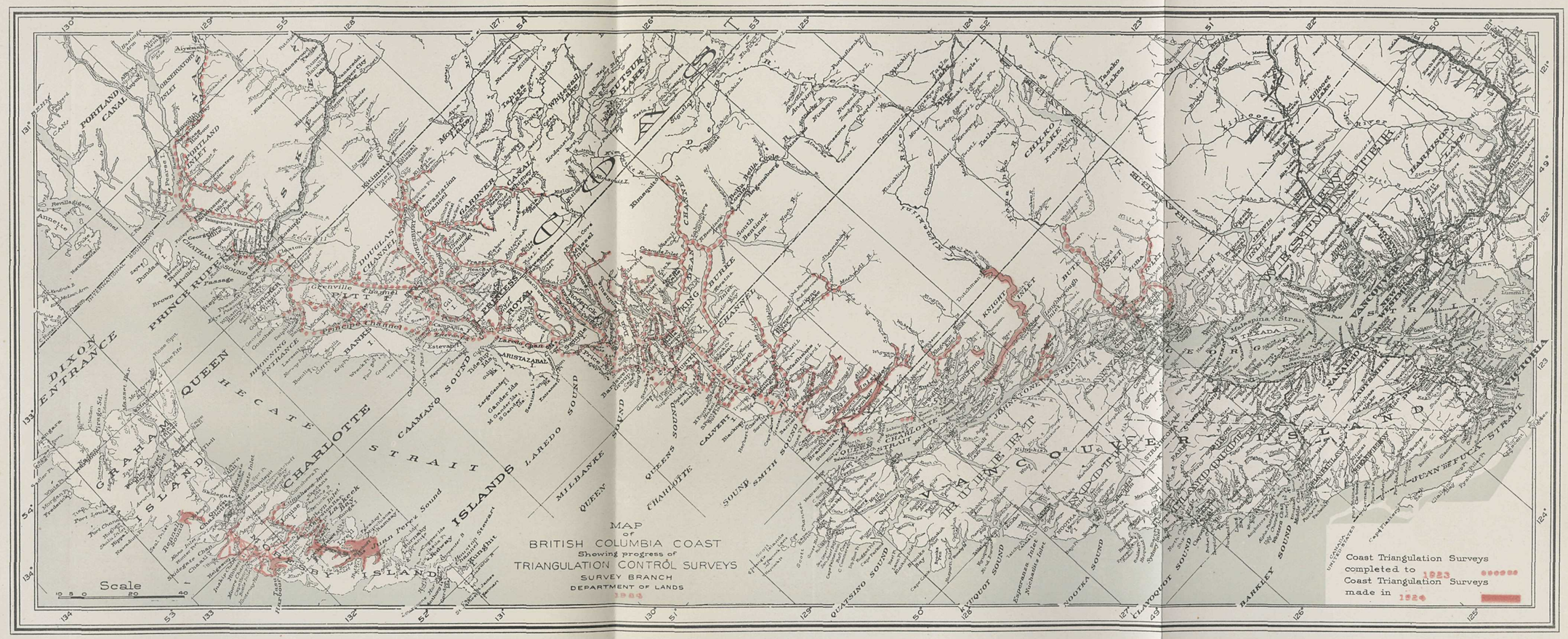
Gilford Island is much indented, the largest bights being Wahkana Bay and Viner Sound in the north; Scot Cove, Shoal Harbour, False Cove, and Health Bay in the west; and Port Elizabeth on the south. Port Elizabeth lies north-west of the Lady Islands and is one of the few places in Knight Inlet where boats of any size can find good anchorage.

### Minstrel Island.

Minstrel Island lies on the south side of the inlet, being separated from Turnour Island by a narrow channel. A post-office and point of call of Vancouver boats is situated on Lot 648 in south-easterly portion of the island. This island has an oval shape and contains about 1,000 acres. Hemlock, cedar, fir, and jack-pine are the principal trees. There is a small area of good land in the southerly portion.

### Chatham Channel.

The entrance to Chatham Channel on the south side of Knight Inlet lies between Minstrel Island and Littleton Point, where it has a width of three-quarters of a mile. This channel is 5 miles long and follows a south-easterly course, gradually contracting in width to its junction with the head of Havannah Channel. Strong tidal streams run in this channel at certain stages of the tides.


MAP
of
BRITISH COLUMBIA COAST
Showing progress of
TRIANGULATION CONTROL SURVEYS
SURVEY BRANCH
DEPARTMENT OF LANDS
1922
Coast Triangulation Surveys completed to 1923
Coast Triangulation Surveys made in 1924
Scale
PORTLAND CANAL
DIXON ENTRANCE
PRINCE RUPERT
HECATE STRAIT
QUEEN CHARLOTTE ISLANDS
CAAMANO SOUND
LAREDO SOUND
MILBANKE SOUND
QUEEN CHARLOTTE SOUND
SOUND SMITH SOUND
QUATSINO SOUND
KYUQUOT SOUND
NOOTKA SOUND
BARKLEY SOUND
VANCOUVER ISLAND
VICTORIA
JUAN DE FUCA STRAIT
Princess Channel
Douglas Channel
Grenville Channel
Principe Channel
Esteban Pt.
Aristazabal I.
Tasu Harbour
Masset
Prince Rupert
Port Simpson
Port Essington
Port Edward
Port Chalmers
Port Clarence
Port Simpson
Port Stewart
Port Tolmie
Port Alberni
Port Renfrew
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Port Hardy
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Port Hardy

### CUTTER AND CALL CREEKS.

Cutter Creek is a narrow bight 1½ miles long and about a quarter of a mile wide, running almost parallel with Knight Inlet and separated from that inlet by a low timbered peninsula, the western extremity of which is Littleton Point.

To the south of Knight Inlet, and 2 or 3 miles distant from it, a parallel inlet named Call Creek extends about 12 miles, varying in width from ½ to 1½ miles. It is a continuation easterly of Havannah Channel. Its shores are rocky and precipitous and rise abruptly to high elevations.

The Trafalgar Geodetic Station is situated on a mountain 3,280 feet high, distant about 4 miles west of the head and three-quarters of a mile north from shore-line of Call Creek. An attempt to tie in this station was made near the end of the season, but other hills intervening and bad weather made it impracticable to connect to stations on Knight Inlet.

### DOCTOR, SHEWELL, AND VISCOUNT ISLANDS.

Doctor Island is almost north of Littleton Point and about half a mile from Gilford Island shore. It is rocky and broken with scrub timber and an area of about 20 acres.

Shewell Island, about three-quarters of a mile eastward of Doctor Island, is at the southerly entrance to Tribune Channel, which it divides into Clapp and Nickoll Passages. It is 1¼ miles long and 15 chains wide. The settler has a house and a very productive garden on the northerly side of the island.

Viscount Island is also situated at the southern entrance to Tribune Channel. It is about 3 miles long and 1 mile wide. Its surface is very rocky and broken, rising sharply from the shore-line to heights varying from 1,500 to 1,900 feet. The timber on the southerly portion has been fire-swept and a greater portion of the accessible merchantable timber on the remainder of the island has been logged. Sargeaunt Passage is a narrow channel bounding Viscount Island on the east side and separating it from the Mainland.

### TSAKONU COVE.

Tsakonu Cove, opposite Sargeaunt Passage on the southerly side of the inlet, has fair anchorage at the head and affords good shelter from westerly winds, which blow almost incessantly in the inlet from early spring to late summer. A low divide separates the stream which enters Tsakonu Cove from the stream that drains into Cutter Creek on Chatham Channel.

### LULL BAY AND HOEYA SOUND.

Lull Bay and Hoeya Sound on the northerly side of the inlet are the only indentations of any size between Sargeaunt Passage and Glendale Cove. Lull Bay is half a mile deep but affords poor shelter. Hoeya Sound is 2 miles deep in an easterly direction and half a mile wide. Shelter and anchorage can be found near the mud-flats at the head. Streams of considerable size drain heavily timbered valleys at the heads of Lull Bay and Hoeya Sound.

From Boulder Point at the entrance to Hoeya Sound a rocky ridge extends across the inlet to Prominent Point, and this is the only portion of Knight Inlet that is not very deep. This shoaling of the inlet may be one of the causes of the heavy tide-rips which occur between these points. On the northerly shore shelter from westerly winds can be obtained in a small cove 1½ miles west of Lull Bay, and in Boulder Bay immediately east of Boulder Point, and at Nigger Creek, 5 miles east of Boulder Point.

### VICINITY OF GLENDALE COVE.

Glendale Cove, a little over half-way up the inlet, is a fair harbour. It is 2 miles long and about half a mile wide. Keogh, Tom Brown, and Martin Lakes are situated in valleys to the south and a river carrying the drainage of these lakes empties into Glendale Cove. About 3 miles east of Glendale Cove a timbered valley extends towards the head of Loughborough Inlet.

Knight Inlet from its mouth to Glendale Cove is bordered by mountains ranging generally from 1,000 to 3,500 feet, with two or three mountains near the 5,000-foot mark. The mountains are for the most part timbered, though there are rock-outcrops in many places.

### GLENDALE COVE TO HEAD OF KNIGHT INLET.

Between Glendale Cove and the head Knight Inlet follows a winding course and the scenery is most impressive. The mountains vary in height from 4,000 to 7,280 feet, which is the eleva-

tion of Mount Rodell on the easterly side of the inlet a few miles from the head. The higher summits are covered with perpetual snow and the hollows are filled with glaciers. The largest ice-fields are in the high valleys above Cascade Point and to the west of Wahshihlas Bay. The mountain-sides are very steep, the steeper slopes being almost bare. In this portion of the inlet there have been numerous rock-slides, and in places the deep water near the shore has been made shallow by the slides. In vicinity of Adeane Point, on the easterly side of the inlet, and of Station 30, west of Grave Point, on the westerly side, whole portions of mountains have fallen over into the inlet, resulting in perpendicular cliffs several hundred feet in height.

Sim Creek drains into Wahshihlas Bay on the west side of the inlet and 5 miles from the head.

### Klinaklini and Franklin Rivers.

Two rivers, the Klinaklini and the Ahashmaaki (Franklin), flow into the head of Knight Inlet. The Klinaklini drains an area of about 1,800 square miles, flowing in from a northerly direction. The river is said to be over 60 miles long, having its source in the mountains forming the western boundary of the Chilcotin Plateau. At low water it is possible to canoe up-stream to the forks, a distance of 15 miles. Above the forks the valley is very narrow and the river flows through narrow box canyons. The Franklin River flows very swiftly, but carries less mud in suspension than the Klinaklini. The waters of the inlet are slightly turbid near Glendale Cove, but they are quite a milky colour at the head.

The delta land at the head of the inlet is the largest flat area of agricultural value in the vicinity of the season's operations.

### Mining.

In Knight Inlet District mining has received but little attention. Perhaps one of the chief reasons why there has been so little prospecting done in the mountains of Knight Inlet is the paucity of safe anchorages for boats and launches. There have been two groups of mineral claims located on Knight Inlet. The first group was located in the Matsin Valley and, according to reports, carries copper ore. The Matsin River flows through this valley in a southerly direction between high mountains and enters Knight Inlet 4 miles from and on the opposite shore from Glendale Cove. The second group was located on the northerly shore opposite Adeane Point and considerable development was done, but I understand that no ore was exposed in the workings.

Location posts were seen in the vicinity of Axe Point, but apparently no work was done on the claims.

Mineral-bearing zones have been found on Chromium and other creeks tributary to the Klinaklini. This section of the country is best reached by way of Chilcotin, travelling over the Pacific Great Eastern Railway to Williams Lake and motoring from there to One Eye Lake, distant about 20 miles from Chromium Creek.

### Industries.

The fishing industry is the most active in the immediate vicinity of our work. The A.B.C. Packing Company has a cannery at Glendale Cove and had a very successful season. I understand that the cannery at Charles Creek, Kingcome Inlet, also put up a heavy pack.

The five kinds of Pacific salmon, in the order of their importance, are the sockeye, spring, coho, dog-salmon, and humpback. Until recent years the last two species had practically no commercial value, but they are now caught for export to the Orient. This demand for all the varieties of salmon has resulted in the lengthening of the fishing season and is of benefit to cannery operators and fishermen.

Codfish, crabs, and oolachan are also found in more or less abundance in these waters. The oolachan is about the size of a smelt and is very abundant at the head of Knight Inlet. The tissues of this fish teem with oil and the Indians extract the oil and use it as a substitute for butter.

### Lumbering.

Call Creek has been the scene of logging operations for many years, and there has been quite a lot of timber logged on limits near salt water in Gilford Island. Comparatively little logging has been done on Knight Inlet. During the past season a camp was in operation near Sargeaunt Passage; another one in Port Elizabeth. North of Glendale Cove all the logging so far has been done by hand-loggers.

The heaviest stands of timber in Knight Inlet are in vicinity of Lull Bay, Hoeya Sound, valleys near Glendale Cove, and in the Klinaklini Valley.

Cedar, hemlock, and balsam are the principal sources of lumber in this district. Climatic conditions do not favour the growth of the Douglas fir.

### GAME.

Black and cinnamon bears are found in the upper portion of Knight Inlet, and occasionally a few grizzlies are seen. During the survey season goats were seen near salt water between Grave Point and the head of the inlet. Deer, mink, and marten are fairly abundant. Ducks and geese are found in Hoeya Sound, vicinity of Glendale Cove, and the head of the inlet. Trout can be caught in most of the creeks and lakes in this district. Many seals and whales were seen during the season.

### CLIMATE.

A large quantity of rain falls in winter and the early spring. The rainfall varies from 70 to 110 inches. The summers are comparatively fine. On the inlet westerly winds prevail in spring and summer, but the worst wind is the one from the north in winter.

The following names indicate that sometimes the waters of Knight Inlet are everything but placid: Stormy Bluff, Protection Point, Shelterless Point, Rough Point, and Escape Point.

