REPORT

INTERNATIONAL BOUNDARY COMMISSION

ESTABLISHMENT OF THE BOUNDARY BETWEEN THE

UNITED STATES AND CANADA

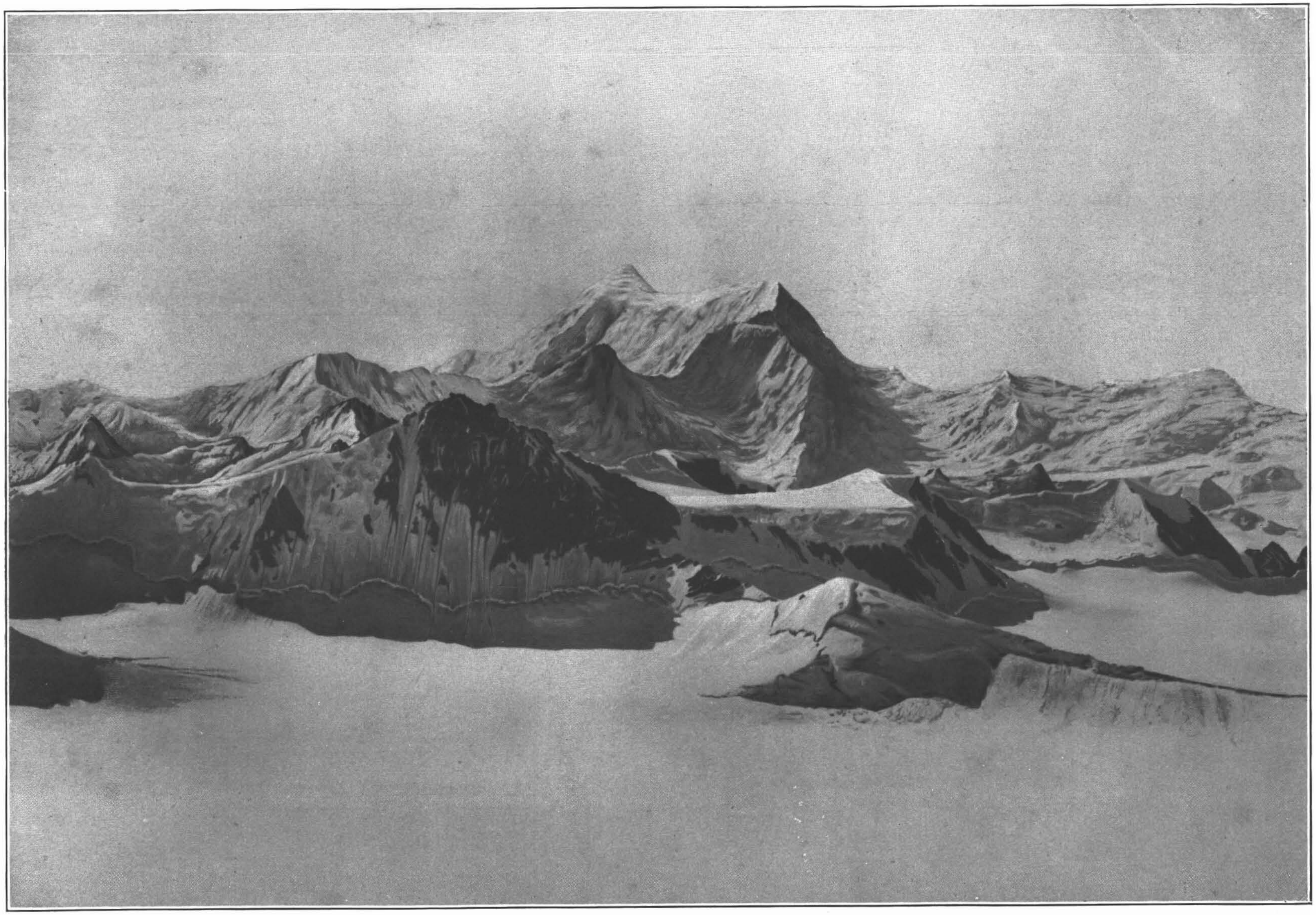
ARCTIC OCEAN TO MOUNT ST. ELIAS

DEPARTMENT OF THE INTERIOR

1918

REPORT OF
THE INTERNATIONAL BOUNDARY COMMISSION

23565—1½



Mount St. Elias (18,008 feet) as seen from the northwest.

Photo taken from station Porky,
elevation 10,200 feet.

JOINT REPORT

UPON THE

SURVEY AND DEMARCATION

OF THE

INTERNATIONAL BOUNDARY

BETWEEN THE

UNITED STATES

AND

CANADA

ALONG THE 141ST MERIDIAN FROM THE ARCTIC OCEAN TO MOUNT ST. ELIAS

In accordance with the provisions of
Article IV of the Convention
signed at Washington
April 21, 1906

His Britannic Majesty's Commissioner
W. F. KING, 1906-1916
J. J. McARTHUR, 1917-

United States Commissioner
O. H. TITTMANN, 1906-1915
E. C. BARNARD, 1915-

Published under the authority of
The International Boundary
Commissioners

LETTER OF TRANSMITTAL.

OTTAWA, CANADA, December 15, 1918.

The Honourable, The Minister of the Interior.

Sir: I have the honour to submit herewith, for transmittal to His Majesty's Government, the printed joint report upon the survey and demarcation of the International Boundary between the United States and Canada along the 141st Meridian from the Arctic Ocean to Mount St. Elias, together with duplicate atlases of signed joint maps, in accordance with the provisions of the Convention between Great Britain and the United States, signed at Washington, April 21, 1906.

The joint report contains:—

Copy of the Convention of 1906.

Copies of the appointments of the Commissioners.

Copy of the Orders in Council creating a neutral strip along the Boundary on the Canadian side.

Copy of the Proclamation of the President of the United States creating a similar neutral strip on the United States side.

Agreements of the Commissioners as to the manner in which the work should be executed.

Explorations and Surveys prior to the Convention of 1906.

General narrative of field operations under the Convention of 1906.

List of the monuments marking the Boundary Line, certified to by the Commissioners.

Description of the field methods, computations, adjustments, and instruments, containing:—

Table showing the geographic positions and elevations of triangulation stations.

Table showing the geographic positions of the monuments and line-projection stations.

Table showing certain elevations not included in the table of geographic positions.

Table of magnetic declinations.

Appendices as follows:—

I. Early explorations and negotiations.

II. Later negotiations, and details of operations on the Boundary prior to the Convention of 1906.

III. Descriptions of triangulation stations, and sketches of the triangulation.

IV. Special equipment used on the work.

V. Ration lists.

VI. Game.

The duplicate atlases contain the thirty-eight original maps, certified and signed by the Commissioners, who have marked thereon the Boundary Line as established in accordance with the provisions of the Convention; also index and profile sheets, and two supplementary sheets, one showing the topography at the Arctic Coast as far west as Demarcation Bay, and the other, considerable additional topography in the region between Mount Natazhat and Mount St. Elias.

The field work, a great deal of which had to be done in portions of the country hitherto considered practically impassable, was completed under the direction of the original Commissioners, Mr. O. H. Tittmann for the United States, and Dr. W. F. King for His Britannic Majesty, and constitutes a lasting tribute to their efficient administration and supervision. Practically all the maps had also been prepared under their direction, as sheets 1 to 32, inclusive, had already been signed by them before the resignation of Mr. Tittmann on April 15, 1915, and the death of Dr. King on April 21, 1916.

The work was completed under the direction of Mr. E. C. Barnard, who was appointed Commissioner for the United States, April 30, 1915, and myself, by the printing and signing of the last six sheets, numbers 33 to 38, and by the preparation, printing, and signing of the report.

The report and the signed original maps transmitted herewith are identical with those transmitted by my colleague to his Government, the reports having been printed from the same plates, and the signed original maps, as well as the copies thereof for both countries, having been printed from the same stones.

It is most gratifying to record that the location of the International Boundary along the 141st Meridian, and the preparation of the maps and report have been accomplished in a spirit of hearty co-operation, and to state that the cordial relations that so long existed between the former Commissioners have been continued by their successors.

I have the honour to be, sir,

Your obedient servant,

J. J. McARTHUR,

His Britannic Majesty's Commissioner.

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ILLUSTRATIONS.

SKETCHES, DIAGRAMS AND MAPS.

CONVENTION BETWEEN THE UNITED KINGDOM AND THE UNITED STATES OF AMERICA RESPECTING THE BOUNDARY BETWEEN THE DOMINION OF CANADA AND ALASKA.—SIGNED AT WASHINGTON, APRIL 21, 1906.

(*Ratifications exchanged at Washington, August 16, 1906.*)

Whereas by a Treaty between the United States of America and His Majesty the Emperor of all the Russias, for the cession of the Russian possessions, in North America to the United States, concluded March 30, 1867, the most northerly part of the boundary line between the said Russian possessions and those of His Britannic Majesty, as established by the prior convention between Russia and Great Britain, of February 28/16, 1825, is defined as following the 141st degree of longitude west from Greenwich, beginning at the point of intersection of the said 141st degree of west longitude with a certain line drawn parallel with the coast, and thence continuing from the said point of intersection, upon the said meridian of the 141st degree in its prolongation as far as the Frozen Ocean;

And whereas, the location of said meridian of the 141st degree of west longitude between the terminal points thereof defined in said Treaty, is dependent upon the scientific ascertainment of convenient points along the said meridian and the survey of the country intermediate between such points, involving no question of interpretation of the aforesaid Treaties but merely the determination of such points and their connecting lines by the ordinary processes of observation and survey conducted by competent astronomers, engineers and surveyors;

And whereas such determination has not hitherto been made by a joint survey as is requisite in order to give complete effect to said Treaties;

His Majesty the King of the United Kingdom of Great Britain and Ireland, and of the British Dominions beyond the Seas, Emperor of India, and the United States of America, being equally desirous to provide for the surveying and marking out upon the ground of the said astronomical line established by existing Treaties, and thus to remove any possible cause of difference between their respective Governments in regard to the location of the said 141st Meridian of west longitude, have resolved to conclude a Convention to that end, and for that purpose have appointed their respective Plenipotentiaries:

His Britannic Majesty, The Right Honourable Sir H. Mortimer Durand, G.C.M.G., K.C.S.I., K.C.I.E., His Majesty's Ambassador Extraordinary and Plenipotentiary to the United States; and

The President of the United States of America, The Honourable Elihu Root, Secretary of State of the United States;

Who, after having communicated to each other their respective full powers, which were found in due and proper form, have agreed to and concluded the following Articles:—

ARTICLE I. Each Government shall appoint one Commissioner with whom may be associated such surveyors, astronomers and other assistants as each Government may elect.