### TRANSPORTATION.

In summer the boats of the Union Steamship Company call twice a week, and in winter once a week at Port Harvey, Call Creek, Minstrel Island, and Tribune Channel. When the cannery is in operation the boats call regularly at Glendale Cove. Most of the places mentioned have post-offices and stores.

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

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## COAST TRIANGULATION, SEYMOUR INLET, RANGES 1 AND 2, COAST DISTRICT.

BY J. T. UNDERHILL.

VANCOUVER, B.C., December 12th, 1924.

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

SIR,—I have the honour to submit the following report upon my season's work in Range 2, Coast District, which consisted of various stretches of Coast triangulation, together with traverse ties and the survey of one lot on the shores of Allison Harbour. The triangulation-work accomplished covered a connection across the mouth of Rivers Inlet, a net across the inner part of Smith Sound, Seymour Inlet lying west of Warner Bay, Belize Inlet, and Allison Sound. The geodetic stations on Mount Bullock and Mount Robinson were also tied in.

In all, 314 triangulation stations were occupied and 73 monuments placed. Work was much hampered by an undue amount of fog and the necessity of waiting upon tides owing to tidal rapids. The sudden dropping of Allison Harbour as a port of call by the Canadian National steamships also caused considerable annoyance and delay, necessitating runs to Hardy Bay for supplies and mail.

### RIVERS INLET AND SMITH SOUND.

The work in this vicinity consisted of stretches of triangulation between existing land surveys, in order that a connection might be obtained from the triangulation of Fitzhugh Sound with the triangulation-work in the Seymour Inlet area. One large triangle connecting Cape Calvert and Rouse Point with Lot 106 on the south shore of Rivers Inlet forms the northern water link. The triangulation of Smith Sound, connecting Lot 1105 with Lot 1108, and with Mr. Elliott's traverse hub at Jones Point, forms the southern water link.

This area, bordering Queen Charlotte Sound on the east, is low-lying, with much-indented shores due to the action of surf. While generally well timbered, the timber is of little (if any) commercial value at present, being small in size and stunted and wind-swept, except in the more

sheltered coves. Even there the timber is small in size until some little distance back from the shore is reached.

Attempts have been made to cultivate the land lying in behind Millbrook Cove and considerable work has been done upon the same. These lands are swampy and need considerable drainage before they can be successfully handled. It would appear that assistance must be given in this respect before any one without capital can profitably deal with them.

Surface indications of mineral were noticed at several points along the shore-line, but as the formations here have been much upset and broken it would require considerable time to determine if they portend any mineral body of value.

The tides at the junction of Fitzhugh Sound and Rivers Inlet are more noticeable than in Smith Sound. While nearly equal in range, the flow in the former, and particularly the ebb, is quite marked. The tides ebbing from Fitzhugh Sound and Rivers Inlet meet in the vicinity of Cape Calvert, and owing to the shallow reef-strewn area to the south-west, with the prevailing westerly summer winds, are inclined to cause tide-rips. Smith Sound, with a smaller water area at its head and a freer access to the open ocean, has a more even and less noticeable flow.

Marine life in this area is abundant, as in all waters of our Coast closely adjacent to the open ocean. Salmon are extensively fished in Rivers Inlet and Smith Sound, while fair catches of halibut and cod are taken off the mouth of Rivers Inlet.

### Seymour Inlet.

The work done in Seymour Inlet consisted of that portion lying to the west of Warner Bay. The north shore of this waterway, being the peninsula lying between Nugent Sound and Seymour Inlet, together with the most westerly part of the peninsula between Belize Inlet and Nugent Sound, is generally rough, broken mountain-sides, well timbered on the lower slopes, but approaching bareness on the summits. The mountains hold a more or less uniform elevation from the vicinity of Mensdorff Point to the neighbourhood of Charlotte Bay, but fall off rapidly in height from this point westerly. The south shore from Warner Bay to Harriet Point is moderately steep mountain-sides, running up to 2,000 feet in elevation, and is generally well timbered. From Harriet Point westerly to Lassiter Bay the south shore is comparatively low-lying, consisting of broken country, with a general slight depression south-westerly to the shores of Queen Charlotte Sound. It is much broken by lakes and waterways and is well timbered throughout. While, as stated above, these shores are generally well timbered, a great deal of the timber is small and in places of poor quality, the existing timber leases covering practically all the timber of present commercial value.

The agricultural possibilities of the surrounding land are negligible at the present time. Some use may be made of the area lying between Seymour Inlet and Queen Charlotte Sound between Harriet Point and Lassiter Bay in years to come.

A few scattered indications of mineral were seen, noticeably in the vicinity of Warner Bay and on T.L. 10710P at the head of Lassiter Bay. In the main, however, this country would appear to be barren in so far as mineral resources are concerned.

Any one accustomed to working on the tidal waters of our Coast 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 the 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 as 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.

### Belize Inlet.

Belize Inlet, from its junction with Seymour Inlet at Mignon Point, runs almost due east and nearly connects again with Seymour Inlet in the vicinity of Maunsell Bay. It is bordered by rough, broken mountain-sides, which hold their elevation more or less uniformly, except the south shore in the vicinity of Mignon Point. Here the hills run out in to a comparatively low-lying point. In general the hillsides are well timbered to the top, more particularly on the

south side. The presence of scattered fir on the north shore in the vicinity of Allison Sound would tend to prove that a greater amount of sunshine and consequent higher temperatures appreciably affect the growth of this species.

Except for one or two scattered parcels of comparatively level land, the shores bordering this inlet are totally unsuited for agricultural purposes.

No indications of mineral, other than iron-stained rock, were seen on either shore, this area apparently being devoid of mineral wealth.

The tides in Belize Inlet, being small in range, have no great flow except in the vicinity of Mignon Point. A noticeable feature, however, is the earlier ebb in this inlet as compared with Seymour. The flow rounding Mignon Point is of an appreciable velocity, and the ebb from Belize Inlet runs easterly down Seymour Inlet to the entrance to Nugent Sound while the tide is still flooding at Nakwakto Rapids. Rainfall in the watersheds of this area, gathered via Mereworth and Allison Sounds into Belize Inlet, have a marked effect on the ebb-tide, as this surplus water must find its level through Nakwakto Narrows.

The marine life in Belize Inlet is similar to that of Seymour, being noticeably less than in the open waters a few miles distant.

### ALLISON SOUND.

Allison Sound, leading off Belize Inlet to the north and east, is a much narrower and more steeply bordered body of water. From Belize Inlet to Chief Nollis Bay the channel breaks through a moderately high range of hills, and then turns east, paralleling the general direction of the mountain ranges to its head. It is moderately timbered on both shores, the concentrations of timber being easily placed by the existing surveyed timber leases. Other than the three Indian reserves shown on exisitng departmental maps, there is no level land of any consequence, and it is fairly certain that the shores of Allison Sound will never be of any use agriculturally.

A few leachings and specimens of float indicating mineral were seen here and there along the shores, but without further investigation this country would seem to hold out poor prospects for those in search of mineral.

Allison Sound, being the most distant of those channels subject to tidal ranges served by Nakwakto Narrows, naturally shows the least marked tidal changes. Other than in the vicinity of its junction with Belize Inlet, where the channel is nearly choked by a small island, the surface flow is more affected by the streams flowing into the inlet than by any other cause. The water itself is also inclined to brackishness, with resultant effects upon the marine life.

### MOUNT BULLOCK TIE.

This work consisted of one large triangle connecting a station erected close to Bullock Geodetic Station with two stations on the north shore of Seymour Inlet, these latter stations in turn being connected to the triangulation of Seymour Inlet itself. Mount Bullock was approached via McKinnon Lagoon, Lee Lake; thence up the northern slope to the summit. Owing to the top being a small, heavily timbered, nearly level plateau, it was impossible, without excessive clearing, to use the geodetic station, and therefore a new station was erected and the two connected by careful traverse. At the same time the geodetic station was connected to existing timber surveys. This tie particularly was much delayed owing to fog, one of the stations on the north shore of Seymour Inlet having to be climbed no less than four times for this reason.

### MOUNT ROBINSON TIE.

In making this tie the west end of Pack Lake was used to obtain a base from which the geodetic station could be seen. Having stepped down to sea-level, a traverse connection was run over the shoulder of the mountain range separating Pack Lake from Belize Inlet. This is a very rough and broken bit of timbered country and considerable care was taken to keep this traverse as free from error as possible. A tie to Lot 746 was also run, as also the north boundary of same. Lot 746 and the country adjoining to the west is capable of future development, being a rolling plateau broken here and there by hillocks. Already some work has been done by settlers, but at present this area is abandoned. When in future Mereworth Sound is triangulated, a tie should be made through Strachan Bay and up Pack Lake as a check on the traverse-work and to afford a stronger azimuth connection.

### Lots 1055 and 1056.

Lot 1055 and Lot 1056, being the water-lot in front of Lot 1055, are situated on the east side of Allison Harbour. The Smith-Dollar Logging Company is utilizing these lots for headquarters camp and booming-ground. For these purposes they are ideal, being just under shelter from the surf waters immediately adjacent and outside the swift waters of Nakwakto Rapids. The company wharf is used as a port of call for all supplies going into the Seymour Inlet area; and while this summer this call was omitted by the Canadian National steamship services, it has now been included again.

### General.

The Seymour Inlet area, in which is included Belize Inlet and Allison Sound, is a series of lateral troughs running east and west gouged out by glacial action. Between the troughs are well-timbered mountain ranges, conforming to the general Pacific slope; that is to say, decreasing in elevation westerly as the ocean is approached. This area is rich in timber resources and already produces a fair cut annually. This will undoubtedly be increased yearly in future, and while at present most of the timber is taken out by hand-logging, machinery is already coming into greater use. Some of the finest cedar in British Columbia is cut in this area. At present all logs are taken either north across Queen Charlotte Sound or south to the Gulf cities. This means an exposure to open waters, with consequent danger of loss.

Neither mining nor agriculture appears to hold out any inducements in this vicinity, the latter being almost out of the question, due to topographic and climatic conditions. A little fishing by seine-boats is carried on, the fish being taken to Alert Bay for canning.

### Weather.

The weather this summer was exceedingly poor for triangulation-work. Day after day fog, which had come in off the sound to the west, would delay work in the mornings. It seemed to hang about 1,000 to 1,500 feet above the water during the day and settles again at night. Rain was also more prevalent than usual, each of the summer months having a short rainy spell. Between periods of fog and rain a few good days were obtained, but unfortunately on Smith Sound the visibility owing to haze and heat-waves was extremely poor. Snow had made its appearance on the hills early in September, and sleet was encountered at sea-level on several occasions at the close of the season.

### Game.

Little game was seen this summer, except while camped in Millbrooke Cove. The country back of here seems well stocked with deer. A few mink were seen at various points along the shores covered, but on the whole animal life seems less prolific than farther to the north. Trout abound in all the lakes and streams fished in.

I have, etc.,

James T. Underhill, B.C.L.S.

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## COAST TRIANGULATION, MORESBY ISLAND, QUEEN CHARLOTTE ISLANDS DISTRICT.

By A. E. Wright.

Prince Rupert, B.C., November 25th, 1924.

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

Sir,—Control triangulation was carried out on the west coast of Moresby Island. A satisfactory site for the base-line was found on the north shore of the East Narrows of Skidegate Channel. At this point the channel is about 15 chains wide at high water, though practically dry at extreme low tide. We succeeded in laying off a straight base over a mile in length, with convenient mountains to the south of the channel on which to expand. The ends of the base were permanently marked with brass survey-plugs, so that the measurement can be independently checked at any time.

A short description of the method of measurement employed might not be out of place.

Stakes 3 inches in diameter and 4 feet long were first cut and driven solidly into the ground at 50-foot intervals along the whole line. As most of the stakes were of hemlock, and as over a hundred were required to be cut and carried to position, this part of the work was one of considerable labour. To make certain of solidity the stakes were all driven as far as possible with a 10-lb. sledge. For the next stage a line of levels was run over the base and ordinary brass pins were placed horizontally on the side of each stake at right angles to the direction of the base. These pins were placed at the same elevation on as many consecutive stakes as possible, and where, on account of the rise or fall of the ground, it became necessary to change the level of the pins, this change was carefully measured and made great enough to ensure as long a series at the new level as possible. The base was then measured with a 100-foot tape, previously standardized, and graduated to hundredths of a foot throughout. Throughout the level portions measurements were only taken to every second stake, the tape being supported on the pin at the half-way. At first the weather was not satisfactory on account of the strong sunlight, and four measurements had to be discarded as the temperature correction was too uncertain. At this stage the measurement had to be reluctantly given up as it threatened to consume too much valuable time, and camp was moved to a place where other work could be accomplished while waiting for a cloudy and windless day. This was not long in arriving, and two measurements were secured which easily came within the limits allowed. A 16-lb. pull was used throughout.

From experiments and calculations with the discarded measurements it was found that the temperature of the dry gravel was 10° higher than the temperature of the air, and that the temperature of the tape conformed very closely to the temperature of the gravel.

At first little difficulty was experienced in expanding from the base, but later on it was found very hard to pick satisfactory mountain stations, as the tops are nearly all flat and of about the same elevation.

The highest mountains in this vicinity lie about the head of Moore and Inskip Channels and are about 3,700 feet in height.

A line of triangles was run overland from the East Narrows to Tasu Harbour and Sewell Inlet on the east coast, and ties were made to the following channels and inlets which were all triangulated, namely: Buck Channel and Canoe Pass (between Chaatl Island and Moresby Island), Kitgoro Harbour; Inskip Channel with its inlets, Boomchain Bay, Security Cove, and Peel Inlet; Moore Channel and its inlets, Douglas, Mitchell, and Mudge Harbours, Kootenay Inlet and Tasu Harbour. Twenty mountain stations in all were set and occupied.