The Commissioners shall at as early a period as practicable ascertain by the telegraphic method a convenient point on the 141st Meridian of west longitude and shall then proceed under their joint direction and by their joint operations in the field, to trace and mark so much of a north-and-south line passing through said point as is necessary to be defined for determining the exact boundary line as established by the said Convention of 28/16 February, 1825, between the possessions in America of His Britannic Majesty, and the adjacent possessions in America formerly belonging to His Majesty the Emperor of all the Russias and ceded to the United States by the said Treaty of 30th March, 1867.

ARTICLE II. The location of the 141st Meridian as determined hereunder shall be marked by intervisible objects, natural or artificial, at such distances apart as the Commissioners shall agree upon and by such additional marks as they shall deem necessary, and the line when and where thus marked, in whole or in part, and agreed upon by the Commissioners, shall be deemed to define permanently for all international purposes the 141st Meridian mentioned in the Treaty of February 28/16, 1825, between Great Britain and Russia.

The location of the marks shall be described by such views, maps and other means as the Commissioners shall decide upon and duplicate records of these descriptions shall be attested by the Commissioners jointly and be by them deposited with their respective Governments, together with their final report hereinafter mentioned.

ARTICLE III. Each Government shall bear the expenses incident to the employment of its own appointees and of the operations conducted by them, but the cost of material used in permanently marking the meridian, and of its transportation and erection in place, shall be borne equally and jointly by the two Governments.

ARTICLE IV. The Commissioners shall diligently prosecute the work to its completion and they shall submit to their respective Governments from time to time, and at least once in every calendar year, a joint report of progress, and a final comprehensive report upon the completion of the whole work.

ARTICLE V. The present Convention shall be duly ratified by His Britannic Majesty, and by the President of the United States of America, by and with the advice and consent of the Senate thereof, and the ratifications shall be exchanged at London or at Washington as soon as possible.

In faith whereof, we the respective Plenipotentiaries have signed this Convention, and have hereunto affixed our seals.

Done in duplicate at Washington this twenty-first day of April, in the year of our Lord one thousand nine hundred and six.

[L.S.] H. M. DURAND.

[L.S.] ELIHU ROOT.

APPOINTMENTS OF COMMISSIONERS.

MR. O. H. TITTMANN FOR THE UNITED STATES.

DEPARTMENT OF STATE, WASHINGTON, September 18, 1906.

Mr. O. H. TITTMANN,
Superintendent, Coast and Geodetic Survey,
Washington, D.C.

SIR,—You are hereby designated as Commissioner on the part of the United States to mark the boundary and make the surveys incidental thereto between the Territory of Alaska and the Dominion of Canada in conformity with the award of the Alaskan Boundary Tribunal and existing treaties.

The immediate duty assigned to you is to supervise the demarcation under the terms of the item "Boundary Line, Alaska and Canada," in the Act making appropriations for the diplomatic and consular service for the fiscal year ending June 30, 1907, approved June 16, 1906; and you are hereby authorized to arrange the details and to carry out the work and to sign the full report and maps as Commissioner for the United States jointly with the British Commissioner.

It has been arranged with respect to this work that each Government shall bear the expenses incident to the employment of its own appointees and of the operations conducted by them, but the cost of material used in permanently marking the boundary, and of its transportation and erection in place, shall be borne equally and jointly by the two Governments.

All vouchers for expenditures incurred under these instructions should be approved by you, or in your absence by the Acting Superintendent of the Coast and Geodetic Survey,

I am, sir, your obedient servant,

ALVEY A. ADEE,
Acting Secretary.

DEPARTMENT OF STATE.

To all to whom these Presents shall come, Greeting:

I certify that O. H. Tittmann, Superintendent of the Coast and Geodetic Survey, has been designated a Commissioner on the part of the United States to mark the boundary and make the surveys incidental thereto between the Territory of Alaska and the Dominion of Canada, in conformity with the award of the Alaskan Boundary Tribunal and existing treaties.

In testimony whereof, I, Alvey A. Adee, Acting Secretary of State of the United States, have hereunto subscribed my name and caused the Seal of the Department of State to be affixed.

Done at the City of Washington this eighteenth day of September, in the year of our Lord one thousand nine hundred and six, and the 131st year of the Independence of the United States of America.

ALVEY A. ADEE.

[Seal of the Department of State.]

23565—2

DR. W. F. KING FOR HIS BRITANNIC MAJESTY.

P.C. No. 1569.

Ref. 1,245,047 on 1301 No. 8.

Extract from a Report of the Committee of the Privy Council, approved by the Governor General on the 23rd July, 1906.

The Minister of the Interior submits that Article I of the Convention which has been recently ratified between Great Britain and the United States, providing for the survey of the Alaskan-Canadian Boundary along the 141st Meridian of west longitude, makes provision for the appointment by each Government of one Commissioner for the carrying on of the work.

The Minister recommends that Mr. W. F. King, Chief Astronomer of the Department of the Interior, be nominated for the position of His Majesty's Commissioner.

The Committee advise that His Excellency be moved to advise the Right Honourable the Secretary of State for the Colonies accordingly.

All of which is respectfully submitted for approval.

JOHN J. McGEE,
Clerk of the Privy Council.

To the Honourable
The Minister of the Interior.

MR. E. C. BARNARD FOR THE UNITED STATES.

DEPARTMENT OF STATE.

To all to whom these Presents shall come, Greeting:

I certify that Edward C. Barnard, of New York, has been designated a Commissioner on the part of the United States to mark the boundary and make the surveys incidental thereto between the Territory of Alaska and the Dominion of Canada, in conformity with the award of the Alaskan Boundary Tribunal and existing treaties.

In testimony whereof, I, William J. Bryan, Secretary of State of the United States of America, have hereunto subscribed my name and caused the Seal of the Department of State to be affixed.

Done at the City of Washington this thirtieth day of April, in the year of our Lord one thousand nine hundred and fifteen, and the 139th year of the Independence of the United States of America.

W. J. BRYAN.

[Seal.]

MR. J. J. McARTHUR FOR HIS BRITANNIC MAJESTY.

P.C. No. 2896.

Certified copy of a Report of the Committee of the Privy Council, approved by His Excellency the Governor General on the 29th November, 1916.

The Committee of the Privy Council have had before them a report, dated 18th November, 1916, from the Minister of the Interior, stating that Article VI of the Convention of the 24th January, 1903, between Great Britain and the United States, provides for the appointment by each Government of a Commissioner to deal with the laying down of the Alaska boundary line, from the southernmost point of Prince of Wales Island to the summit of Mount St. Elias, in accordance with the terms of the award of the London Tribunal of 20th October, 1903; also that the Convention of 21st April, 1906, in Article I, provides for the appointment of a Commissioner for the demarcation of the Alaska boundary, from the summit of Mount St. Elias, along the 141st Meridian, to the Arctic Ocean.

The Minister states that Mr. James Joseph McArthur having been appointed for the Commissionership under the Treaty of 11th April, 1908, for all sections of the international boundary from the Atlantic to the Pacific Ocean (excepting the section from St. Regis to the mouth of the Pigeon River), it is desirable that Mr. McArthur be also appointed as Commissioner to succeed our late Commissioner, Dr. W. F. King, under the above-mentioned Conventions of 1903 and 1906.

The Minister represents, in this connection, that all the field work on both these sections of the Alaska boundary has now been finished, but, under an agreement entered into by former Commissioners King and Tittmann, twenty-four[1] degree sheets, showing the country from the southernmost point of Prince of Wales Island to the summit of Mount St. Elias, are now in course of preparation and will require to be signed by the British and American Commissioners. Under a similar agreement between the former Commissioners, the 141st Meridian boundary was subdivided into thirty-eight sections for mapping purposes. Thirty-two of these sheets have already been printed and signed by former Commissioners King and Tittmann, but the six remaining sheets which are now nearly ready for the printer will need to be signed, as will also the reports called for under the Convention.

In view of the circumstances above set forth, the Minister recommends that Mr. James Joseph McArthur, Dominion Land Surveyer and former Assistant International Boundary Commissioner, be nominated to succeed the late Dr. King as Commissioner for the whole of the Alaska boundary line dealt with under the Conventions of 1903 and 1906.

The Committee, on the recommendation of the Minister of the Interior, advise that Your Excellency may be moved to inform His Majesty's Secretary of State for the Colonies of the desire of Your Excellency's advisers in this regard.

All of which is respectfully submitted for approval.

RODOLPHE BOUDREAU,
Clerk of the Privy Council.

To the Honourable
The Minister of the Interior.

FOREIGN OFFICE, January 6, 1917.

No. (2140/45/A.)

SIR,—With reference to my despatch No. 389 of the 15th ultimo I request that Your Excellency will notify the United States Government that Mr. J. J. McArthur has been appointed to succeed the late Dr. King as British Commissioner for the whole of the Alaska Boundary line dealt with under the Conventions of 1903 and 1906.

I am, with great truth and respect, etc.

VICTOR WELLESLEY.

His Excellency
The Right Honourable
Sir C. SPRING-RICE,
G.C.M.G., G.C.V.O.,
etc., etc., etc.

[1]Reduced by the present Commissioners from twenty-four to thirteen, each sheet covering one degree of latitude and two degrees of longitude.

ORDERS IN COUNCIL CREATING A NEUTRAL STRIP ALONG THE BOUNDARY ON THE CANADIAN SIDE.

P.C. No. 810.

Ref. 1,569,421 on 1301 (7).

Certified copy of a Report of the Committee of the Privy Council, approved by His Excellency the Administrator on the 14th April, 1908.

On a report dated 1st April, 1908, from the Minister of the Interior with reference to a Despatch from His Majesty's Ambassador at Washington, dated 30th October, 1907, submitting for the consideration of the Dominion Government a proposal by the United States Government that joint action be taken for the reservation of a strip of land sixty feet wide on each side of the Canada-Alaska boundary line under similar conditions to that formerly established along the Mexican boundary line by Proclamation of the President of the United States.

The Minister of the Interior submits that in his opinion such a reservation will be of great service in the protection of the revenue and in the enforcement of the law generally, and he therefore recommends that with a view to the prevention of the erection of buildings or permanent structures or works on or close to the boundary line, except railways, aqueducts, bridges, canals, ditches and other works of a public character and except buildings or permanent structures or works properly connected with such railways, aqueducts, bridges, canals and other works of a public character, to be authorized to reserve the land within a strip sixty feet wide along the boundary line between Canada and Alaska from sale, lease and entry so far as the lands in question are vested in the Dominion.