### SKIDEGATE CHANNEL.

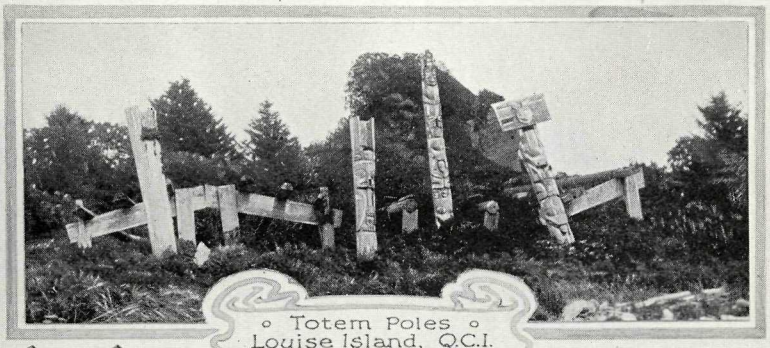
Moresby Island is separated from Graham Island by Skidegate Channel and Skidegate Inlet. The latter has about the only permanent settlements on the Queen Charlottes outside of Masset Inlet and the east coast of Graham Island. It is a deep inlet with many islands and bays, with low well-rounded mountains covered with excellent spruce and hemlock.

At the head of the South Arm of Skidegate Inlet Skidegate Channel commences, narrowing down to a width of from 5 to 20 chains. This is the East Narrows, navigable by the larger boats only at high tide. A boat drawing 4½ feet can get through at half-tide or better, but the channel is very intricate and should not be attempted by strangers except at high tide. It is about 3 miles long.

To the west of the East Narrows the channel widens out and the North Arm stretches north for 3 miles. It is half a mile wide and its shores are covered with good spruce and hemlock.

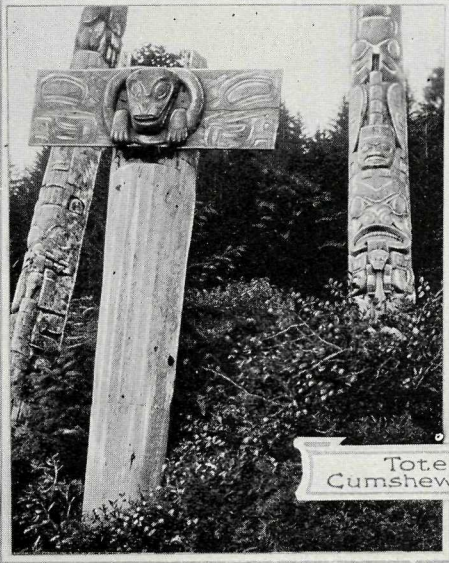
To the west of the North Arm is the West Narrows, 1½ miles long and about 20 chains wide. This narrows is deeper than the East Narrows and is navigable for small boats at all stages of the tide.

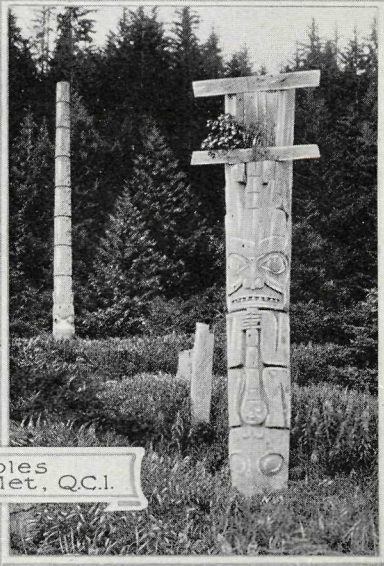
There is a strong tide through Skidegate Narrows at nearly all stages. At the entrance to the East Narrows the tide by the shore conforms nearly to that at Port Simpson. At the entrance to the West Narrows the tide conforms to that of the open Pacific and is about fifty minutes ahead of Port Simpson tides. As the tide starts to fall at the West Narrows nearly an hour ahead of that at the east, it follows that for nearly an hour the tide is flowing into the North Arm from the east and flowing out of it to the west coast at the same time. It is possible to leave Skidegate or Queen Charlotte City two or three hours before high tide and travel westward by row-boat or canoe for nine hours with a strong fair tide.



Totem Poles
Louise Island, Q.C.I.

Laskeek Totem Poles
at Tanoo Island, Q.C.I.





Totem Poles
Cumshewa Inlet, Q.C.I.

The main Skidegate Channel lies west of the West Narrows and is about 1 mile wide and 7 long. A large creek empties into the head of Skidegate Channel, flowing from the south-east. There is excellent spruce, cedar, and hemlock along the sides of this creek. An old trail connects through this valley with Security Cove. It was built some years ago when the mine at Gold Harbour was working, affording a short-cut between the country about Moore and Inskip Channels and Skidegate Inlet. The trail is about 8 miles long and by its use it was not necessary to take to the open sea at all. The character of the land changes greatly after passing the West Narrows—the mountains are higher and steeper with much poorer timber.

Chaatl Island forms the south shore of this portion of Skidegate Channel and is separated from Moresby Island by Buck Channel on the south and Canoe Pass on the east. Canoe Pass dries right across and is not navigable even at high water except by the smallest boats.

There is some good spruce and hemlock on the lower slopes of the south and east shores of Canoe Pass.

Buck Channel is 6 miles long and gradually widens from ½ to 3 miles. On the north shore about half-way along lies the abandoned Indian village of Chaatl. The former inhabitants joined the Skidegate band years ago and have since lived on Skidegate Inlet.

### West Coast of Moresby Island.

Kitgoro Harbour, or French Harbour, as known to the fishermen, is 3 miles south of Buck Channel. It is about 3 miles long with a narrow entrance. The head is a basin with deep water flanked by extensive tide-flats. The water is deep until well within the narrow entrance, where it shoals, with bottom covered with small boulders. There is said to be a deep channel through this shoal, but I did not find it.

Three miles to the south-east of French Harbour one enters the extensive body of water locally described indefinitely as "Gold Harbour." It consists of Inskip and Moore Channels, with several inlets branching off both.

To the north of the entrance of Inskip Channel lies Kaisun Harbour, a good anchorage, sheltered by islands from the heavy sea, but not much sheltered from south-west winds. It is about 1½ miles long and half a mile wide, with a deep but rather narrow entrance at the west end. At the east end there is a narrower and shallower entrance which leads into Boomchain Bay, also sheltered by islands.

Inskip Channel is 10 miles long, with Security Cove off to the north-east from a point 3 miles within the entrance. Security Cove is a long narrow inlet 5 miles long and a quarter of a mile wide. At the head it widens out to half a mile in width, with extensive mud-flats. It is a safe anchorage with deep water all the way in. Two large creeks flow into it, one from the north and one from the east. There is good timber in both these creek-bottoms and for some distance up the mountain-sides.

Kuper (Hibben) Island forms the south shore of Inskip Channel. It is 10 miles long and two wide and rises to a height of 2,700 feet. The north and east slopes are well timbered. To the south of Kuper Island is Moore Channel, named after Captain Moore, of H.M.S. "Thetis," sent to overawe the Gold Harbour Indians in 1852. While in the vicinity a rough survey was made of Moore Channel and Douglas and Mitchell Harbours. Prior to this time gold had been discovered in a small vein on the west shore of Mitchell Harbour, and about 1852 the vein was being worked by the Hudson's Bay Company or their employees.

Douglas and Mitchell Inlets are similar in appearance. They both bear away in a south-easterly direction for about 4 miles, gradually narrowing towards their heads.

From the junction of Inskip and Moore Channels Mudge Inlet extends south-east for 3 miles, with a small patch of good timber at the head. Peel Inlet extends first east and then south-east for 5½ miles. There is good timber at several points on the north shore of Peel Inlet and at the head, which reaches to within 5 miles of Lagoon Inlet on the east coast.

The entrance of Kootenay Inlet is about 8 miles south of Moore Channel. The entrance is narrow but deep, though partly blocked by kelp. About a mile within the entrance it divides into two arms. The North Arm is 2 miles long and 20 chains wide, with a little good timber at the head. The South Arm is from 3 to 4 miles long, with a narrow entrance for nearly half a mile. Inside it widens out and is nearly half a mile wide until near the head. There is very good spruce and hemlock on the north shore and in a wide valley at the head. This valley runs through to the head of the North Arm of Tasu Harbour.

### TASU HARBOUR.

The entrance to Tasu Harbour cannot be seen from the outside until right abreast. It is only 15 chains wide and very deep, with high cliffs on both sides. It is quite a large body of water, with an extreme length north and south of 10 miles. It extends easterly for about 5 miles to within 2 miles of the head of Crescent Inlet on the east coast. It is divided into three arms—North Arm, South Arm, and South-east Arm. The latter is almost choked up with islands at the entrance. There is good timber at the head of all these arms and on the mountain-side between Tasu Harbour and Crescent Inlet. A fairly good trail extends from near the south-west corner of Lot 1944 to the head of Crescent Inlet. This trail has several large windfalls and is not well brushed out in places. It is not shown on the departmental reference maps at present.

There is another trail from the head of the North Arm of Tasu Harbour to the head of Sewell Inlet. It is 4 miles long and was an exceptionally well-built trail. It is now pretty much grown over and some of the bridges and puncheon are broken down.

About fifteen years ago there was a great deal of mining activity at Tasu Harbour. A great many claims were staked and about twenty Crown-granted. On the west shore of the South Arm inside of Gowing Island there are large ore-bunkers still standing, with an aerial tram leading to a copper-mine at about 1,000 feet elevation. It was last worked in 1917 and the bunkers will not survive many more winters. This appears to be the only mine in the vicinity that ever shipped.

### THE WEST COAST.

The shores of the west coast are very rough and forbidding. It is impossible to make a landing even in the best weather. There are no beaches and the waves have washed long gullies into the rocks, making it impossible to walk along the shore. There is no vegetation for about 100 feet above high tide, above which there is a thick growth of salal and scrubby spruce and hemlock. Even in fine weather the swell is sufficient to make landing difficult 8 miles up Inskip and Moore Channels. Kelp grows thickly among the rocks at the base of the cliffs and thin patches are seen half a mile offshore in places. About these patches and at the mouths of all the inlets there are strong tide-rips at certain stages of the tide.

### TIMBER.

While there is some very good spruce, cedar, and hemlock in the area triangulated, it is unlikely that it will be exploited until the timber in more accessible regions is exhausted, or until the price is considerably higher. Practically all the flat land has good timber, but there is very little flat land. The greater part of the mountain-sides are covered with a more scrubby growth suitable for pulp-wood when the demand comes. At some points on the mountain-sides where the underlying rock is partly limestone the large spruce, cedar, and hemlock grow at an elevation of 1,500 feet, and at some of these places, at an elevation of from 1,000 to 1,500 feet, some excellent yellow cedar is found. The higher parts of the rounded mountains are covered with muskeg up to an elevation of 2,500 feet, above which it is mostly rock.

The disability mentioned above does not apply to the timber around Skidegate Channel, as it should be possible to tow small rafts through the narrows at high tide.

### MINING.

There is no mining being carried on within the area triangulated. On the west shore of Mitchell Inlet the Early Bird Group, above mentioned as being worked by the Hudson's Bay Company, is worked spasmodically. It is at present owned by Mr. McLellan, of Queen Charlotte City. We picked several good specimens out of the dump showing free gold. A 2-stamp mill run by water-power has been installed, but the vein seems to have pinched out and will require more development before more gold can be obtained.

On the north shore of the South Arm of Kootenay Inlet the Blue Mule Group, owned by Wiggs and McRae, has had considerable development done on it during the last few years. A Ross mill with a capacity of 1 ton per day, run by a water-wheel, has been installed. In this case the gold is not all free-milling.

At Canoe Pass and on the south shores of Buck Channel oil-seepages of a thick tarry nature may be seen on the beach in several places. In the seepages noted the oil seems to have oozed

through the gravel and the lighter portions evaporated, leaving the gravel cemented together with a tarry substance which seems rather brittle. There has never been any drilling for oil in this vicinity.

### Water-powers.

There are no water-powers capable of any large development in the area triangulated, though small creeks capable of running small stamp-mills, etc., in rainy weather are numerous. The largest creek seen during the summer is that draining into the head of Thetis Cove, Mitchell Inlet, and its drainage area must be under 16 square miles. Tasu River was much smaller when seen in August, although it must be a large creek when in flood.

### Fisheries.

There are no canneries in the area covered by this report. The spring-salmon trollers all operated off the west coast of Graham Island this year. I believe that the trollers used to troll around the entrance to Buck Channel and sometimes farther south, and at one time a shallow channel was dug through the mud in Canoe Pass to let the gas-boats through, but it is now partly filled up. No salmon or herring were seen in Tasu Harbour, but a few dog-salmon were running up the creeks about Gold Harbour in September. A few halibut-boats fish off the west coast in the fall and spring, as the many inlets afford good shelter in bad weather.

### Settlement.

In the area triangulated there is no settlement whatever, and outside of trips to Queen Charlotte City and one halibut-boat, no one was seen all summer.

Around the shores of Skidegate Inlet are the largest permanent settlements on the Queen Charlottes, with post-offices at Sandspit and Aliford Bay on the south shore, and Skidegate and Queen Charlotte City on the north. At Sandspit there are several families who make a good living at agriculture, without having to eke out an existence by spasmodic fishing and logging.

Cattle range the bush of the islands and north shore of Skidegate Inlet and the east coast from Copper Bay to Rose Spit. It is only necessary to feed them for a short time during the winter. All sorts of berries and vegetables and nearly all fruits thrive around Skidegate Inlet, though slightly hampered this year by a plague of blue jays.

There is no land suitable for agriculture on the west coast or on the western inlets.

The cannery of the Maritime Fisheries at Aliford Bay was not operating this year, though it was used as a collecting-station during part of the summer and the fish taken to Haysport, on the Skeena River.

### Transportation.

The steamer "Prince John," of the Canadian National fleet, maintains a weekly service with Prince Rupert in the summer and a bi-weekly service with Prince Rupert and Vancouver during the winter. There is a road from Queen Charlotte City to Tlell, on the east coast of Graham Island.

### Climate.

The climate of Queen Charlotte Islands varies with the different portions. On the inlets off the west coast the precipitation would be about 250 inches in a bad year. The east coast is much drier, probably varying from 60 to 120 inches of rainfall, while at Sandspit, on Moresby Island, and along the east coast of Graham Island the rainfall is still less. There is very little snowfall at sea-level and no summer frosts.

### Game.

A small species of black bear is the only large game on Moresby Island. They are very numerous around the creeks in the fall and quite tame enough to prowl about the camp at night, stealing anything edible left outside the tents. Quite a few grouse were seen in June and July, but very few were seen later on in the summer. Pheasants placed along the east coast are becoming numerous from Tlell to Sandspit. Geese and fish-ducks breed on the islands, the former on the small lakes which occupy nearly every depression on the mountain-tops. The edible ducks do not seem to arrive until the fall, but both they and the geese are very numerous all winter. Deer should do very well if introduced in sufficient numbers.

I have, etc.,

A. E. Wright, B.C.L.S.

## COAST TRIANGULATION AND LAND-TIES, QUEEN CHARLOTTE ISLANDS, AND SURVEY ON PORCHER ISLAND.

BY F. S. CLEMENTS.

VICTORIA, B.C., December 22nd, 1924.

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

SIR,—Work on Porcher Island was a correction survey of Lot 6786, situated about 4 miles up the Oona River and accessible by trail from the settlement at the mouth of said river. The lot contains very little timber, two-thirds being flat muskeg capable of being drained and used for hay meadows. The remainder of the lot is rolling and covered with scattered spruce, hemlock, and yellow cedar. Climate is about the same as that of Prince Rupert. Game consists of black bear, geese, duck, and grouse. The settlement at the mouth of the Oona River consists of nineteen substantial log-built buildings containing fifty inhabitants, of which sixteen are children attending school. Small boats may anchor safely in the mouth of the Oona at high tide, but rest on mud bottom at low tide. Almost all of the settlers are fishermen or work at Prince Rupert, 30 miles distant by water.

### TOW HILL, GRAHAM ISLAND.

Work at Tow Hill was a tie survey of Lot 228 to the Tow Hill Geodetic Station, situated at the mouth of the Hiellen River, about 30 miles by water and 20 miles by wagon-road from the settlement at Masset.

The lot contains very little timber, two-thirds being covered with muskeg capable of being drained and used for agricultural purposes. The remaining one-third is covered with scattered hemlock, spruce, and cedar, and is level with the exception of Tow Hill, which stands 500 feet above sea-level and is composed of a volcanic rock about 15 chains in diameter.

The mouth of the Hiellen River is very shallow and not a safe anchorage for small boats, unless they go well up on a very high tide, where they will have to wait for as high a tide to get away. The Langara Fishing and Packing Company operates a clam-cannery at the mouth of Hiellen and has a telephone-line to Masset.

All of the north end of Graham Island east of Naden Harbour is a low, gently undulating plain, with a few flat-topped hills covered with spruce, hemlock, and cedar, except where muskegs occur. The coast-line, when the wind is from the north, north-east, or north-west, has only two safe harbours—namely, Masset and Naden.

The climate is about the same as Prince Rupert. The game the same as Porcher Island, except that deer are scarce.

### NADEN HARBOUR, GRAHAM ISLAND.

Work at Naden Harbour was a resurvey of Lot 2010 and a tie of same to Lot 2477 on the opposite or east side of the harbour.

Lot 2010 adjoins Indian Reserve No. 11, or Kung Village, on the north. It is on rolling ground well covered with spruce, hemlock, and cedar, but contains very little land suitable for agricultural purposes.

Lot 2477 is fairly level and covered with spruce, hemlock, and cedar. Kung Village was deserted, the natives being away fishing at North Island. The crab-cannery opposite at George Point was occupied by a caretaker. The Consolidated Whaling Corporation, Limited, on the west side of the harbour and about 5 miles south of Lot 2010, was operating.

The whole of the north end of Graham Island west of Naden Harbour is hilly and irregular.

### LANGARA OR NORTH ISLAND.

At Langara Island a tie survey of Lot 676 to the Langara Island Geodetic Station was made.

Lot 676 adjoins Egeria Bay. The north end of the lot is hilly and contains very little good timber. The whole island is hilly and irregular, with open muskeg in places. All the merchantable timber is near the shore, being spruce, cedar, and hemlock. The coast is rocky and without a safe anchorage, except at the south end of the island near the Indian reserve. Eight fishing-boats manned by Indians were working off the east coast of Langara Island.

### Skidegate Inlet.

Land-ties were made on both north and south sides of Skidegate Inlet, Maud Island, and Lina Island, between Sandspit and Long Arm.

This part of Queen Charlotte Islands is noted for both climate and scenery, and justly so. The surrounding country is mountainous, with very little level land near the water. The mountains vary in height between 1,200 and 3,600 feet, the foot-hills being covered with hemlock, spruce, and cedar.

The waters of the inlet are safe for rowboats and small launches and are studded with small islands. The C.N.R. steamer "Prince John" during the summer months gave a weekly service to Queen Charlotte City, Skidegate, and Sandspit. Game consists of black bear, deer, grouse, duck, geese, etc. Fishing is the only industry at present.

### Rennell Sound.

Ties were made of Section 18, Township 10, to Lots 30 and 31, Yakoun Bay, and triangulation of Rennell Sound from head to north end of Shield Island. Twenty-seven stations and five sub-stations were fixed by cementing brass bolts or copper nails in ¾-inch holes drilled in solid rock or boulders buried in the ground.

Rennell Sound is surrounded by mountain peaks varying in height between 1,500 and 4,000 feet. Hemlock, spruce, and cedar cover the foot-hills, with yellow cedar or cypress on the higher slopes. There is very little agricultural land, and owing to the rainfall it would be very difficult to harvest crops of hay.

An abandoned fish-salting plant and wharf is located on the west shore about 1 mile from the head and a small log cabin on the east shore just north of Shield Island. The Yakoun Lake Trail leaves the east shore of Yakoun Bay, just opposite the south end of Shield Island. Large or small boats may anchor safely at any point east or south of Shield Island.

Black bear, deer, marten, otter, ducks, geese, etc., abound near and in these waters. Five black bear were counted on the beach one evening, but only one deer, although there were plenty of deer-signs.

The climate is mild but wet, the temperature being about the same as Queen Charlotte City.

The general formation of the country is very mixed, sedimentary rocks predominating, which seem to have been subjected to great heat. Granite and sandstone outcrop here and there. The whole west coast from Rennell Sound to Skidegate Inlet seems to have been shaken up by earthquakes and volcanoes. It is rugged and irregular and dangerous to navigate near shore owing to half-submerged reefs and others just covered, extending well out to sea.

It rained 99 days out of the 165 spent in the field. At Rennell Sound on two occasions 8 inches of rain fell in twenty-four hours. Only one fishing-boat and one timber-cruising launch called during our stay there.

I have, etc.,

F. S. Clements, B.C.L.S.

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## TRIANGULATION SURVEY, MORESBY ISLAND, QUEEN CHARLOTTE ISLANDS DISTRICT.

By A. S. G. Musgrave.

Victoria, B.C., October 15th, 1924.

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

Sir,—The general topography of the east coast of Moresby Island consists of a series of deep inlets, the heads of which lie amongst the steep mountains forming the backbone of the island; these inlets afford excellent shelter for launches and also form many natural booming-grounds for logging operations. The timber is almost exclusively spruce, hemlock, and cedar, the great bulk of which lies close to tide-water of some description. All timber at present being cut is towed to the Mainland in Davis rafts to Powell River and Swanson Bay; these rafts have greatly simplified the risky towing over Hecate Strait.

This season saw a very heavy run of humpback salmon, the canneries at Lockeport and Lagoon operating to full capacity; the purse-seine boats had to lay off for periods to avoid catching surplus quantities.

Mining is completely inactive, the big mining groups near Jedway and Lockeport not being worked in any form.

Transportation facilities to the Mainland leave a lot to be desired at present; the winter schedule of one boat a fortnight to handle all the Queen Charlotte Islands freight and passenger service is meeting with severe local criticism. The summer schedule of one boat a week, with various small freighters to handle the salmon-pack, met with approval, but unfortunately owing to many unforeseen circumstances this was very much interrupted.

I was very much struck by the universal demand for better connection with the Mainland, and consider that development will be retarded until an improved service is operating.

### VICINITY OF LOCKEPORT.

In accordance with your instructions, preliminary to starting the Coast triangulation-work I first carried out a series of land surveys and the rechecking of old timber surveys. This work extended from close to Skidegate Inlet southerly to Lyell Island.

My first work consisted in the subdivision of the Lockeport Cannery property into two parcels, also the surveying of two foreshore leases for wharf purposes. I then carried out a tie to the group of mineral claims at Anna Lake, some 2 miles from Lockeport, and the connecting of same to the Coast triangulation system. Anna Lake lies 250 feet above sea-level, being drained by a fair-sized creek 1 mile long to tide-water.

Lockeport lies in a sheltered inlet on the fringe of the main mountain divide running down the centre of Moresby Island; for this reason it catches considerable rain. The rainfall statistics kept by the genial William Morgan, the local Notary Public, Postmaster, and storekeeper, show 4.76 inches in July, and from August 21st to September 21st 13 inches of rain. The rainfall, however, on the islands lying off the east coast of Moresby is considerably less; a very common sight is to watch a driving rainfall on the mountains while bright sunshine prevails offshore.

### LYELL ISLAND.

Twenty-six miles of compass-line were run in the vicinity of Atli Inlet, Lyell Island, correcting old timber surveys. The country here is heavy travelling, windfalls, bluffs, salal and devil's-club making progress slow.

A portion of this island is logged off, but a considerable amount of good timber still stands, fronting on natural booming-grounds; there is, however, no water-power available.

### LOUISE ISLAND.

The work on Louise Island consisted in adjustments to old timber overlaps and the tying-in to the Provincial Coast triangulation system of the Canadian Geodetic Survey Station on a mountain-top on Louise Island. I accomplished this latter by triangulating from Reef and Low Islands to a station erected over the geodetic station through the courtesy of Mr. McCallum, of the Geodetic Survey of Canada. Mr. McCallum has also established a second station near the south end of Moresby Island, and both these are connected to the Mainland by rays from Bonila Island, etc., and these are in turn connected to the main primary triangulation system of the United States in the State of Washington, which links the Atlantic with the Pacific by a transcontinental network.

Louise Island is somewhat similar to Lyell Island, being rugged, mountainous, and well timbered.

### CUMSHEWA INLET.

The adjustment of considerable overlaps in the old surveys was the main work here. A resurvey of some 20 miles of shore-line, extending from Copper Bay southerly to Lot 27 on the north shore of Cumshewa Inlet, was carried out and the various discrepancies located.

The topography of this country between Cumshewa and Skidegate Inlets is in striking contrast to all the country to the south of Cumshewa; it is very low-lying and hence much drier; the logging camps here in September had considerable difficulty in obtaining water enough to operate their donkey-engines, whereas Lockeport over the same period had 13 inches of rain.

The timber is again solely spruce, cedar, and hemlock, many fine stands existing; owing to the easy grades it is very suitable hauling to tide-water, but good natural booming-grounds are rarer.

The very shallow waters in Hecate Strait opposite these parts make the seas particularly dangerous during a south-east or north-west wind.

### Darwin Sound.

The Coast triangulation-work commenced at the junction of Crescent and Logan Inlets with Darwin Sound. A suitable base-line 1 mile in length was found close to the conclusion of the work of Colonel W. J. H. Holmes, B.C.L.S., in 1923; this base-line gave a very satisfactory check on all work to the north.

The base was very accurately measured, firm stakes being driven every 75 links, each stake being capped with tin, which enabled a fine scratch to be recorded on it; temperature, sag, standard variation, and deviation from the horizontal were all allowed for, an accuracy of inside 1 in 50,000 being obtained.

The type of stations used throughout the triangulation were about 3 feet 6 inches high, with two cross-arms nailed on a base about 3 feet by 1 foot; the cross-arms were shingles off deserted shacks in all cases and the balance was driftwood; whitewash was freely used on the targets and cairns of rocks holding them in place. These targets were set up over in every case and proved clearly visible up to 5 miles, provided the sun was not shining into the instrument. The headlands were very suitable for triangulation-work in most cases, being free of brush and projecting well above high tide.

Darwin Sound extends from Crescent Inlet southerly to Point Richardson; it is very sheltered water throughout, being completely protected from Hecate Strait by Lyell Island. The timber is good for the entire easterly shore-line, but on the westerly side south of the north end of Shuttle Island it is particularly poor and non-merchantable, except in very small draws.

Bigsby Inlet, which runs westerly, cutting into the main mountain range, is very barren and rocky along both shore-lines; it is deep water throughout but poor anchorage.

### Juan Perez Sound.

This body of water is named after Ensign Juan Perez, who in 1774 sailed from San Blas in the corvette "Santiago" on an exploratory trip to the north; while not actually the first discoverer of the Queen Charlotte Islands, his boat was one of the very early ships to report on the rough position and outline of the islands.

The sound is very open to a south-east wind from Hecate Strait and has to be treated with respect by gas-boats; the prevailing summer wind appeared to be from the north, however, so we were not worried very much with bad weather there. The main steamer-channel from Jedway northwards lies outside Burnaby Island and thence between Burnaby and Ramsay Islands into Darwin Sound; this is good deep water throughout and well free of reefs. The various inlets running off Juan Perez have several dangerous half-submerged reefs which need careful watching; throughout the work I fixed the position of all such reefs by rays.