The Minister points out that the title to wild lands adjacent to the Canada-Alaska boundary line is vested in the Dominion to the northward only of the sixtieth parallel of latitude. South of the parallel the lands lie in the province of British Columbia and the title to the crown lands is vested in the province.

The Minister has reason to believe, however, that the province of British Columbia will be willing to give its co-operation.

In connection with this subject the Minister of the Interior desires to suggest consideration of the possibility of making a similar reservation along other parts of the common boundary line, which, besides extensive stretches of water boundary, comprises some 1,900 miles on land.

Of the 1,300 miles or thereabouts from the Straits of Georgia to the Lake of the Woods, some 400 miles lie west of the summit of the Rocky Mountains. Along this distance the Minister understands that the Government of British Columbia has already reserved a strip 66 feet wide, wherever the land has not already been disposed of, along the International Boundary Line. East of the Rocky Mountains, under the original surveys made by the Dominion Government, road allowances were left adjoining the boundary. These road allowances are no longer under the control of the Dominion Government, having now passed under the jurisdiction of the provinces of Alberta, Saskatchewan and Manitoba.

The four provinces mentioned would doubtless agree to make the road allowances and the reservation permanent, though to secure that end, concurrent agreement by the United States or by the several states affected, to reserve a similar strip would appear to be desirable.

The Minister states that along the line from the St. Lawrence River to the St. Croix the natural difficulty of enforcing the laws of the two countries along an extensive boundary line is enhanced by the fact that the property adjacent to the line, on both sides, has passed into private hands, and at many points there exist so-called " line houses " which stand close to or upon the line, and which in many instances, as has been charged, have been used for smuggling or for evasion of law, to a serious extent. While it may not be practicable, by reason of the expense which it would involve to apply the effective remedy of removing these houses altogether, it is a matter for consideration whether there are any steps which the two Governments could take to prevent the erection in future of further houses of this kind.

The Committee, concurring in the foregoing, advise that His Excellency be moved to forward a copy hereof to His Majesty's Ambassador at Washington, with a request that he inform the Government of the United States that the Dominion Government is in full accord with the principle of their proposal, and will take steps to give effect to the reservation along the frontier of the Yukon Territory, and that he further call attention to the suggestions herein contained relative to other parts of the International Boundary Line.

All which is respectfully submitted for approval.

RODOLPHE BOUDREAU,
Clerk of the Privy Council.

To the Honourable
The Minister of the Interior.

P. C. No. 2235 M.

Ref. 1,633,875 on 1,301 (8).

Certified copy of a Report of the Committee of the Privy Council, approved by His Excellency the Governor General on the 7th August, 1908.

The Committee of the Privy Council have had under consideration a despatch, dated 22nd June, 1908, from His Majesty's Ambassador to the United States, transmitting copy of a proclamation by the President of the United States setting apart as a public reservation all unpatented lands of the United States lying within sixty feet of the boundary line between the United States and Canada. His Majesty's Ambassador draws attention to the fact that the original proposal for reservation of the Alaska frontier has now been extended so as to include the whole frontier, this being in accordance with the wishes of the Dominion Government.

The Minister of the Interior, to whom the said despatch was referred, states that under the authorization of the Order in Council of 14th April, 1908, he has withdrawn from sale, lease and entry, all public lands lying within sixty feet of the international boundary in Yukon Territory.

The Minister recommends that the matter be brought to the attention of the Government of the province of British Columbia, which with a view to the better enforcement of the laws of that province as well as of the Dominion may find it advisable to make a similar reservation along the boundary between British Columbia and Alaska and along the 49th parallel.

In view of the fact that the lands in the road allowance which was laid off in the original surveys of Dominion Lands along the international boundary in the provinces of Manitoba, Saskatchewan, and Alberta, have been transferred to these provinces, the Minister further recommends that the matter be brought to the attention of the respective Provincial Governments with the suggestion that this road allowance be retained for public use only.

The Committee, concurring in the foregoing, submit the same for approval and advise that Your Excellency may be pleased to transmit the substance of this Minute, if approved, to His Majesty's Ambassador at Washington for the information of the United States Government.

RODOLPHE BOUDREAU,
Clerk of the Privy Council.

To the Honourable
The Minister of the Interior.

Published in *The Canada Gazette* of 3rd April, 1909, vol. 42, for the fourth consecutive week.

PROCLAMATION BY THE PRESIDENT OF THE UNITED STATES OF AMERICA (RESERVATION OF LANDS ON CANADIAN BOUNDARY).

Whereas, the customs and immigration laws of the United States can be better enforced and the public welfare thereby better advanced when the Federal Government has complete control of the use and occupation of lands abutting on international boundary lines;

Now, therefore, I, Theodore Roosevelt, President of the United States, do hereby proclaim and make known that all unpatented public lands of the United States, lying within sixty feet of the boundary line between the United States and the Dominion of Canada, are hereby declared to be, and are set apart as a public reservation, and shall hereafter be subject only to such rights as have been heretofore legally acquired under settlements, entries, reservations, or other forms of appropriation, and are now existing, but shall not be subject at any time to any other claim, use, or occupation, except for public highways; and any patent issued for any legal subdivision affected by this reservation under any claim hereafter initiated, shall contain a recital that it is issued subject to this proclamation.

In witness whereof, I have hereunto set my hand and caused the Seal of the United States to be affixed.

Done at the City of Washington this 15th day of June, in the year of our Lord one thousand nine hundred and eight, and of the Independence of the United States the one hundred and thirty-second.

[Seal.]

THEODORE ROOSEVELT.

By the President:
Elihu Root,
Secretary of State.

(No. 810.)

AGREEMENTS OF THE COMMISSIONERS AS TO THE MANNER IN WHICH THE WORK SHOULD BE EXECUTED.

The first conference of the Commissioners was held at Washington, D.C., November 23, 1906, and following days, the Commissioners exhibiting their credentials, which were found in proper form.

At this and subsequent conferences, the principal points agreed upon by the Commissioners with regard to the fulfilment of their duties under the terms of the Convention were:—

That the final and agreed longitude of the observing pier on the south bank of the Yukon River, as determined by officers of the Coast and Geodetic Survey and officers of the Dominion Observatory, was 9 hours, 24 minutes, 00.027 seconds west of Greenwich, or 17.62 feet west of the true meridian of 141 degrees west from Greenwich, and that the initial point of the boundary line should be located in accordance therewith.

That an accurate azimuth should be observed by a joint party at the initial point, and that a mark should be set determining the direction of the boundary line, which should be produced in this direction north to the Arctic Ocean and south to Mount St. Elias.

That the work should be executed jointly by representatives of the two Governments.

That the boundary line should be produced by the micrometric transit method, representatives of the two Governments observing independently.

That the boundary line should be permanently marked by large and small aluminium-bronze monuments set in rock or concrete foundations at intervals of not more than four miles, and intervisible where practicable, except in the region between Mount Natazhat and Mount St. Elias.

That a vista with a 20-foot sky line should be opened along the boundary through all timber encountered.

That a belt of triangulation should be extended along the boundary line, and the geodetic positions of all monuments determined.

That the computation of the trigonometric determination of the positions of peaks and monuments should be made under the direction of the computing division of the Coast and Geodetic Survey at Washington, and that the results, when obtained, should be submitted to the Commissioners for their final approval and adoption.

That a topographic map, for final drawing on a scale of 1/62,500 with a contour interval of one hundred feet, should be made of the belt of country extending not less than two miles and not more than two and one-half miles on each side of the boundary line, excepting in the region between Mount Natazhat and Mount St. Elias, where it might be made wider if found desirable.

That a line of precise levels should be run from tide water at Skagway, Alaska, to some point on the boundary line for the control of elevations.

That the Alaska Coast Boundary should be drawn from Mount St. Elias to the 141st Meridian on such course parallel to the coast as should be found most equitable in the topographic conditions.

That the maps should be engraved on copper and printed in colors from stone, and that after the completion of the printing the copper plates should be deposited for safe keeping in the vaults of the United States Geological Survey, Department of the Interior, Washington, D.C.

EXPLORATIONS AND SURVEYS PRIOR TO THE CONVENTION OF 1906.[1]

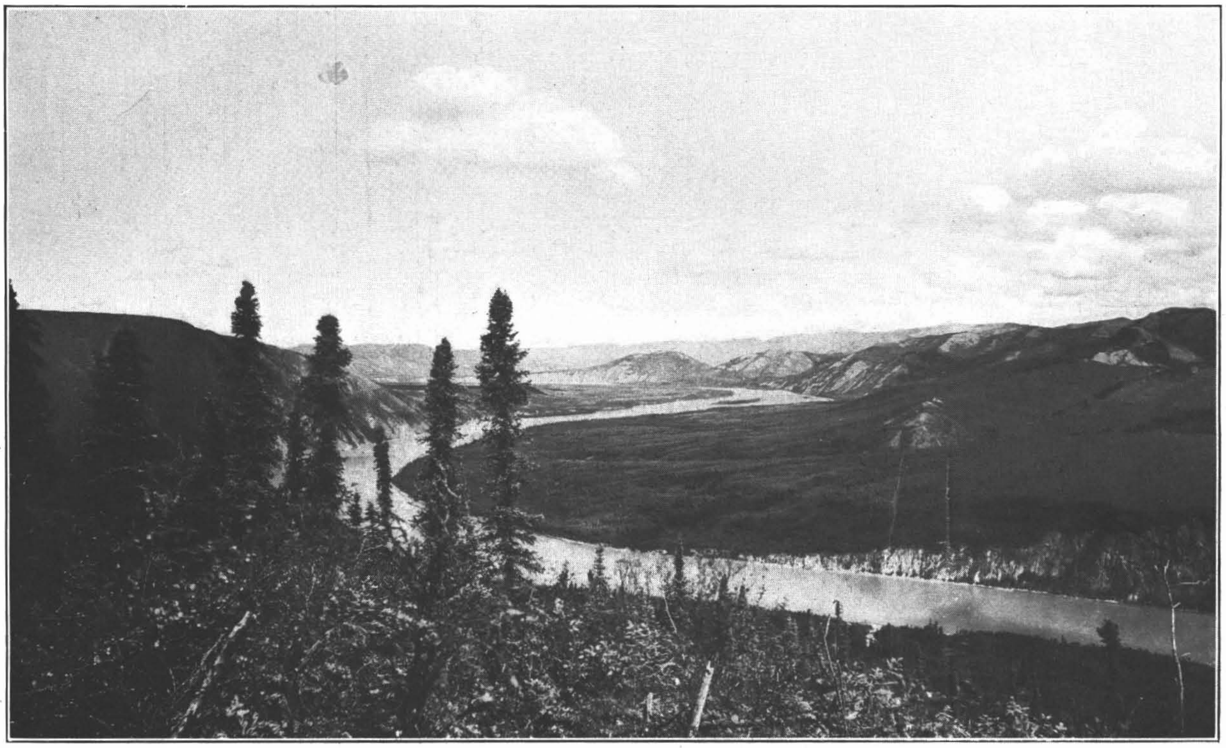
Although the United States had acquired the territory of Alaska by purchase from Russia in 1867, no effort was made to locate the Boundary Line along the 141st Meridian until 1887, when a Canadian party in charge of the late Wm. Ogilvie, Dominion Land Surveyor, descended the Yukon River, erected an observatory and spent the winter of 1887–8 on the north bank of the river near the meridian, and having determined the longitude of the observatory by astronomic observations, measured the requisite distance therefrom and marked a point where the 141st Meridian of longitude west from Greenwich crossed the Yukon River.

In 1889, United States parties in charge of J. E. McGrath, Assistant, and J. H. Turner, Sub-Assistant, Coast and Geodetic Survey, ascended the Yukon River to Fort Yukon, where the parties separated. Mr. Turner's party ascended the Porcupine River to the vicinity of the 141st Meridian, where a winter camp was built, and during the winter of 1889–90 observations were taken for longitude, latitude, and azimuth, determining the position of the Boundary Line, which was marked with three temporary monuments. Mr. McGrath's party continued up the Yukon to the point occupied by Mr. Ogilvie in 1887, and remained there until the spring of 1891, the observations for longitude, latitude, and azimuth being continued throughout the second winter on account of unsatisfactory observations due to bad weather during the winter of 1889–90. The results of these observations confirmed the position of the Boundary Line as determined by Mr. Ogilvie.

In 1895, Mr. Ogilvie again occupied the observatory built by him in 1887, and made additional observations which checked the work previously done by Mr. McGrath and himself, and by a more accurate measurement determined a point on the 141st Meridian, where an azimuth was observed, the direction of the Boundary Line determined and the line produced to the north five miles, and to the south as far as Sixtymile River, cutting, blazing, and marking the line by small cairns. In 1902, the line was extended southward from Sixtymile River to the flats at the head of Scottie Creek by a Canadian party under J. J. McArthur, Dominion Land Surveyor, but no permanent marks were set.

Early in 1906, Mr. O. H. Tittmann, Superintendent of the United States Coast and Geodetic Survey, and Dr. W. F. King, Chief Astronomer of the Dominion of Canada, who were at that time Commissioners for the Alaska Coast Boundary, and who expected to be and were later appointed Commissioners for the survey of the 141st Meridian under the Convention of 1906, learned that by the proposed Article I of the Convention then under consideration, it was provided that the survey of the International Boundary Line along the 141st Meridian should be based upon a telegraphic determination of the longitude at some convenient point, and when they became aware that the terms of the Convention had been agreed upon, they were met by the consideration that the refined astronomic observations requisite for this determination could not properly be made except during the summer, while a reduction of the observations would require considerable time. In order that full advantage

[1] For details see Appendices i and ii.



x xx

Looking north across the Yukon at the Boundary, showing Ogilvie's old line (x) and the new line (xx).

of the summer season of 1907 should be taken in the survey of the line, and with a view especially of meeting urgent demands which had been made for an early demarcation of that portion which extends southward from the Yukon River, it appeared desirable that the astronomic observations which were a necessary preliminary to the survey operations should be completed during 1906. They therefore decided to utilize, in advance of the formal ratification and proclamation of the Convention, the organizations under their direction, namely, the Astronomic Branch of the Department of the Interior of Canada, and the United States Coast and Geodetic Survey, in performing the astronomical work.

The only point of the 141st Meridian which was in telegraphic communication with outside points was the crossing of the Yukon River, and this point was therefore necessarily chosen for the astronomical determination. The telegraphic connection was made by the lines of the Canadian Government and the Canadian Pacific Railway Company with Vancouver, B.C., and also by the United States Government line with Fort Egbert (Eagle), Alaska, on the Yukon, about twelve miles below the Boundary.

The longitude at Vancouver and Fort Egbert, as reckoned from Greenwich, had already been determined by operations carried on under the two Governments, the astronomic stations at Seattle, Wash., and Vancouver, B.C., having been connected during the season of 1905 by the telegraphic determination of their difference of longitude, the observers being Assistant Edwin Smith of the Coast and Geodetic Survey, and Dr. Otto J. Klotz, of the Dominion Observatory at Ottawa; and later the longitude was carried by Assistant Smith and Assistant J. E. McGrath by cable to Sitka and Valdez, and thence overland to Fort Egbert.

Looking up-stream (northeast) from the point from which the photograph opposite was taken.

Hence a determination of the longitude near the meridian by two telegraphic routes was possible, and as such double determination would result in increased accuracy, it was resolved upon, and late in July, 1906, observers were sent to each of the three stations, Vancouver, Fort Egbert, and the Meridian: Mr. Smith of the Coast and Geodetic Survey to Egbert; Mr. McDiarmid of the Dominion Observatory, to a station near the Boundary on the Yukon; and Dr. Klotz of the Dominion Observatory, to Vancouver.

Considerable difficulty was experienced in obtaining good wire connection between the Boundary and Vancouver. The line, in its length of nearly two thousand miles, traverses a sparsely settled country; in fact, by far the greater part is a wilderness. Through the woods a fair "right of way" is cleared, and the wire is supported on trees from which the branches have been cut. Under these conditions, with the vicissitudes of wind and water and fire, it was only to be expected that interruptions in the telegraphic service would be not infrequent, but as it subsequently turned out, the service was better than anticipated, the good results being largely due to the solicitous interest of the superintendent of the line, Mr. J. Phelan, and of the chief operator at Vancouver.

Mr. McDiarmid was installed at the Boundary ready to observe by August 20, and work began on the 22nd. The weather at all three stations was continuously very propitious, and the telegraph line, as mentioned already, worked better than had been expected, so that by September 3 seven differential longitude determinations had been secured between Boundary and Vancouver, for five of which each observer had obtained a full set of stars for the two independent time determinations, while for the other two nights good time determinations were also obtained, though not with the full complement of stars. Similarly, between Boundary and Egbert, seven differential longitudes were obtained.

It is interesting to note that though Ogilvie's line of 1895–6, as marked on the ground, was about 370 feet too far west, the longitude observations showed that his line of 1887–8 was only some 218 feet west of the meridian, as established by the most modern methods under almost ideal telegraphic conditions, and the McGrath observations gave a position only 477 feet east of the final line.[1] This may be considered a great tribute to the original observers, their work[2] having been done by what might almost be called field methods, and under weather conditions which were the reverse of propitious.

The Convention of 1906[3] was signed at Washington on April 21 of that year, and ratifications were exchanged, also at Washington, on August 16 following. Under Article I of the Convention, the Commissioners for the Alaska Coast Boundary, Mr. Tittmann[4] and Dr. King[4], were appointed Commissioners also for the survey and demarcation of that portion of the 141st Meridian forming the boundary between Alaska and Canada.

[1] See summary of observations, pages 237 and 238.
[2] Appendix ii, page 217 *et seq.*
[3] For full text, see pages 15 and 16.
[4] See appointments, pages 17, 18 and 19.

GENERAL NARRATIVE OF FIELD WORK UNDER THE CONVENTION OF 1906.

SEASON OF 1907.

PARTY ORGANIZATION.

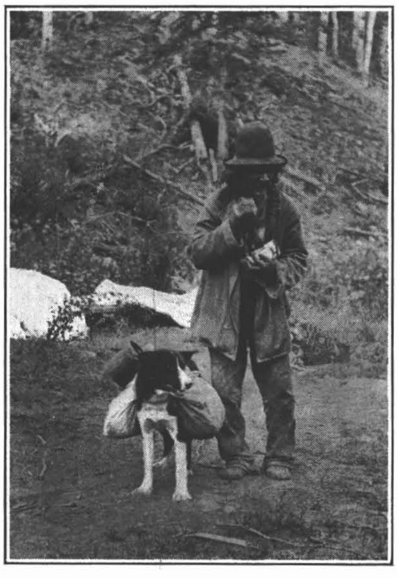
——	For the United States.	For His Britannic Majesty.
Chiefs of Parties	G. C. Baldwin Thos. Riggs, jr	A. J. Brabazon, D.L.S.
Assistants	W. B. Reaburn A. I. Oliver W. B. Gilmore	Fred. Lambart, D.L.S.

FIELD WORK.

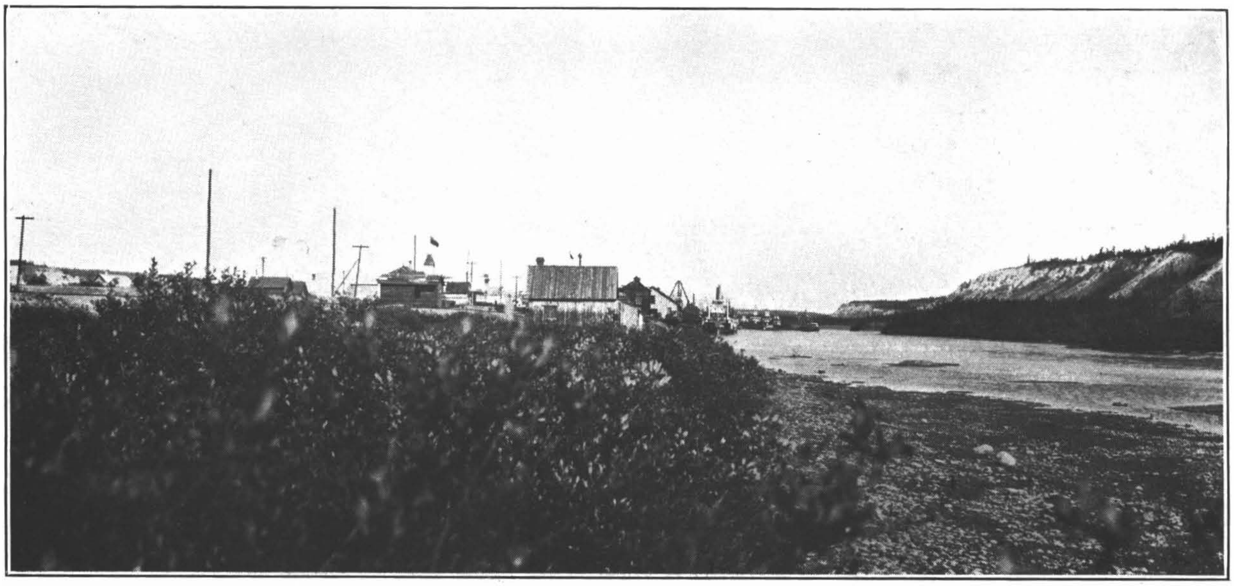
The observations taken during 1906 by the officers of the United States Coast and Geodetic Survey and of the Dominion Astronomical Observatory, having been computed during the winter gave an accurate determination of the longitude of the astronomical pier on the south bank of the Yukon River, and showed it to be 17.62 feet west of the 141st Meridian west from Greenwich.