Like Darwin Sound, the timber is only good down the easterly shore, the timber around De la Beche, Hutton, and Werner Inlets being considerably poorer.

The triangulation was carried easterly between Lyell and Faraday Islands to the group of islands called Tuft, Tar, and Agglomerate, and thence northerly to tie in the east coast of Lyell Island. The passage between Faraday and Murchison Islands is particularly reefy and should be avoided by gas-boats.

The regulation brass monuments were cemented in drilled holes on all prominent headlands and at junction of waterways.

Hot Spring Island contains excellent natural pools which are just the right temperature for hot baths; the island also has a few good trails through pretty woods.

A check base-line was measured in Werner Bay at the southerly limit of the triangulation-work; four careful measurements were made under very suitable weather conditions, which enabled an accuracy of well inside 1 in 50,000 being obtained.

The approximate position and elevation of six of the main mountains in the dividing range were fixed so as to give a general idea of the topography.

GENERAL.

No deer were visible on Moresby Island or adjacent islands. Black bear abound, twelve being within easy rifle-shot on two consecutive days; they do not appear to be on any of the islands lying off Moresby, however. Grouse were fairly plentiful. Pheasants are multiplying around Skidegate where they have been introduced. Red, grey, and salmon cod abound in the deeper waters. Humpback and dog salmon are the only species of salmon caught in merchantable quantities.

The geological formation is very striking, great folds of strata being visible along the shoreline, bent and overlapping by volcanic action. Some good fossils of the Cretaceous period were found along the north shore of Cumshewa; amongst the better ones were identified *Inoceramus sulcatus, Haploceras beaudanti, Thetis affinis, Lytoceras sacya,* and *Turrilites carlottensis,* all of the Cretaceous period.

All Indian reserves south of Skidegate Inlet are now abandoned, the Haidas congregating around Skidegate Village, except during the fishing season, when some of them go to Lagoon and Lockeport. They are a particularly good type of Coast Indian and speak English fluently. A very good outline of their history is given in Dr. G. M. Dawson's report in 1878 to the Geological Survey of Canada. Amongst other things he mentions their blackstone carvings and rough silversmith-work; these arts are still carried on by the old Indians, but it is almost a dead art.

I have, etc.,
ARTHUR S. J. MUSGRAVE, B.C.L.S.

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## TRIANGULATION SURVEYS, LAKELSE AND KITIMAT VALLEYS, RANGE 5, COAST DISTRICT.

BY P. M. MONCKTON.

TERRACE, B.C., November 1st, 1924.

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

SIR,—Work started on June 1st by chaining a base-line along the track of the Canadian National Railway near Copper City, where there is a tangent of approximately 2¼ miles. From this base the triangles were carried southerly across the Skeena by setting stations at varying heights up the mountain-sides. Conditions were fairly good during June, the weather being quite fine and sometimes rather too hot. After the first few days of July we reached the end of good transportation and had to commence cutting trail and packing all supplies on our backs, after which our rate of progress slowed up considerably. During the period from July 5th to September 1st we were entirely occupied with the triangulation of the valley of the Upper Kitimat; that is to say, the part above the forks. This necessitated a lot of trail-construction, the distance to the head being 40 miles from our supply-cache at Lakelse Lake. July started very rainy, but the weather was fine from July 21st to August 10th, and by August 15th we had built trail and moved camp as far as the headwaters of the Kitimat River and were ready to turn back, reading the angles down-stream. However, the weather broke up completely at this juncture, and from now on till the end of October there was never another fine spell, all work subsequently being done whenever the chance offered to pick up a station through a rift in the clouds, and everybody on the party, as well as stores and equipment, were henceforth more or less perpetually wet.

We were finished with the Upper Kitimat by September 19th. On September 1st I had sent my assistant and two men by launch from Prince Rupert to Kitimat with instructions to reconnoitre a site for a base-line at Kitimat and erect stations therefrom northerly to meet me. This programme was duly carried out and the two divisions of the party met at Cecil Creek on September 28th. On October 6th the triangulation reached salt water and I reduced our numbers by four men. From October 6th to 24th the weather remained very wet and cloudy, so that much time was consumed in surveying the 12 miles between the head of the inlet and Underhill's Coast triangulation survey near the mouth of Kildala Arm. On October 25th we left Kitimat for home by launch, arriving at Inverness on the 27th and reaching Terrace the same night.

### TOPOGRAPHY.

The country between the Skeena and the head of Kitimat Arm is a wide valley, hemmed in on both sides by steep granite mountains of the Coast batholith. The floor of this valley averages about 5 miles wide and the quality of the soil is very variable. From the Skeena to Lakelse Lake there is a good deal of gravel bench, but all along the west side of Lakelse Lake there are granite-outcroppings, rising in Hermon Mountain to a height of 1,790 feet, with Lakelse Lake about 400 feet. Two miles south of Lakelse Lake a gravel bench stretches right across the valley with an almost uniform elevation of 830 feet and forms the summit between the Skeena and Kitimat watersheds. This bench can be followed southerly till it narrows down and merges into Iron Mountain, an isolated hill 2,750 feet high in the middle of the valley, with the Kitimat flowing to its east and the Wedeene on its west.

From Iron Mountain to the Coast is about 12 miles of low flat land, with here and there an outcrop of granite. The soil is mostly alluvial and covered with a heavy growth of timber, most of which would appear more suitable as pulp than lumber. At the mouth of the Kitimat River are extensive grass-flats, under water at extreme tides, on which about sixty head of beef are pastured. Here live the few remaining white settlers, five familes in all, numbering ten people. On the east shore of the inlet, 2 miles down from the head, is the large Indian village, with a native population of about 300. There are also a Methodist Mission and a school for the Indian girls.

The Kitimat River is navigable for canoes from salt water to the forks without other difficulty than the hard work of tracking up numerous riffles. It is very tortuous, continually changing its channel, and full of bars and jams. Above the forks—the North Fork, or Chist Creek, as the Indians call it—it is not navigable. The South Fork supplies 90 per cent. of the water for the Kitimat and is a rough and turbulent stream, with a fall of 30 feet to the mile. However, Indians take their canoes up to the junction of its two main feeders, another 27 miles, in the spring, when they can walk up on the ice on either side and line. The divide at the head of the easterly of these two feeders communicates with the South Fork of the Copper by a high and difficult pass occupied by a huge glacier. The other fork comes from a bearing of S. 10° W. and in all likelihood leads into the head of either the Dala or Hirsch Rivers. The Upper Kitimat Valley is not over a mile in width at any point, and is mostly a sandy loam soil and grows some very fine spruce and cedar. It is hemmed in by high ranges on both sides, rising to some 9,000 feet in some of the highest peaks near the summit. I append a list of approximate elevations taken with the aneroid, unless otherwise stated:—

| | Feet. | | Feet. |
|---|---|---|---|
| Terrace Station (G.T.P. survey) | 223 | Junction, Wedeene and Kitimat | 150 |
| Skeena at Terrace | 170 | Iron Mountain | 2,750 |
| Six-mile Post, Lakelse Lake Road | 800 | Kitimat | Sea-level. |
| Lakelse Lake | 400 | Forks of Kitimat | 550 |
| Mount Baldy, Lakelse Lake | 5,300 | Upper Forks | 1,400 |
| Mount Hermon | 1,790 | Head of S.E. Branch (Kitimat-Copper Divide) | 5,600 |
| Summit, Kitimat-Lakelse Divide | 830 | | |
| Dahl's cabin, Wedeene River | 580 | | |

### CLIMATE.

This region all lies adjacent to the wet Coast belt and shares the same climate in a greater or less degree. The only meteorological records are kept at Terrace, on the Skeena, which will represent the driest point in the area; here the precipitation for 1923 was 52 inches. Kitimat itself is probably about the same as Prince Rupert, which had 132 inches in the same year. The temperature is about the same at Kitimat and the Skeena, an average year ranging from —5° to 85°. Snow is very heavy near Iron Mountain, often lying 12 feet deep in the woods.

### TIMBER.

All the Coast species of timber are found. There seem to be more of balsam and hemlock than other varieties. Spruce does well in some parts of the valley, but it is unaccountably absent from a great part where one would expect to find it. Cedar is found on the lower flats and is often of high quality, but taken all through there is very little of it. On burnt hillsides jack-pine and birch appear. Timber-line is about 4,700 feet on southern slopes and 3,800 feet on northern.

### MINERALS.

Along Kitimat Arm several small veins of quartz were seen, some carrying white iron, but of no value. On Iron Mountain is a group of four claims owned by Chas. E. Moore, of Kitimat; this is a magnetite-deposit and contains also 3 per cent. of copper. It its owner can prove it to be of large enough extent, no doubt some day it will be of value. On Williams Creek and on Thornhill Mountain, near the Skeena, there are many claims, but none as yet have proved their value.

### COMMUNICATIONS.

The northerly part of this area is well supplied with roads and trails; an automobile-road reaches from Lakelse Lake to Terrace, the Skeena now being spanned by the fine new Government bridge. This road is continued southerly as far as the Hot Springs as a trail. From this point south the old road built in 1906 by Foley, Welch & Stewart can be followed easily for about 17 miles, but is badly encumbered by fallen logs. This brings one to Dahl's cabin at the junction of Wolf Creek with the Wedeene, but beyond this the road can scarcely be traced at all. We followed a very old blazed trail ourselves, about 8 miles to Moore's cabin at the foot of Iron Mountain. Mr. Moore has built a very fine trail to the mouth of the Wedeene and from there the usual method of travel is by canoe. Kitimat has a wagon-road for 3 miles up the valley, terminating at the Sandhill. Mail-boats call once a month at Kitimat on no certain dates.

### GAME.

Goats are plentiful above the timber-line, as also are marmots or whistlers. Along the rivers and creeks bear of all sorts are common, especially in August and September. Coyotes were often heard and one wolf seen on the Little Wedeene, though these latter are rare. There are no deer, moose, or caribou. Cohoe, sockeye, and dog-salmon were observed and a great many trout were caught.

### AGRICULTURE.

This is carried on only near the Skeena and at Kitimat in the area covered in this report. However, most of the soil is too heavily timbered at present, and a would-be pre-emptor would have difficulty in finding any land with less than the statutory 8,000 F.B.M. to the acre.

I have, etc.,

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

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## PHOTO-TOPOGRAPHICAL SURVEY, NICOLA VALLEY, KAMLOOPS DIVISION OF YALE DISTRICT.

BY R. D. MCCAW.

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

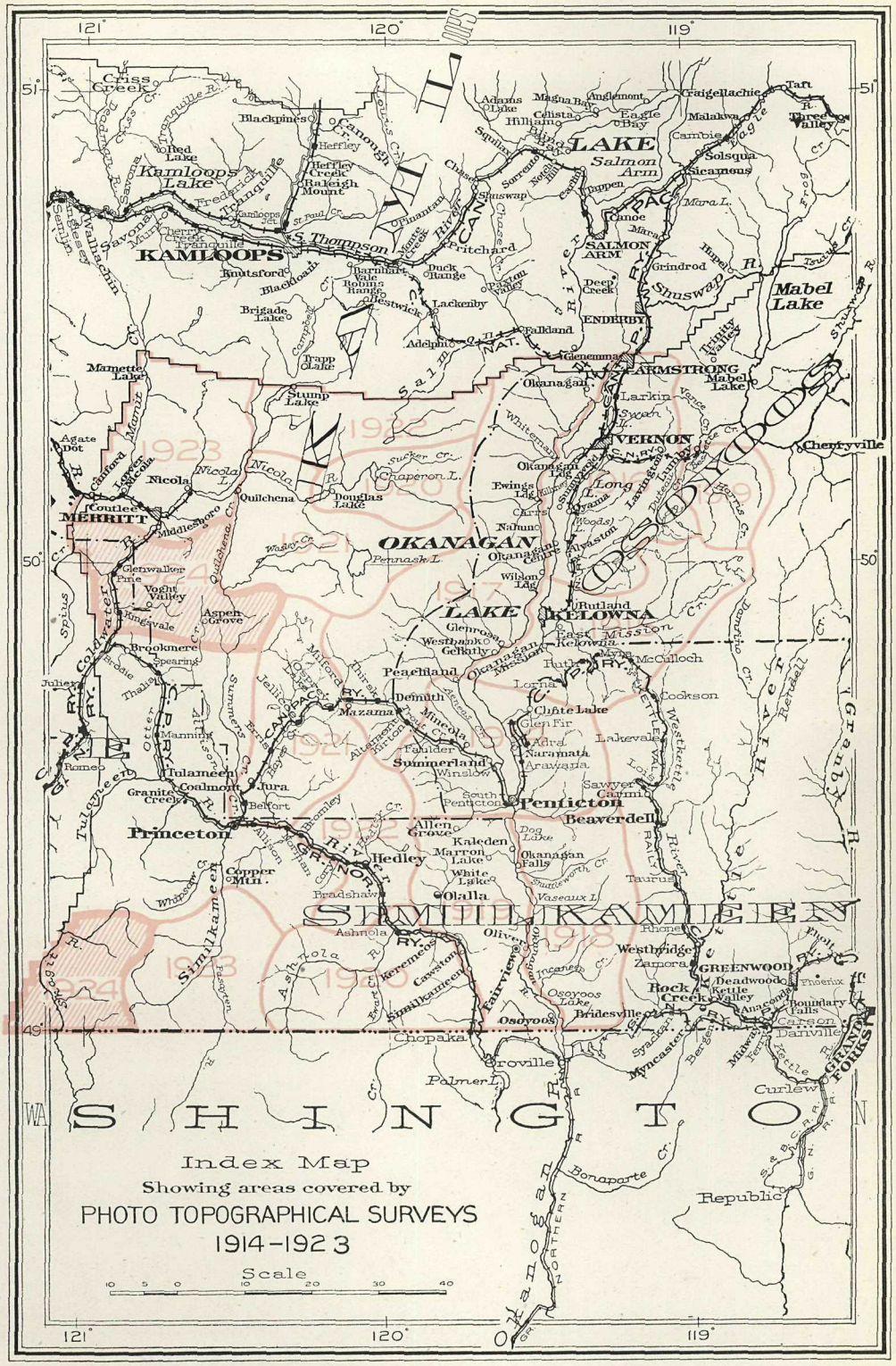
VICTORIA, B.C., December 31st, 1924.

SIR,—I have the honour to submit my report upon the photo-topographical surveys carried on by me in the Nicola Valley during the past season, continued southerly from last year's work, the east boundary being work done in previous seasons and the west boundary being the Dominion Railway Belt. The area completed during the year extends south to an approximate line between Lot 4417 on the east and Section 6, Township 11, Range 22, in the Railway Belt, on the west. The total area is about 440 square miles.

I would again refer to my 1914 report for information on methods and technical details of the system of photo-topographical surveys. As has been the custom in these semi-rolling areas, filling-in traverses were run when necessary. The traverses, being dependent on pacing and compass, were connected either with the triangulation or with land surveys as often as possible in order to minimize inaccuracies. I mentioned last year that the Ilford panchromatic camera-plate was tested out and found to be a superior article for this work. During this season we used Ilford plates entirely, some 75 dozen being exposed.

The first camp was located on Goady Creek, near Merritt. For transportation a Ford car was supplied to me at Merritt. This was used for getting about and for moving camp several times. On long moves a truck or team was hired. The car enabled us to work at long distances from camp, thus saving many camp shifts.

The Iron Mountain Station of the Geological Survey was visited first and the signal repaired. A new auxiliary signal was erected some 850 feet to the south as the main station could not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Criss Creek
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S. Thompson
Savona
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Cache Creek
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Lillooet
Pavilion
Lytton
Lytton
Spuzzum
Yale
Hope
Boston Bar
Nicomen
Blackpines
Canoe
Heffley
Heffley Creek
Raleigh Mount
Chinnantan
Pritchard
Barnhart Vale
Robins Range
Westwick
Lackenby
Brigade Lake
Trapp Lake
Mamette Lake
Stump Lake
Adams Lake
Magna Bay
Anglemont
Eagle Bay
Craigellachie
Tapp
Sicamous
Solsqua
Malakwa
Cambie
Mara L.
Grindrod
Deep Creek
Falkland
Enderby
Armstrong
Mabel Lake
Larkin
Vernon
Okanagan Lake
Okanagan Centre
Ewings Lake
Carrs
Nahmo
Okanagan Mission
Wilson Lake
Rutland
Kelowna
East Kelowna
McCulloch
Lorna
Cookson
Chute Lake
Glen Fir
Adra
Naramata
Arawana
Lakeval
Sawyer
Cawston
Penticton
Beaverdell
Peachland
Summerland
Winslow
South Penticton
Allen Grove
Kaleden
Marron Lake
Okanagan Falls
White Lake
Olalla
Vaseaux L.
Taurus
Westbridge
Zamora
Rock Creek
Deadwood
Greenwood
Phoenix
Anaconda
Boundary Falls
Carson
Danville
Midway
Curlew
Grand Forks
Bridesville
Osoyoos
Osoyoos Lake
Oliver
Fairview
Keremeos
Cawston
Similkameen
Chopaka
Oroville
Palmer L.
Mycaster
Bonaparte
Republic
Princeton
Hedley
Copper Mtn.
Bradshaw
Ashnola
Tulameen
Coalmont
Granite Creek
Jura
Belfort
Merritt
Coutlee
Nicola
Quilchena
Middlesboro
Chapperon L.
Douglas Lake
Aspen Grove
Kingsvale
Brookmere
Spearing
Glenwalker
Pine
Voght Valley
Juliet
Romeo
Manning
Thalia
Otter
Tulameen
Similkameen
Nicola
Coldwater
Spius
Agate Dot
Canford
Lower Nicola
Nicola L.
Quilchena
Mamit
Nicola
Okanagan
Lake
Long L.
Pennask L.
Mabel Lake
Cherryville
Tarr
Three Valley
Salmon Arm
Shuswap
Sicamous
Salmon River
Eagle River
Shuswap R.
Spallumcheen
Kettle River
Granby R.
Okanogan
Similkameen
Tulameen
Nicola
Coldwater
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be seen from that direction. Shovel Nose Mountain was chosen for a new triangulation station south of Iron. This feature is very prominent and rises a little to the north of Brookmere. The altitude is about 5,500 feet. Another signal was placed on a high feature west of Merritt at the head of Midday Creek watershed. Camera stations were then occupied along Spius Creek and some traverse done along the Coldwater Road and tributary roads. The intention was to complete the area west of the Coldwater at once, but on account of smoke from fires for burning insect-infected timber and brush in this area we had to abandon it and on June 21st moved camp to Corbett Lake.

Triangulation and photographic stations were now occupied to cover the Lumbum Commonage and adjacent areas not already done, the general course being to continue southerly in the vicinity of the main Merritt–Princeton Road and westerly along the Kane Valley and Iron Mountain Roads. On July 3rd the Geological triangulation station Missezula was visited and an auxiliary signal placed on an open rock bluff some 1,800 feet to the north-west. It was found that the old station was in a poor position for our work this year as it would be hidden by timber from many subsequent stations.

The next base of operations was in the Pot Hole Creek basin. A camp was located on Lot 1902 on July 23rd near the centre of this area. Surveys were also projected south into the Shrimpton Creek watershed almost to Missezula Lake. My main triangulation station of 1921—"The Wart"—was reoccupied and the signal repaired. During the summer of 1922 a forest fire did much damage to the Shrimpton Creek watershed, leaving a large area of standing jack-pine poles, bleached almost white by sun and rain. Some of the pre-emptions in the Pot Hole Creek-Shrimpton Creek area have apparently been abandoned. There are about six settlers there at present. Very little is grown; the chief product is the grass in the marshes. To the west of this area is a trough running north and south, containing Allan, Kentucky, Blue, and Missezula Lakes, as well as many small sloughs. Most of these lakes have no apparent outlet. On the west side of the aforesaid trough is a broken mineralized ridge adjacent to Aspen Grove, which in days past presented much activity, although at present no work is being done on the very numerous mineral claims.

From Pot Hole Creek we moved to the valley of Voght Creek at the junction of Howarth Creek. From this camp surveys were carried on through Kane Valley, Voght Valley, and part of the Coldwater River Valley. Some work was also done in Midday Valley. A forest fire near Brodie caused much trouble while we were in this camp and the smoke became so bad that we had to leave the area on September 5th before completing it. On this date we moved to Merritt and completed the Midday Creek-Coldwater River area begun at the beginning of the season. From September 15th much time was lost from bad weather and smoky atmospheric conditions. Numerous trips were made without accomplishing anything. The Iron Triangulation Station was occupied on September 25th. The day was overcast and readings were obtained with difficulty. The work left undone up the Coldwater, near Brodie, was done from this camp, rains having extinguished the fire near there.

On October 7th we moved to Aspen Grove and completed the season in that locality. The main station, Shovel Nose, was occupied from this camp on October 11th and the Missezula Station on the 13th. We broke camp on the 16th and moved in to Merritt. On the 17th the Hamilton Station was reoccupied, completing the main triangulation system. The camp outfit was stored at the Government Office at Merritt, while the Ford car was left in storage with the Public Works Engineer there.

## GENERAL.

Poor atmospheric conditions bothered us more than the average this season. In the beginning of the season there was usually a haze of smoke of varying density, much coming from fires of insect-infected timber and brush. As these fires were kept up until towards the end of June, the routine I had laid down was necessarily changed in order to avoid the smoke as much as possible. During July, August, and September there was more or less smoke a good part of the time, most of it drifting in from a distance. There was little rain until the latter half of September, and while we got but little then at our camp near Merritt, there was a good deal farther back.

Following is a summary of work done this year: Main stations (triangulation), 5; photographic stations, 168; separate camera stations, 232; land-ties made, 25; miles of paced traverse (about), 230.

The area done is more or less of rolling-plateau nature, the prominences not being a great height above the valleys, except in the vicinity of the Coldwater River, Spius Creek, and Midday Creek. Generally timber covers the country, although open areas occur in the vicinity of Lumbum Commonage and along the main road from Merritt to Princeton. Yellow pine is the predominant timber of the lower altitudes. A great deal of this has been logged off and is being logged off at present. During the summer logging operations were going on in the Midday Creek-Coal Hill area, the timber being transported by train and motor-truck to the mill at Merritt. Douglas fir is scattered throughout and in some areas assumes quite a large size. The higher elevations see the usual jack-pine predominant, with some spruce, balsam, and in parts some white-barked pine appearing. One lone white-pine tree was seen on the north slope of Shovel Nose Mountain. There is a good growth of grass and weeds, usually both, in the open country and in the timber. The western portion of the area done is not grazed to any great extent, while the eastern part seems to be overrun with stock.

The main highway through the country covered this year is the Merritt–Princeton Road. At Aspen Grove the new 1-Mile Creek diversion leaves the old road, giving a shorter route to Princeton than the old, which goes via Canyon House and Coalmont. From the old road at the Hastings Ranch a new road is in the course of construction westward to Brookmere, heretofore isolated from highway connection. Branch roads extend from the main road to the Loon Lake-Pot Hole Creek area into Kane Valley and into Iron Mountain Valley. The Coldwater River Valley is served by the Kettle Valley Railway and a road from Merritt as far as Kingsvale. A branch extends from this westerly into Midday Valley and another branch extends easterly up Voght Creek to the Kane Valley Road. An old road almost abandoned extends from this branch road southerly to the Hastings Ranch, connecting with the old Merritt–Princeton Highway. The area west of Coal Hill is reached by roads from Merritt and from Lower Nicola. There are many other farm-roads and wagon-trails giving access to various parts, some of which will be shown on the topographical plan. Some pack-trails exist, but with the exception of the old Boston Bar Trail, going west from Midday Valley, are used for little else than saddle-trails.

Industrial activities in the district were not as great as the year before. The coal-mines were working only part shifts and the lumber industry was less active. The ranches in the district, while but small holdings as compared with the larger ones to the east, produce quite a few head of beef cattle. The crops were usually good when left alone by the grasshoppers. This pest was very bad in the eastern part of the area again this summer, in parts whole grain-fields being cut down. In the open areas often not a blade of grass was left standing.

I have, etc.,

R. D. McCAW, B.C.L.S.

## PHOTO-TOPOGRAPHICAL SURVEY, SKAGIT RIVER VALLEY, YALE DISTRICT.

BY G. J. JACKSON.

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

VICTORIA, B.C., December 26th, 1924.

SIR,—The area covered by photo-topographical survey this season was in the Yale District and consisted of the valley of the Skagit River from its source to the International Boundary. On the east it connects with my work of the season of 1923 and on the west is bounded by the Railway Belt.

The party was organized at Princeton and moved up the Hope–Princeton Trail by pack-train. Arriving at Hope Pass, on the summit between the Skagit and the Similkameen, where we had planned to start our work, we found a considerable amount of snow and no horse-feed at all. This forced us to continue down the Skaist Creek to the first feed, which we found at Strawberry Flat, about 6 miles from and 2,500 feet below the summit mentioned above.

Here we commenced operations and worked down the Skaist and the Skagit Rivers to the junction with the Klesilkwa River. We also made two side-trips, one up Cedar Creek as far as Allison Pass and the other up Mount Snaas between Skaist and Canyon Creek. Then we worked up the Klesilkwa River as far as the Railway Belt and after that up Maselpanik Creek to its head. From here we moved back to the Skagit and worked down it to the International Boundary. We now went over the Hozameen Range by means of the Skyline Trail; after occupying several stations on this range we dropped into Gibson Pass. From here we occupied several

stations on Muddy Creek and on Lightning Creek and cut trail up on to the hills at the north. However, we never used this, as it snowed and rained almost constantly from September 17th until October 5th, when we decided it was useless to stay out any longer this year. So we moved down the Similkameen River to Princeton, reaching there on October 7th, and then the party was disbanded.

This season was the most unfavourable one I have ever experienced for photographic or triangulation work. On half the days we were in the field it was impossible to take views or readings, either on account of smoke or of low-hanging clouds or rain or snow. Whenever possible we used these days to make the required traverses and to cut trails, but even in spite of doing this a lot of time was lost.

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 my own.

During the season 50 dozen views were taken and the following stations occupied: Main stations, 5; camera stations, 78; separate camera stations, 64. In addition to these, several ties were made to lot corners and to the Railway Belt and about 70 miles of traverse was run. About 15 miles of new horse-trail was cut and many miles of old cleared out.

## General.

The Skagit River has its source in the hills around the Hope Pass, about 25 miles from Princeton. It is here known as Skaist Creek and flows in a south-westerly direction for about 7 miles, and there is joined by 33-Mile Creek from the east, which drains the north and west sides of the Three Brothers range of mountains. Six miles farther down Cedar Creek, which has its source at Allison Pass, about 12 miles to the east, comes in. These two creeks now form what is called the Skagit River, and this flows nearly west until 3 miles farther down Canyon Creek flows in from the north. This creek drains the country west of Mount Snaas and is a big creek in the spring, but is said to be dry in the fall. Another mile down the Sumallo Creek comes in from the west. This drains an area to the west of Silvertip Mountain and also west about 12 miles to the summit of the Nicolum Creek. Turning south-west, the Skagit flows 8 miles to the mouth of the Klesilkwa River. This river comes in from the west from the summit of Silver Creek and the divide of Chilliwack Lake. One main branch—the Maselpanik Creek—comes in from the south at the Railway Belt line, 4 miles west of the Skagit. This drains a basin back to the International Boundary. Continuing south-east, the Skagit is joined from the east by the Muddy or Nepopekum Creek, which comes in from Gibson Pass, about 5 miles north of the International Boundary.