In order to take full advantage of the short working season in this portion of Alaska, the Commissioners decided to send representatives to the boundary in the early spring to make observations for azimuth and to mark points on the Boundary Line determining its direction, so that all would be in readiness for the immediate prosecution of the work when navigation should open, permitting the other members of the party to reach the starting point with their larger outfit of pack-horses, equipment, and supplies.

Mr. F. A. McDiarmid, Canadian Representative, and Mr. G. C. Baldwin, United States Representative, and those who were to accompany them, met in Seattle during the latter part of March, and, with their instrumental equipment, proceeded via steamer to Skagway, Alaska, thence by the White Pass and Yukon Railway to Whitehorse, Y.T., and by stage line 330 miles to Dawson. Arriving there on April 13, they purchased supplies, and on the 14th started with hired teams over the frozen Yukon for the Boundary Line. In places the ice was very rough, while in other places the snowdrifts were deep, and in still others the ice was



Old Indian with his pack-dog at Whitehorse, Y.T.

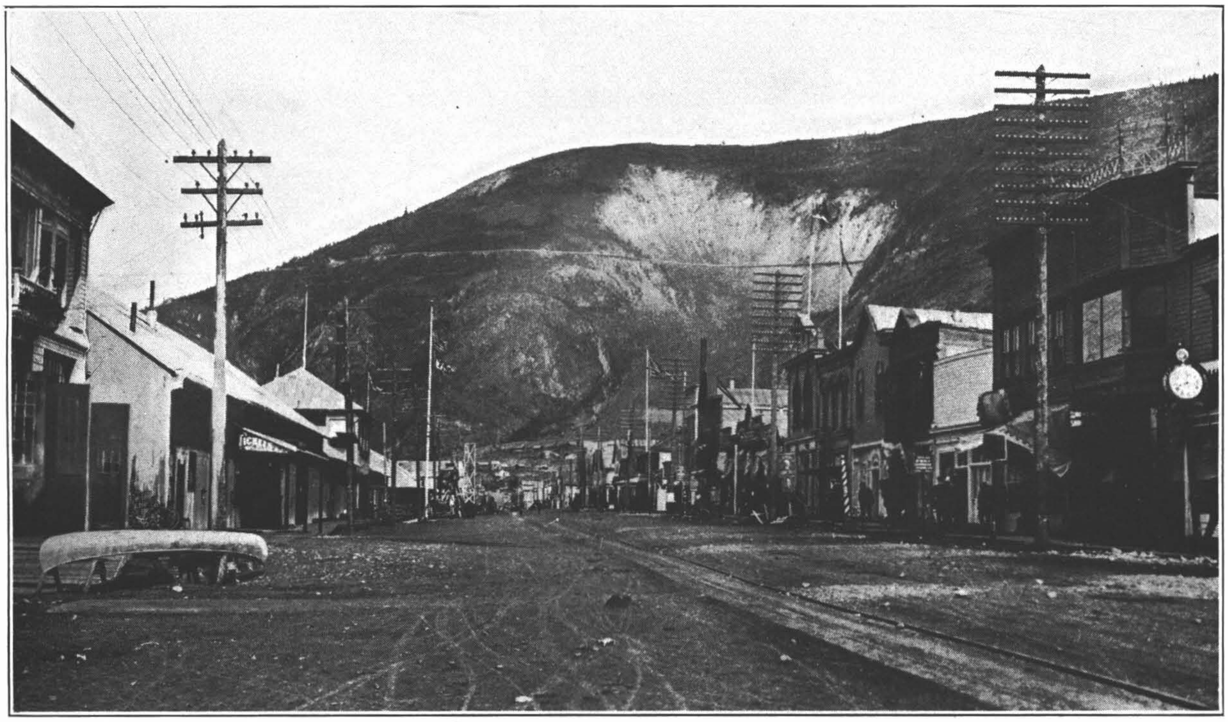


The Fiftymile River at Whitehorse.

covered with water and slush to the depth of a foot, so that progress was slow and laborious. Twice the sled capsized on the rough ice, several times a path had to be shovelled through the huge drifts, while in the early morning it was often necessary for the men to walk in front of the horses and break down the heavy snow crust. In the flooded sections of the river some of the party walked ahead through the icy water to test the ice and select the best route. When the party reached the town of Fortymile, they were compelled by the Royal Northwest Mounted Police to discharge the Dawson team, as this was the entrance to a district where there existed a quarantine to prevent the spread of glanders, and a few days' delay occurred before another team could be secured to take them the remainder of the distance to the Boundary Line, which they reached on April 20.

The snow was still deep on the hills, and was very soft, making it difficult, as the party was not provided with snowshoes, to climb to the summit on which an azimuth mark was to be placed. A point was first located and marked on the Boundary Line directly east of the 1906 longitude pier a distance of 17.62 feet as agreed to by the Commissioners, and in order to determine a second point on the line at a considerable distance, the pier was occupied and observations for azimuth were taken by both United States and Canadian observers to determine a true north-and-south line, and at a second point about one and one-quarter miles south of the pier, an offset was made and the second point established on the Boundary. These two points determined the direction of the line.

The other members of the joint parties arrived at the Boundary early on the morning of June 12, the United States parties having left Seattle on May 25, the Canadians boarding the same boat at Vancouver the following day. Skagway was reached on May 30, where the parties remained a few days, as Lake Laberge was still ice-bound. Entraining at Skagway on June 5, they arrived at Whitehorse that evening, and took up their quarters on the White Pass and Yukon Route steamer *Canadian*, on which boat they sailed for Dawson and the Boundary on the evening of the 8th, reaching the latter point, as already stated, on the 12th.



First Avenue, Dawson.

What a contrast was this trip to that made by the Ogilvie party in 1887! These early surveyors, with their instruments, supplies, and two canoes, occupied about seven weeks on that part of the trip from salt water to the present site of Whitehorse, while the " hardships " of the later parties consisted in having their horses and outfits loaded on the White Pass and Yukon Route train at Skagway, stepping into a comfortable first-class coach themselves, and enjoying the wonderful scenery through the mountains and over to Whitehorse, the trip occupying about eight hours.

The arrangements for the season were as follows:—

Each Government was to furnish its own supply and transportation trains, but in this, as in all other matters, the work was greatly facilitated by the hearty co-operation of all concerned, and it was no unusual occurrence to find a United States pack-train supplying subsistence to a Canadian party, or *vice versa*. It was soon found that although the primary object of the survey was to run and mark a boundary, there was "no boundary line" as far as the work itself was concerned, and all worked together so well, and everything progressed so smoothly at all times, that it seemed as if the work were being done by one large party.

Owing to the fact that few Canadian surveyors were available for the work, this year the greater part of the field-work was done by the United States parties, the Canadians, as a partial offset to this, supplying the subsistence for the entire force.

The line-projection was carried on jointly by a United States and a Canadian observer, and a Canadian representative was attached to the United States triangulation party. With the exception of these men and the field hands with them, the force was entirely from the United States.

The first permanent marks on the boundary were the two bronze monuments of the large pyramidal type which were set, one on either bank of the Yukon, while the parties were encamped there in June, these monuments being eventually given the numbers 111 and 112 when the final numbers were allotted. These were the only monuments set this year, though the vista was cut and stadia measurements made as far as the Sixtymile River, a distance of over fifty miles. Throughout this section, monument sites were selected and the positions tied in to the triangulation preparatory to the setting of the monuments the following year. The vista was cut with a sky-line "20 feet clear," and though this involved the felling of a great number of trees, it made an opening through the timber which will be very conspicuous for a great many years.