The valleys of the Skagit and its tributaries are very narrow and the sides are very precipitous, soon reaching timber-line and higher. The mountains reach an altitude of from 6,000 to 9,000 feet and are very rocky and very much cut up by deep gulches, so that travelling on them is very difficult and means a series of steep ascents and descents.

From the mouth of the Klesilkwa River to the International Boundary the valley widens out and is from 1 to 2 miles wide. Here there is considerable bottom land and low benches that would be good for cultivation, but it is for the most part heavily timbered. Two ranches have been started in this part of the valley in years gone by, but they are now deserted and rapidly growing up with second growth. The distance from a railway and the fact that a pack-trail formed their only means of communication with the outside world evidently proved a handicap too great to be overcome.

There is a luxuriant growth of timber in the valleys and for some distance above. In the bottom lands there are large fir, cedar, hemlock, spruce, and balsam trees. As the sides are ascended these give place to smaller fir, balsam, and black pine. The big timber extends a short distance up Skaist Creek and up Cedar Creek nearly to Allison Pass, also up the Sumallo and Klesilkwa and for several miles up the Maselpanik. From the mouth of the Klesilkwa River to the International Boundary considerable black pine grows on the low benches, and on the bottom lands there are cottonwood and alder trees along with fir, cedar, spruce, and balsam. Wild rhododendrons grow in great profusion in the valley and are found considerable distances up the mountains. They are a wonderful sight when in full bloom. As far as we saw, the flowers were all of one colour—a light pink.

There is very little grazing in the Skagit watershed. The timber and brush is so dense in the valleys that grass is killed out, while the mountains are so rocky and precipitous that little

grass can grow on them. While in the valley we had great difficulty in finding enough feed for the horses; there were only two or three little flats where the grass was growing and some small wild-hay marshes. Where the valley widens out below the Klesilkwa River there are several old clearings and grass grows there.

The only residents in all the valley are several prospectors, who work on their claims in the summer and trap in the winter.

Steamboat Mountain, on the east side of the Skagit River and about 8 miles north of the International Boundary, was the scene of considerable excitement in 1911, when, upon the strength of reported discovery of rich gold-bearing ore on this mountain, there was a great inrush of prospectors and speculators. Companies were formed, townsites were surveyed, and many claims were staked—all to fall flat when it was learned that there were no values in the original find.

This rush, however, helped to open up the country and considerable prospecting was done, with the result that several bodies of ore have been discovered and preliminary work done on them. These are on 10-Mile Creek, just north of Steamboat Mountain. They consist of low-grade sulphide ores, containing gold, silver, copper, zinc, lead, iron, and antimony in greater or lesser quantities. Very similar ore was also discovered on the Sumallo Creek, a short distance up from Skagit River. A valuable report by Dr. C. E. Cairnes on the geology of this district is found in the Summary Report, 1923, Part A, of the Geological Survey of Canada.

At present this district can only be reached by pack-trail. It is about equidistant from Hope, on the Canadian Pacific Railway, and Princeton, on the Kettle Valley Railway, but the Skagit River itself is much more accessible from Hope and only 23 miles distant at its closest point. There are two trails from Hope to the Skagit. One is up Silver Creek and down the Klesilkwa River. This trail is badly blocked near the summit by windfalls and second growth. The other trail is up the Nicolum River and down the Sumallo Creek. This is the main Hope–Princeton Trail and as far as the Skagit is an excellent pack-trail with a good grade. It was constructed by the Royal Engineers sixty to seventy years ago. These two trails are connected by a good trail down the east side of the Skagit and this trail continues on down into the State of Washington.

The Hope–Princeton Trail continues up the Skagit from the mouth of the Sumallo Creek. About 2 miles up there is a branch trail leading up Canyon Creek to the headwaters of the Tulameen River. At Cedar Flat, 4 miles farther on, another branch leads up Cedar Creek to Allison Pass at an elevation of less than 4,500 feet; then down the Similkameen River to Princeton. The main trail follows up the Skaist Creek and over the summit at an elevation of about 6,000 feet; then down Whipsaw Creek to the Similkameen River Trail, about 9 miles from Princeton.

About 3 miles north of the International Boundary there is another trail connecting the Skagit with the Similkameen, known as the Skyline Trail. This is a very steep trail and goes right over the top of the ridge dividing the two watercourses. It reaches an elevation of about 6,500 feet. There is a more feasible route for a road or trail up the Muddy Creek to Gibson Pass and thence down the Similkameen, reaching an elevation of less than 4,500 feet, but the Muddy is not possible now with horses.

Game appeared to be fairly plentiful in all parts of the area. Deer, both the large mule-deer of the Interior and the small black-tail of the Coast, were very abundant everywhere. Mountain-goats were seen on most of the peaks. Bear, black, brown, and grizzly, were seen in great numbers; we counted as many as twenty at one time. Grouse were very scarce, but blue grouse, spruce and willow grouse, and ptarmigan were occasionally seen. There seemed to be hardly any young birds this season; probably they did not survive the cold wet spring and summer. Fur-bearing animals, chiefly beaver, lynx, marten, mink, and coyotes, are found in fair numbers.

The Skagit River contains rainbow trout in great numbers up to 3 lb. in weight. There are also some Dolly Varden trout. It is an excellent stream for fly-fishing after the water goes down so that it can be waded, but the banks are too brushy for pleasant fishing during high water.

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.*

Sidney, B.C., January 9th, 1925.

Sir,—The programme of the boundary survey between the Provinces of Alberta and British Columbia was planned to complete the field-work during the season of 1924, in so far as it is considered necessary to carry it on under the existing Commission. There now only remains to establish on the ground the 120th meridian from near the north boundary of Township 97, to which point it was carried by Mr. Cautley's division in 1923, to the 60th parallel of latitude, which forms the north boundary of the respective Provinces, a distance of approximately 175 miles. The tract of country through which the meridian is unsurveyed lies in as yet virgin country, and there appears to be no immediate need for the establishment of the boundary.

During the season of 1924 Mr. Cautley's division was engaged in producing the 120th meridian south from monument 61–4 on Torrens Mountain—the most southerly monument established in 1922—to monument 56–0 at the intersection of the meridian with the summit watershed of the main range of the Rocky Mountains. The intersection occurs at the crest of a mass which has tentatively been named Haig Mountain. It is an elevation of the watershed about 2 miles south of Sheep Creek, and the intersection is very close to its highest point; in fact, well within 100 feet. It is interesting to note that the intersection occurs at a point about 18 miles south and about 8 miles east—in relation to the adjacent topography—of the point at which it is shown on existing maps. It may also be noted that Sheep Creek has usually been shown 6 miles north of where it has proved to be.

The total distance from monument 61–4 to monument 56–0 was found by Mr. Cautley to be 33.9 miles, in which distance he established fifteen monuments on conspicuous points of the line. The monuments all consisted of a rock post or standard post of the Dominion Lands Survey system surmounted by a large and well-constructed cairn, with the exception of monuments 58–2 and 58–3; these latter occur in open alpine meadows where it was necessary to adopt the standard post and earth-mound type of monument. Photographs of monuments will form part of Mr. Cautley's survey returns.

Mr. Wheeler's division commenced work where it had been discontinued in 1923 and continued the photo-topographical survey of the watershed and vicinity northward to Torrens Mountain, to which point Mr. Cautley had carried the survey of the 120th meridian in 1922, thereby completing the topographical survey of the Interprovincial Boundary from the International Boundary—the 49th parallel of latitude—between Canada and the United States to connect with Mr. Cautley's topographical survey along the 120th meridian at Torrens Mountain.

The Geodetic Survey of Canada completed the triangulation between Yellowhead Pass and the intersection of the watershed with the 120th meridian. A base-line was laid out and measured by a party in charge of Mr. McDiarmid, of the Geodetic Survey, in the Sheep Creek Valley, and a series of triangles expanded from it to tie in with and check the system of quadrilaterals carried from the initial base-line measured on Yellowhead Lake, close to the summit of Yellowhead Pass, at the commencement of this work in 1922.

### Mr. Cautley's Survey Operations.

A synopsis of Mr. Cautley's report is as follows: A careful tie by triangulation was made between the 16th base-line and the 120th meridian. A carefully surveyed connection was also made with the triangulation base established in Sheep Creek Valley by Mr. McDiarmid.

Sheep Creek Pass Summit, referred to in Mr. Cautley's instructions in the expectation that it would be a boundary pass, proved to be about 1¾ miles west of the 120th meridian, so, lying wholly in British Columbia, no monumental survey of it was made.

The survey of the 120th meridian having been completed, Mr. Cautley moved his party by trail to the summit of Robson Pass, a distance of about 71 miles. The trip occupied from August 15th to 25th, including two days lost on account of heavy rain.

The trail from Sheep Creek to Mount Robson is picturesque in the extreme—in one day's travel it crosses the summit of the Rockies no less than four times—but has no other good qualities. It has been located by guides in charge of hunting-parties and follows the path of

least resistance; i.e., involving the least possible amount of axe-work. The result is that a great deal of it lies above timber-line and necessitates a tremendous amount of climbing for horses, while those parts which are in timber are poorly located and badly cut out.

The summit of Robson Pass is a wide gravel flat extending between Adolphus Lake on the Alberta side and Berg Lake on the British Columbia side, the two lakes lying about 1¼ miles apart.

At Robson Pass Mr. Cautley met Mr. Wheeler and they jointly decided upon the points to be marked by monuments to define the boundary across the pass. Three concrete monuments, besides the memorial monument erected by Mr. Wheeler in the centre of the pass, and three bolts and cairn monuments were established to mark the survey. The work was begun on August 26th and completed on September 5th.

Mr. Cautley now moved his party by trail to Miette Pass, arriving there on September 10th. The route lies via Calumet Creek, Moose Pass, Moose River, Colonel Creek, Colonel Pass, and Grant Pass to Miette Pass. The trail has little to recommend it except its scenic possibilities. The distance is approximately 33½ miles and includes a lot of bad hills alternating with marshy river-bottoms. It rained a good deal on the way and on the three higher passes—Colonel, Grant, and Miette—the ground was covered with 6 inches of snow.

Miette Pass is a gap of about 3 miles between high mountains. There are three distinct passages, separated by two hills 800 or 900 feet high. All three passages drain to the Miette River on the Alberta side and to Grant Brook on the British Columbia side. (*See also* Wheeler's report to Surveyor-General of British Columbia, 1922.)

Eight concrete monuments and two bolt and cairn monuments were established to mark the survey. A third bolt and cairn monument should have been established on a high ridge to to the south of the most southerly passage, but the snow was too deep; its omission is not serious, because the natural line of watershed leading south from the monument established at the bottom of the south passage is quite distinct and above timber-line.

The survey of Miette Pass occupied twenty-three days. It is an open pass and would have taken much less time except for bad weather. It snowed every day from September 18th to 26th, at which date there was 21 inches of wet snow on the floor of the valley and from 3 to 4 feet on the hillsides, above timber-line, over which the survey had to be carried.

Most of the time the temperature was below freezing and there were high winds. Under the circumstances it was necessary to adopt arduous methods: Horse-trails had to be shovelled out to the higher monument-sites; dry wood and tubs in which to melt snow had to be packed up; the concrete had to be made with hot water so as to overcome the frozen condition of the gravel; and hot rocks laid under canvas around the green concrete to permit it to set. Angles read at exposed stations above timber-line under such weather conditions are naturally regarded with suspicion, but we were relieved to find our triangles closed within perfectly normal limits.

Mr. Wheeler and party arrived at the camp from Sheep Creek on the 25th in the midst of a wild snow-storm, having been storm-bound for three days at Colonel Pass, only 5 miles distant. He and Mr. Cautley went over the work on the 26th and put in bolt 9–T.

Mr. Cautley finished the field-work on October 3rd and paid off the bulk of his party at Yellowhead on October 5th.

### GEODETIC SURVEY TRIANGULATION.

The triangulation of the Geodetic Survey, to connect the Dominion Lands Survey system at Yellowhead Pass with the 120th meridian at its intersection with the main watershed of the Rockies, was as heretofore in charge of H. F. Lambart, D.L.S., of the said survey. Four parties were placed in the field and the angle-reading at the various stations of the triangulation was completed.

In addition, a party under Mr. McDiarmid laid out a base-line in the Sheep Creek Valley at the northern extremity of the triangulation and measured the same by precise methods. The base was 3 miles in length and from end to end lay along open and practically level meadow lands. He also established the exact longitude of the eastern end of the base and marked the same by erecting a concrete pier. The longitude of this point has not yet been received. The work was done by means of a radio plant, recording time direct from Washington. It was found to give most adequate results.

The field-work of the triangulation was duly completed and the objects in view—namely, of connecting widely separated extreme points of the land surveys and of supplying data to place

the survey of the Interprovincial Boundary in true position—have been accomplished. Mr. Lambart's reports of the work will, when completed, cover the details in full.

### Topographical Survey Operations.

Organization was effected at Jasper and the usual tests of cameras and plates made for the photo-topographic work.

The party, in charge of A. J. Campbell, D.L.S., with N. C. Stewart, D.L.S., as assistant instrument-man, started for the scene of operations on June 23rd and travelled via the Snake Indian River Trail to Smoky River; thence via Bess Pass and the Jackpine Valley to North Morkill Pass, where the work had been discontinued the previous season, arriving there on July 8th.

Between July 9th and 15th seven stations were occupied. From July 16th to July 31st thirteen stations were occupied notwithstanding the fact that the latter part of the month was stormy, with frequent rains and low clouds obscuring the landscape, a condition of affairs highly detrimental to work depending upon the obtaining of good photographic views.

On July 27th Mr. Campbell started for Mount Robson to attend the unveiling ceremony of the special monument erected at the summit of Robson Pass to commemorate the survey of the Interprovincial Boundary. Mr. Campbell arrived back at his camp on August 14th. During his absence Mr. Stewart was in charge of the work, which was carried forward continuously.

Between July 31st and August 14th eight stations were occupied. Much stormy weather with rain, snow, and low clouds occurred during the latter part of August, but, notwithstanding, twenty stations were occupied and the work pushed through to Torrens Mountain.

September 1st to 6th the party moved back to Sheep Creek Valley and camped near the summit of the pass. En route four additional stations were occupied and the programme of the survey completed, with the exception of a few intervening stations that had been left behind owing to unsuitable weather.

Mr. Wheeler arrived at Sheep Creek Pass on September 6th, having completed the work with Mr. Cautley at Robson Pass. Bad weather again interfered until the 11th, when two stations at Sheep Creek Pass Summit were occupied and, on the 12th, three others in the vicinity. Camp was now moved down the valley of Sheep Creek and the two final stations occupied on the 13th. On the 14th a move was made for Miette Pass, where Mr. Cautley was working.

Owing to snow-storms the party was held up for four days en route and did not arrive at Miette Pass until September 25th. Much snow had fallen for the time of the year, and on September 26th had reached a depth of 21 inches in the valley-bottom at the pass summit.

September 26th Mr. Wheeler went over the survey-work at Miette Pass with Mr. Cautley. It was well advanced, but the tremendous difficulty of making the survey and building monuments in such mountainous country while buried in snow made the work very slow and laborious. Much credit is due to Mr. Cautley for carrying on and completing the work under such unfavourable conditions, and it is due to his well-systematized methods and dogged perseverance against severe hardship that it was completed.

The Topographical Division started for Jasper on September 27th and arrived there on the evening of the 28th. The party was paid off on the 29th.

### Memorial Monument.

It was decided that a special memorial monument of the boundary survey should be erected at the summit of Robson Pass. The Alpine Club of Canada was holding its annual camp there, so it was arranged to have the unveiling ceremony take place on the morning of July 31st while the camp was in session, and to hold the annual meeting of the club the same afternoon.

This arrangement was a most appropriate one, for the work of the boundary survey has been of very special interest and benefit to the club and to its widely scattered membership, owing to the fact that the watershed of the main range of the Rockies, which constitutes the boundary between the two Provinces, lies along the crests of the highest peaks of the range, and that the mapping of these areas and consequent distribution of information concerning them has been of very great value to all visitors, or prospective visitors, to the Canadian Rockies. So much so has this been the case that map-distribution in connection with the boundary survey has very greatly surpassed the original intention, and many of the sheets illustrating the more attractive parts have gone through several editions owing to the demand for them, and have

proved of great advertising value to the tourist business of the mountain regions quite apart from the survey of the boundary.

At the unveiling ceremony the Government of British Columbia was represented by G. R. Naden, Deputy Minister of Lands, and J. E. Umbach, Surveyor-General; the Government of Alberta by P. N. Johnson, Director of Surveys; the Dominion Government by P. N. Wallace, Boundary Commissioner during the first two years of the survey, and by F. A. Williamson, Deputy Commissioner of the National Parks Branch of the Department of the Interior; the Geodetic Survey of Canada by H. F. Lambart, in charge of the parties of the Geodetic Survey collaborating with the boundary survey; the Canadian National Railways by Osborne Scott, General Passenger Agent; and the Canadian Pacific Railway by A. O. Seymour, General Tourist Agent.

Unfortunately, R. W. Cautley, Interprovincial Boundary Commissioner, representing the Dominion Government and the Government of Alberta, was at the time working upon the boundary in wild country far to the north and it was not possible to get word to him in time to attend the ceremony, but A. J. Campbell, D.L.S., who had been associated with Mr. Wheeler's division of the survey as chief assistant in charge of the photo-topographic work since the beginning, arrived the same day. The monument was unveiled by Mrs. Campbell as a tribute to the excellent work done by her husband in such connection.

The erection of the monument lay within the province of Mr. Cautley's division, but owing to his forced absence the work was done under Mr. Wheeler's superintendence, with the very efficient assistance of Mr. Lambart and A. H. MacCarthy, the latter a member of the Alpine Club, who had had practical engineering experience as a commander in the United States Navy.

The ceremony was an impressive one. The towering magnificence of the mighty snow-clad mass of Mount Robson, rising directly above, gave solemnity and dignity to the scene. The surroundings were certainly unique. The great mountain whose crest, golden in the fitful sunshine and then obscured by passing clouds, was a full mile above us, close by the glorious blue waters of Berg and Adolphus Lakes, and all around wide-spreading snow-fields and tumbling ice-falls between precipitous rock ramparts, the crowd of picturesquely garbed mountain-climbers, men and women, assembled about the monument, which occupied the centre of a broad, bare shingle flat, brought vividly home to us the magnitude of the works of Nature at their origin and the wonderful heritage we possess in this mountain wilderness of unsurpassed scenic grandeur.

Mr. Naden opened the proceedings with a few appropriate remarks, followed by the Surveyor-General of British Columbia, who complimented the Commissioners upon the successful completion of a distinctly arduous undertaking. Acknowledgments were made by Mr. Wallace and Mr. Wheeler. Then, as the Union Jack fluttered from the unveiled monument, the cook's toscin sounded at the Alpine Club camp and a passing rain-storm scattered the assemblage to well-earned refreshment after its labours.

The monument erected did more than memorialize the boundary survey. On the Alberta side an inscription-plate recorded the name of the late Edouard Deville, who for more than forty years had been Surveyor-General of Canada, and under whose direction the work of the boundary survey had been carried on since its inception in 1913—a man and a scientist, to whom Canada owes most largely her magnificent system of land surveys, and also the introduction of the method of photo-topography, a method so well suited to her mountain areas and so successfully carried on in mapping them. It is fitting that his name should be on record at a place where their grandeur reaches a climax.

### SHEEP CREEK PASS.

Although not a boundary pass, owing to the fact that the 120th meridian lies 1¾ miles east of its summit, it is one of importance for the reason that the intersection of the said meridian with the watershed of the main range occurs on the crest of the so-called Mount Haig, which mass forms part of the southern confines of Sheep Creek Valley. Owing to duplication elsewhere it is suggested that the name be changed to "Intersection" Mountain. The pass is also of importance on account of the base-line of the Geodetic Survey triangulation, which is located close to the summit, having been connected with the 120th meridian at the western extremity, and with the longitude pier established by Mr. McDiarmid at the eastern extremity of the base.

It is here a beautiful, wide, open valley extending from the summit in broad meadow lands for a distance of 7 or 8 miles. A number of small lakes and ponds scattered over the valley-

bottom add to the picturesque character of the scenery, and groves of spruce and pine along the margins give the whole a park-like appearance that is very attractive.

### Jarvis Pass.

Beyond Sheep Creek Valley northward the line of travel follows a tributary of Sheep Creek over a divide to the headwaters of Porcupine River, flowing from Cecilia Lake (Surpise Lake, local name) to a junction with another source flowing from Porcupine Lake, both exceedingly picturesque sheets of water of considerable size as lakes go in that part of the mountains. A short distance below the junction the main stream is joined by a source from Jarvis Pass. This pass is densely timbered and holds a chain of six or more lakes of varying size. While a pass of the watershed, its summit lies in British Columbia, about 8 miles west of the 120th meridian, and does not specially concern the boundary survey. The South Branch of Big Salmon River apparently flows westward from these lakes.

The Porcupine Valley is here a broad trough of several miles in width. It shows areas of spruce and pine forest-growth, intersected by numerous small meadow-land opens. Much of it has been burned over and there are wide stretches of brulé. The Porcupine River so near its source is a shallow swift-flowing stream about 100 feet wide. It soon assumes more considerable proportions.

### Beyond the Porcupine.

Continuing northward, Wolf Pass (local name) leads to the head of Narraway River, which flows eastward on the north side of Torrens Mountain. Travel by the survey, however, was made by way of a tributary of the Porcupine, over a divide to the headwaters of Torrens River, the Eastern Branch of Narraway River, which it joins north-east of Torrens Mountain; then by way of Saxon Creek to the Narraway at a point not far west of the 120th meridian. The timber-distribution is of an open character and travel can be made in almost any direction by the majority of the many valleys traversing the terrain.

North of the Porcupine the hills get lower and of more rounded form. They are of an open shaly formation and the timber reaches to near their summits. The valleys between are more closely timbered and meadow openings are few and of small size. The country, north and east, soon merges into densely timbered foot-hills and then to flat country beyond, where burned areas are predominant.

### Last Group of High Mountains.

Between Sheep Creek Pass and Jarvis Pass in British Columbia rise the last high group of mountains. Of this, Mount Sir Alexander (Mackenzie), 10,740 feet, and Mount Ida, 10,472 feet above sea-level, are the outstanding features. There may possibly be another of the group above 10,000 feet, but the majority are little over 9,000 feet or less. Northward beyond this group the hills soon get lower and trend well to the north-west. The outstanding peaks are prominent more on account of their isolated positions and to the lower altitude of the timber-line than to excess in elevation.

### Game and Fish.

The open hillsides and meadow-land valleys of the area adjacent to Sheep Creek are a paradise for big-game hunters. Caribou and smaller deer are plentiful and moose are seen quite frequently. Brown bear are in the woods, and grizzlies frequent the rocky cirques and passes near or above timber-line, where the Parry marmot (mountain-gopher, so called) lives in colonies on the patches of alpine meadows and affords them good hunting. Mountain-goat are frequently seen on the rock-faces of the mountains; and a little farther east, among the lower shale hills in the Sheep Creek and Porcupine River country, the big-horn or mountain sheep are abundant.

Many hunting-parties visit this section of the country during the late fall, when the hunting season is open, and seldom go away dissatisfied. The dry grassy meadow lands, interspersed with groves of trees, and the open hillsides furnish ideal hunting conditions and most attractive camping-grounds.

No fish were caught by the survey party. Although trout are said to inhabit the streams lower down, they do not seem to frequent the upper waters so near to their source in sufficient quantity to make it apparent.

### General Remarks.

The timber-distribution is practically the same as already reported. Timber-line may rise to 6,300 feet or thereabouts; more definite information will be available when the season's elevations have been worked out. On the Alberta side the open meadow lands are interspersed

with groves and patches of small-sized spruce, pine, and balsam at the higher altitudes. North of Sheep Creek and as the foot-hills are approached eastward the timber becomes more densely distributed.

No large bodies of timber of special commercial value were noticed. On the British Columbia side, directly the watershed is crossed, the valleys become densely timbered, and, presumably, by timber of a larger and more valuable dimension. Fir and cedar would also in all likelihood soon make their appearance. Burned areas were seen in the Porcupine Valley and in Sheep Creek Valley east of the meadow lands, also in the vicinity of Torrens Mountain and at a few other places, but, taken as a whole, the proportion is small.

North of the jack-pine valleys, once the Great Shale Ridge is passed, travel becomes easy for horses, except for the constant ascent and descent of the big hills. Owing to the open nature of the country horses can be taken in almost any direction through the valley-bottoms and over the intervening divides, a fact which greatly facilitated the work of the survey and was distinctly a contrast to the difficulties encountered south of the Big Shale Ridge, which borders the valley of the West Branch of the Jackpine River (Curly Creek) on the north.

### CLOSE OF THE FIELD-WORK.

The field-work of the survey of the boundary between the two Provinces has been successfully closed in so far as the Commission is concerned. The work of preparing the final reports and maps is now in hand and they will be submitted in due course. The topographical survey and mapping of the watershed has been carried from the International Boundary—the 49th parallel of latitude—to intersection with the 120th meridian, and then on to where the meridian passes over Torrens Mountain.

North of Torrens Mountain the 120th meridian has been surveyed by Mr. Cautley to a point about 90 miles north of where it crosses Peace River. Over this section the topographical survey and mapping has been done by him.

From Torrens Mountain the meridian was carried south to its intersection with the watershed at Sheep Creek Valley. Here a closing was made between the respective surveys of the two divisions. It is of interest to note that they closed satisfactorily, taking into account the difference of the methods and instruments employed, also the long stretch of country they have traversed, with starting-points so widely apart and of such independent origins. In latitude the closing appears to be 143 feet; in longitude the closing appears to agree in the plot of the triangles. The distance between the two starting-points in a straight line is approximately 214 miles. The final computations are not yet completed, but it is not anticipated that any radical difference will become apparent. The altitudes carried respectively from determinations by precise levelling at Yellowhead Pass and at Pouce Coupe close to 11 feet, a small matter in the consideration of mountain elevations and very nearly as close as the method of photo-topography can locate contours.

A. J. Campbell, D.L. and B.C.L.S., has been chief assistant to the Topographical Division since its inception in 1913, and for a very considerable part of that time has had charge of the photographic survey party in the field and of the reduction of field data to map-construction in the office. I desire to place on record my very keen appreciation of the excellent work done by this valuable officer and of the large share he has had in the success of the survey.

I also desire to make my acknowledgments of the very friendly relations that have existed throughout between the Commissioners, J. N. Wallace representing the Dominion for the first two years, and R. W. Cautley representing Alberta for the first two years and Alberta and the Dominion for the rest of the time. The adjustment of the boundary across the various passes surveyed has required some give and take, but only in one instance have we had a difference of importance—namely, at the summit of Phillips Pass, a short distance north of Crowsnest Pass. This difference has been adjusted by mutual concession and the survey at Phillips Pass was finally completed by Mr. Cautley at the beginning of the 1924 season.

I have, etc.,

ARTHUR O. WHEELER,
*Interprovincial Boundary Commissioner.*

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