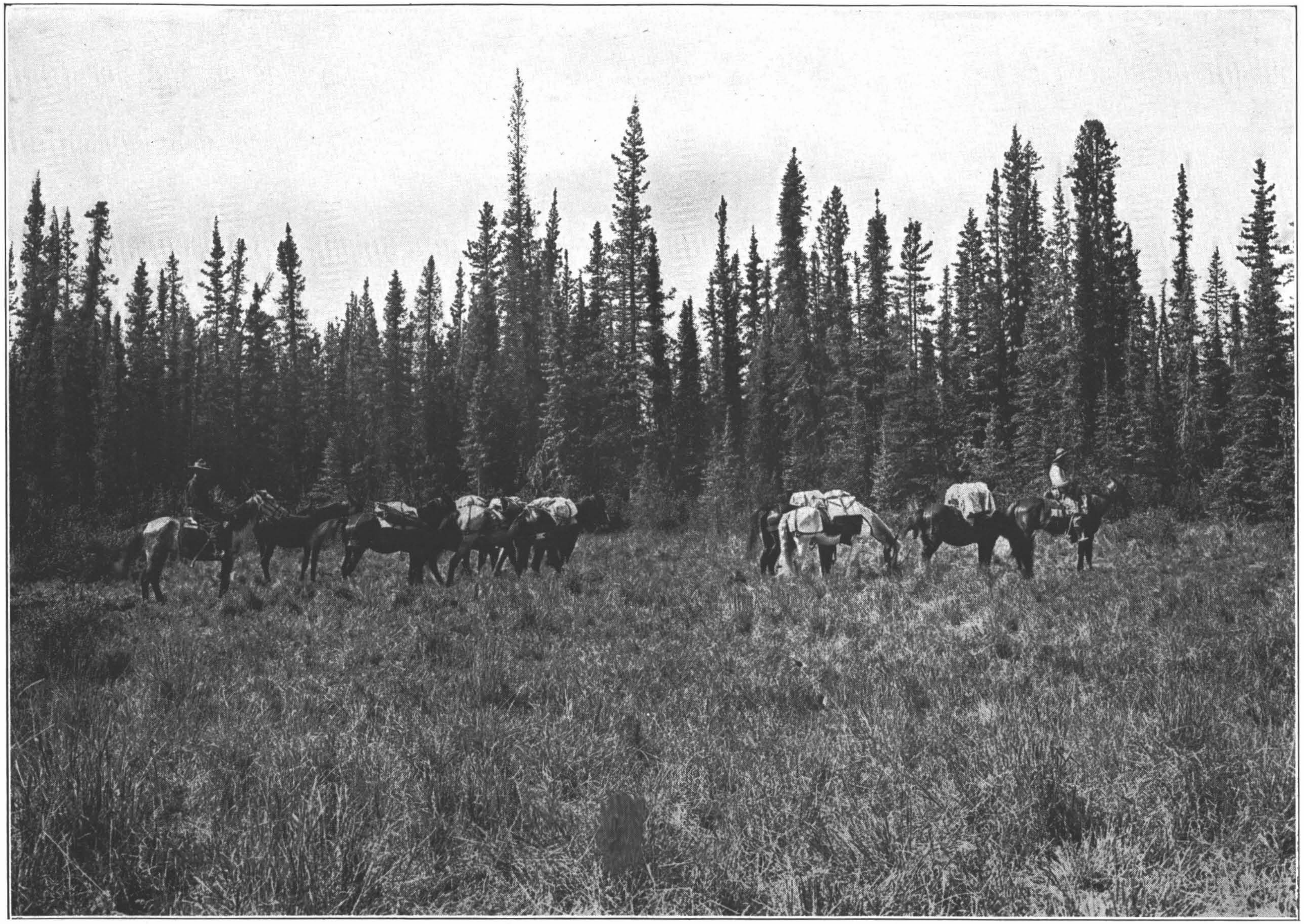
While the parties were in camp at the Yukon, there occurred one of those strange, sad incidents which come to those whose profession takes them to the far corners of the earth. On June 24 one of the camp cooks noticed the body of a man floating downstream. A boat was sent out and the body towed ashore and landed at the mouth of Boundary Creek, a little below the camp. The cook happened to be a Dawsonite and identified the body as that of a man named Frank McKay, who had been drowned a short distance below Dawson by the upsetting of his canoe some three weeks previously. Using the telegraph loop in the Boundary observatory, a message was sent to Dawson, and Captain Tucker of the Royal Northwest Mounted Police came down next day in the mail launch to hold an inquest. But as the body had been landed below the boundary line in United States territory, the police were unable to handle the case. The United States authorities at Eagle, through the Commissioner there, authorized the burial of the body, but could provide no funds, so it fell to the lot of the Boundary Surveyors to construct a rough box of packing-cases in which, after being wrapped in canvas, the remains were laid at rest behind the old roadhouse near the mouth of Boundary Creek, the United States Chief of Party reading the burial service.

The triangulation,[1] which was expanded from a base measured on the south bank of the Yukon River, extended southward, along the line, to a point a few miles south of the Sixtymile, in the valley of which river a check base was measured.

The joint line-projection party traced the line for a distance of 125 miles south from the Yukon, using heliotropes for back- and fore-sights and for communication, points being determined and marked on prominent ridges at intervals of from ten to twenty miles. The topographic party mapped a strip of country along the boundary, four miles wide, and extending from the Yukon to Walker's Fork of the Fortymile River, a distance of about forty-five miles. This topography was done by the United States parties with the plane table, while for the purposes of comparison, the Canadians made a photo-topographical survey of the same strip.

The Yukon was assumed to have an elevation at the boundary of 835 feet above sea-level, and this datum was used until precise levels were carried in from Skagway, as will appear later. This assumed elevation, which proved to be remarkably nearly correct,[2] was based partly on a comparison of barometer readings taken in camp by Ogilvie in 1887-8 with contemporary readings taken at Sitka, Alaska, and at Port Simpson and Victoria, B.C., and partly on general knowledge of the length and average fall of the river per mile.

[1] See sketches, page 265, *et seq.*
[2] See page 57.



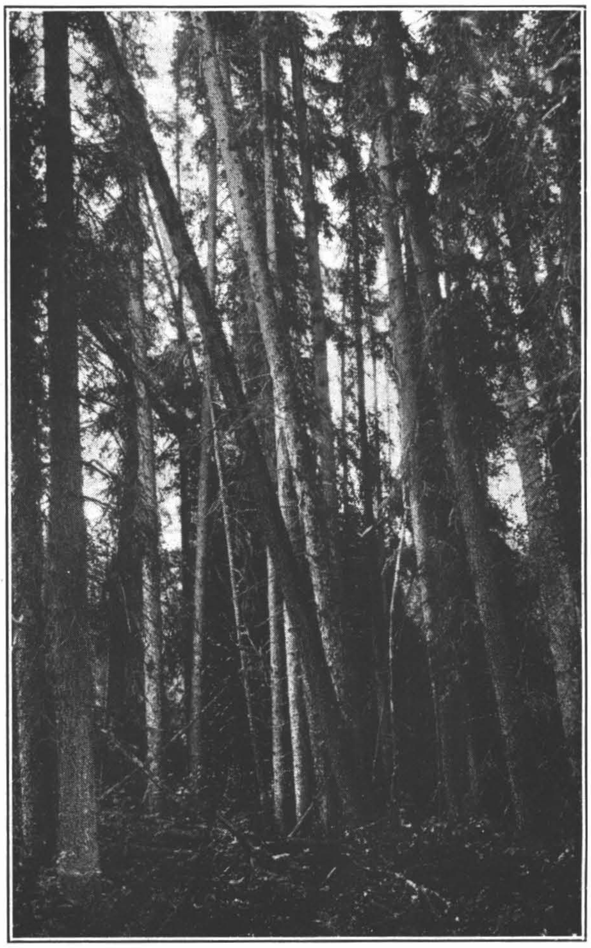
Pack-train ready for the trail.

Supplies stored on an animal-proof cache.

Forty-eight pack-horses, purchased in eastern Washington, furnished transportation for the parties during the season. The animals, after coming safely through a strenuous season, were to have wintered at Tanana Crossing, Alaska, but all perished in a furious blizzard which overtook them on their way there. The question of wintering the stock used on the survey was a source of much worry and disappointment to those in charge of the work. The horses had to be purchased "outside" and "taken in." The first cost, though comparatively reasonable, was augmented by the heavy freight rates and the cost of feeding while on the long journey to the point where they could be used. As the cost of taking them "outside" again in the fall, wintering them, and returning them again in the spring was prohibitive, they had to be wintered in the country, and, as the survey progressed, the outcome of this plan was found to be more or less uncertain. Some winters all the animals would "come through" looking fit and well in the spring, while again every head perished, and this despite the fact that every likely spot in the whole north district was given a fair trial.

As conditions met with in 1907 were more or less typical of those throughout the whole work, with the exception of the extreme north and south ends, a short description of them, perhaps, will not be out of place here. The country was undulating to mountainous, generally with deeply eroded stream beds. Heavy timber was usually encountered in the valleys, with the summits bare, or at best covered with a sparse growth of stunted timber or underbrush. Generally, travelling was found to be good along the ridges, except, of course, in the more mountainous portions, where the valleys were found to furnish the best routes of travel, and almost no trail-cutting was necessary except where it was impossible to travel on the ridges, and not always then. The thick moss overlying almost the whole lower country made very tiresome "going" for man and beast, and tended to make the firm, hard ridge-tops the popular lines of communication.

Wood for fuel was everywhere plentiful, as was also good water for camp purposes. The long days of these high latitudes aided the work materially, though at times, particularly on the more northerly portion of the work, many of the men complained that at first they were unable to get their usual quota of sleep owing to the light at night. The majority, however, soon became accustomed to this, and "bed-time" was "bed-time" no matter how light the night.


Heavy timber along Ladue River.

Mosquitoes and other insects were plentiful, but by using "mosquito bars" during the day, and sleeping in mosquito-proof tents at night, the human members of the parties managed to get along fairly comfortably. Not so, however, with the horses, which were often so bothered that they could not remain quiet long enough to feed or rest, though they were protected as much as possible by mosquito blankets, "fly-dope," and numerous smudges, the latter proving the most practical of all the various schemes experimented with.

The annual joint report of the Commissioners, provided for in Article IV of the Convention of 1906, and covering this season's operations, reads as follows:—

First Joint Report of the Commissioners for the Demarcation of the 141st Degree of West Longitude.

The undersigned Commissioners, appointed in virtue of the first Article of the Convention between the United States and Great Britain, signed at Washington on the 21st April, 1906, have the honor to present their first report upon the progress of the demarcation of the one hundred and forty-first meridian of west longitude where it forms the boundary line between the United States and Canada.

By Article I of the Convention it was provided that the survey of the line should be based upon a telegraphic determination of the longitude at some convenient point. When the undersigned became aware that the terms of the Convention had been agreed upon, they were met by the consideration that the refined astronomical observations requisite for this determination could not properly be made except during the summer, while the reduction of the observations would require a considerable time. In order that full advantage of the summer season of 1907 should be taken in the survey of the line, with a view especially to meeting urgent demands which had been made for an early demarcation of that portion which extends southward from the Yukon River to the St. Elias Alps, it appeared desirable that the astronomical observations which were a necessary preliminary to the operations should be completed during 1906.

The undersigned, having these circumstances in mind, decided to utilize in advance of the formal ratification and proclamation of the Convention, the organizations which are under their direction, namely, the Astronomical Branch of the Department of the Interior of Canada and the United States Coast and Geodetic Survey, in performing the astronomical work. Accordingly, observers were sent out about the end of July, who completed the necessary observations in August and September. The computations were made during the winter.

The only point of the 141st Meridian which is in telegraphic communication with outside points is the crossing of the Yukon River. This point, therefore, was necessarily chosen for the astronomical determination. The telegraphic connection is by the lines of the Canadian Government and the Canadian Pacific Railway Company with Vancouver, B.C.; and also by the United States Government line, with Fort Egbert, Alaska.

The longitude at Vancouver and Fort Egbert, as reckoned from Greenwich, had already been determined by operations carried on under the two Governments, and by the most approved methods. Hence a determination of the meridian by two telegraphic routes was possible, and as such double determination would result in increased accuracy, it was resolved upon, and observers were sent to each of the three stations Vancouver, Fort Egbert, and the Meridian.

When the observations had been reduced, the records and computations were examined by both Commissioners who, at a conference held in Ottawa in March last, agreed upon instructions to the line surveyors that the final and agreed longitude of the observing pier at the Yukon River was 9*h.* 24*m.* 00*s.*027 west of Greenwich, or seventeen feet, approximately, to the west of the true meridian of one hundred and forty-one degrees west of Greenwich.

In pursuance of instructions prepared by the Commissioners at the conference above mentioned, a joint party was sent out in March for the purpose of establishing the initial point and determining the direction of the meridian. At the opening of navigation on the Yukon River in May, a joint survey party followed.

Two aluminum-bronze monuments have been placed to mark the meridian at the crossing of the Yukon, one on each bank, and at this date the tracing out of the line southward, and the triangulation and topographical work of the survey, are in active progress.

O. H. TITTMANN,
U. S. Commissioner.

W. F. KING,
H. B. M. Commissioner.

OTTAWA, 27th August, 1907.

SEASON OF 1908.

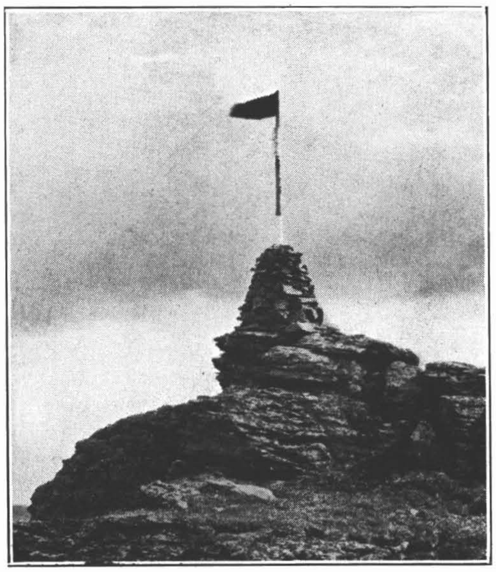
PARTY ORGANIZATION.

	For the United States.	For His Britannic Majesty.
Chiefs of Parties	G. C. Baldwin Thos. Riggs, jr.	A. J. Brabazon, D.L.S.
Assistants	W. B. Reaburn W. B. Gilmore A. I. Oliver	Fred. Lambart, D.L.S. D. H. Nelles, D.L.S. Claude Brabazon. Thos. P. Reilly.

FIELD WORK.

Work was continued southward in 1908 under the same general arrangements as in the previous year. The British Commissioner, however, had a more generous appropriation at his disposal and was able to put more men in the field, necessitating some slight changes in the details, and making possible a more even division of the work and responsibilities in the field.

The topographic party was sent into the Yukon over the winter trail, late in April, and was at work by the middle of May, thus gaining nearly a month's time over the other parties engaged on the work. This experiment was so successful that the practice was followed each successive year to increase the length of the working season, a very important consideration in view of the great expense of taking the parties into and out of the country, and of the relatively large proportion of the total number of days of the field season which were necessarily consumed in getting to the work in the spring and out again in the fall.



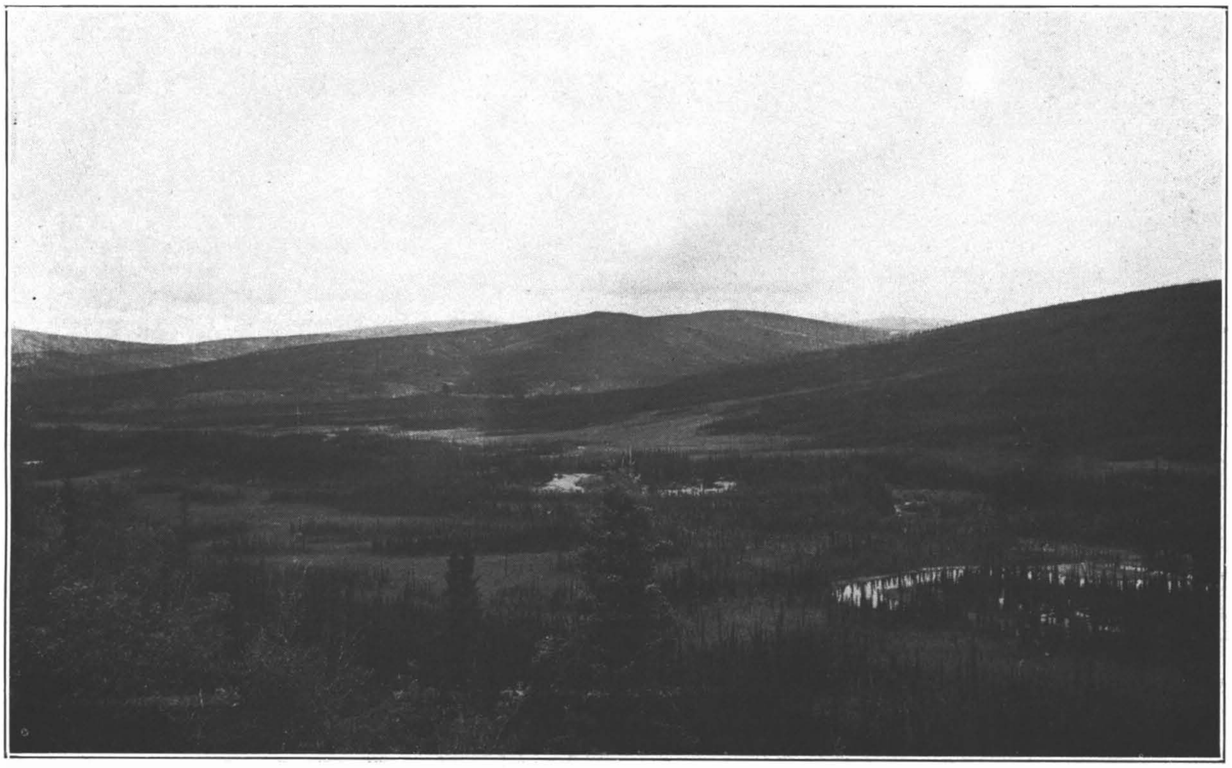
" Marmot " triangulation station.

The topographic party, though, had to work under great difficulties until the arrival of the main party, as they had no means of transportation except "man-power," all their supplies being taken in on sleds, or by back-packing, a distance of about twenty-five miles from a depot on the Sixtymile River. In addition to this the snow was so deep that most of the work had to be done on snowshoes. The topographic belt was extended southward about sixty-five miles this season.

In the Sixtymile country.

Several depots of supplies for the work had been established for this season's operations. The main bases were at Miller Creek, the United States supplies having been taken in during the winter, and the Canadian supplies over the wagon road from Dawson in June. From here they were distributed during the season to the various camps by special supply pack-trains, assisted at times by the different camp-trains when they could be spared for this work. Other depots for the use of the joint line-projection party were established at Katrina Creek and Canyon City, with a smaller depot on Snag Creek for the triangulation party, all these supplies being taken in by small-boat via the White River as soon as possible after the opening of navigation.

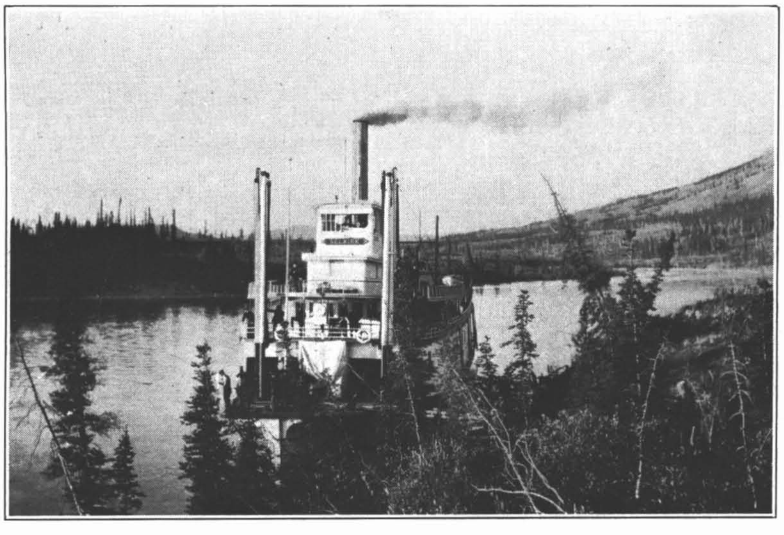
Early in June one of the river steamers landed the line-projection party at the mouth of the White River, which they ascended in small boats. The members of the main party were met by their pack-trains at Katrina Creek and went overland to the boundary at "O," the last point set in 1907, near the crossing of Snag Creek. The fore-helio party continued up the river to Canyon City, and attempted to reach a point on line which had been selected the previous fall, and which was about seventy miles south of "O." They were unsuccessful in this, however, and though they made many attempts from various ridges, they were unable to get into communication with the main line-projection party, who as a result were forced to send forward their rear-helio party as a fore-party, and use target back-sights. Although this necessitated shorter, and hence more numerous, sights, they were able to get the line south to, and across, the White River before the close of the season. Owing to illness, the Canadian observer was unable to occupy the last two stations, but the independent work of the United States observer was in due course accepted as satisfactory by



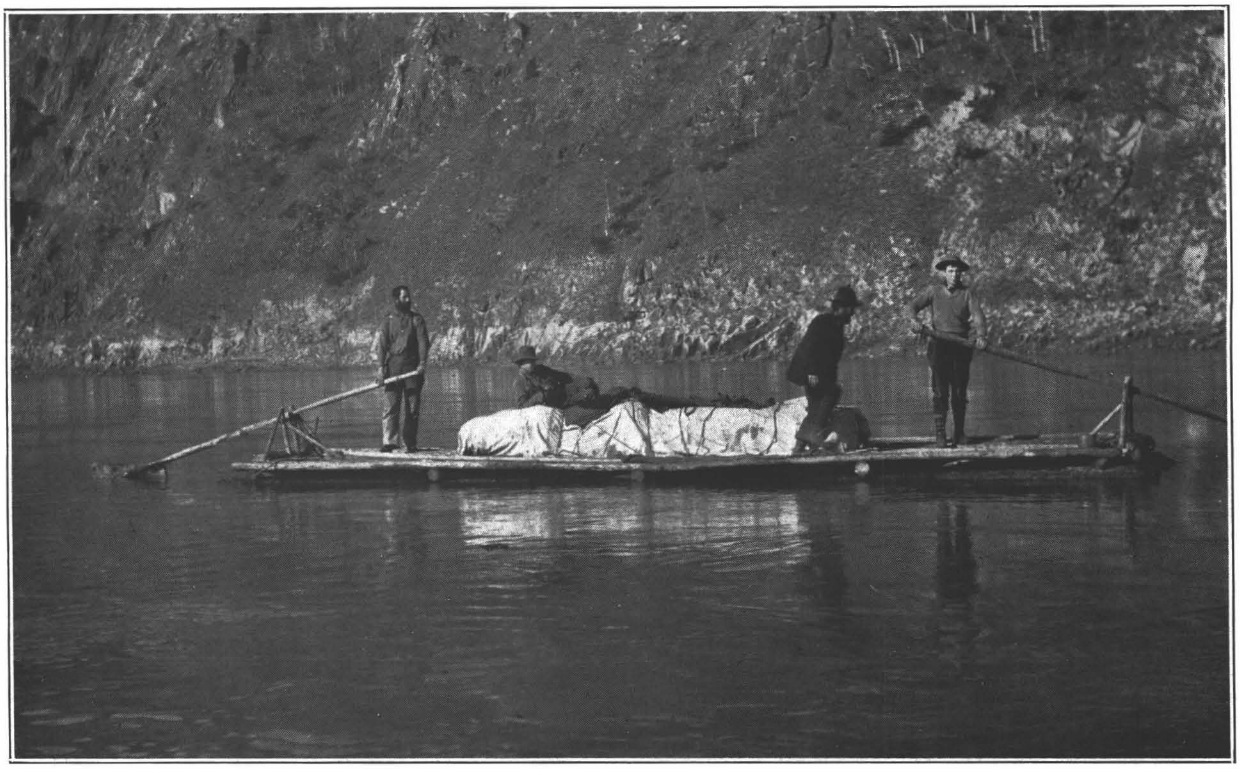
Valley of Ladue River.

the Commissioners. This party returned to Dawson in small boats, floating down the White and Yukon Rivers.

The reconnaissance and triangulation parties succeeded in carrying their work southward about seventy-five miles from the ridge south of the Sixtymile River. These two parties were depending for their late season subsistence on the small cache of supplies which had been boated up Snag Creek, but which they were unable to locate, as it had been left farther downstream than agreed, and it was only after being for forty-eight hours entirely without food that these parties met, and both were forced to return and join the topographic party at Ladue River, the only serious result being a regrettable shortening of the all too brief field season.



The *Selkirk*, of the W. P. & Y. Route, "wooding-up" at Lower Laberge.



Rafting down the Yukon in 1908.

A Canadian party set twenty-four monuments, thus completing this part of the work as far south as the Sixtymile River, from which point they returned to Dawson over the Glacier trail. As each of these small monuments weighs about fifty-five pounds, and is set in concrete with two hundred pounds of cement, the question of transportation in this and the succeeding years was one of considerable importance.

The Canadian vista-cutting and stadia party opened the vista and measured the line as far as Ladue River, a distance of about fifty-five miles, selecting, marking and locating the monument sites as they progressed. Photo-topography for comparison purposes was also continued as far as the Ladue.

The various parties that finished their season's work here, built rafts on which they floated down to Dawson, where the whole force embarked on up-river steamers, on the first stage of the journey to Vancouver and Seattle.

The United States horses which survived the season's work were wintered at Champagne Landing, while the Canadian stock was sent up to the fine feed bars of the upper White River.

The annual joint report of the Commissioners, provided for in Article IV of the Convention of 1906, and covering the season's operations, reads as follows:—

Second Joint Report of the Commissioners for the Demarcation of the Meridian of the 141st Degree of West Longitude.

The undersigned Commissioners, appointed in virtue of the First Article of the Convention between Great Britain and the United States, signed at Washington on the 21st April, 1906, have the honor to present their second report upon the progress of the demarcation of the 141st Meridian where it forms the boundary line between Canada and the United States.

The joint party, referred to in our former report, that was sent out in March, 1907, to establish the initial point and to determine the direction of the meridian, completed that work, and had the meridian marked for a distance of 2 miles south of the Yukon River by the time the main survey party arrived in June.

The operations of the season were conducted as follows:—

One joint party carried on the accurate prolongation of the meridian, southward, and established governing points on the boundary.

Another party carried on a triangulation for the purpose of accurate measurement along the line, made a plane table survey on a scale of 1/45,000, extending two miles on each side of the line, and cut out a vista through the woods where these occur. The plane-table topography was supplemented by a photo-topographical survey on either side of the boundary.

The mileage of the season of 1907 was: Establishment of points on the meridian, 130 miles, from just north of the Yukon River to the hill in the bend of Scottie River; triangulation, 61 miles, to the hill south of Sixty-mile River; cutting out the line and marking the sites for monuments, 52 miles; and the topographic surveys, 46 miles. No permanent monuments were set during this season, except the two at the Yukon River.

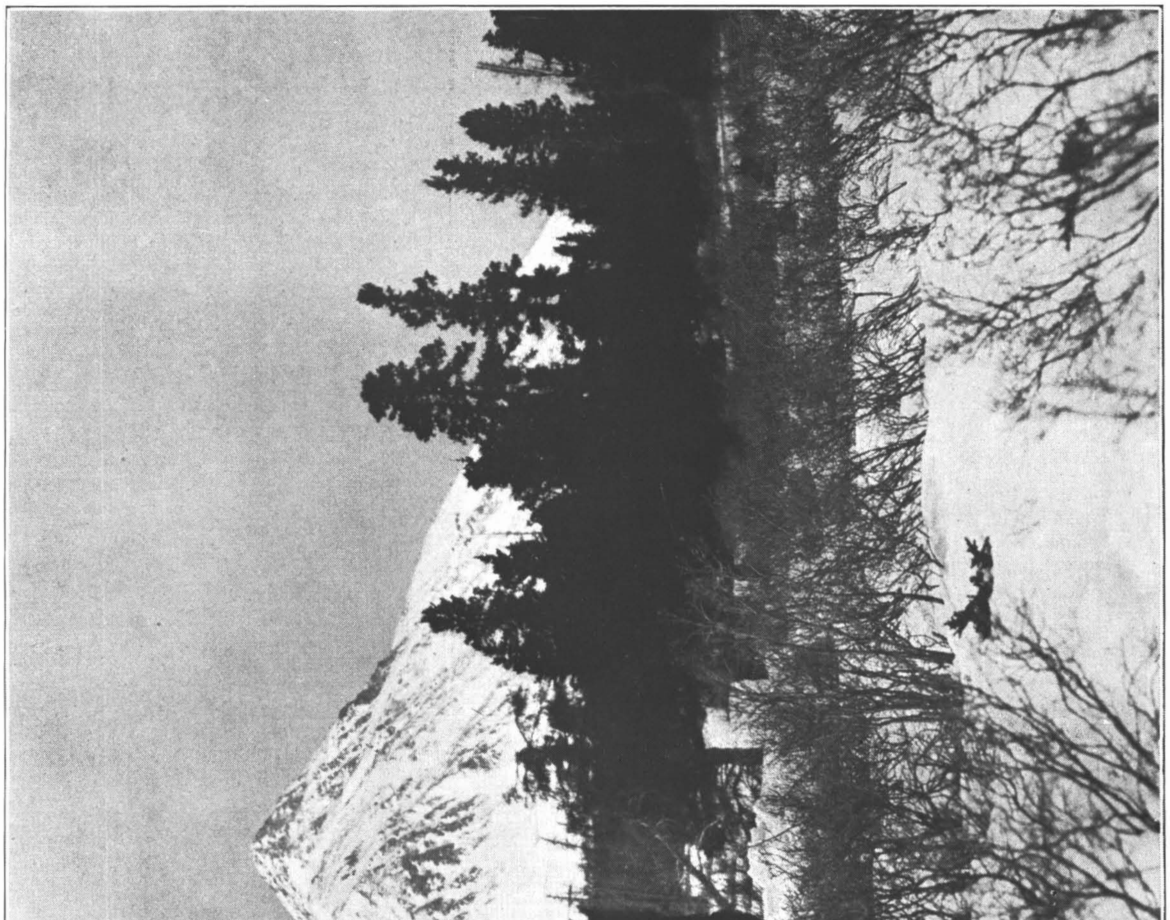
During the season of 1908, the distribution of the force was somewhat different from that of the previous season; one joint party produced the meridian as before, but the auxiliary work of triangulation, topography, and line-cutting was divided among three parties. A party to plant the permanent monuments was added and a levelling party to determine the elevation of a point on the meridian referred to sea-level at Skagway, via Whitehorse.

The mileage of the season of 1908 was: Prolongation of the meridian and establishment of governing points, 75 miles from the terminal point of 1907, to a point about two miles south of White River; triangulation, 77 miles, to the hill in the bend of Scottie River; topography, 65 miles, to the hill south of the main branch of Ladue River; the line cutting, 45 miles, to the main branch of Ladue River; and levelling, 159 miles. Permanent monuments were set at the points determined upon during the previous year, from Yukon River to Sixty-mile River. These monuments are of aluminum-bronze; one of them, on the north bank of Forty-mile River, is a large one, similar to those set at the crossing of Yukon River (six feet high, one foot square at base); the others are of smaller pattern, like those used on the boundary of the coast strip of Alaska (30 inches high).

W. F. KING,
H. B. M. Commissioner.

O. H. TITTMANN,
U. S. Commissioner.

OTTAWA, 29th December, 1908.



Mount DeCoeli from near the mouth of the Kaskawulsh River.

SEASON OF 1909.

PARTY ORGANIZATION.

——	For the United States.	For His Britannic Majesty.
Chiefs of Parties	G. C. Baldwin	A. J. Brabazon, D.L.S.
	Thos. Riggs, jr	Fred. Lambart, D.L.S.
		J. D. Craig, D.L.S.
Assistants	W. B. Reaburn	D. H. Nelles, D.L.S.
	A. C. Baldwin	A. G. Stewart.
	D. W. Eaton	Thos. P. Reilly.
	A. I. Oliver	
	W. C. Guerin	
	L. Netland	

Mount Natazhat (13,440 feet) as seen from the mouth of Kletsan Creek.

Field Work.

By the fall of 1908 the projection of the line had crossed White River and thus was far in advance of the other divisions of the survey, and the Commissioners therefore decided that during 1909 a special effort should be made to carry the whole work as far as the Natazhat Range, about fifteen miles south of river. This necessitated a large increase in the size of the parties and in the number of horses necessary for transportation. It was also decided to increase the length of the working season

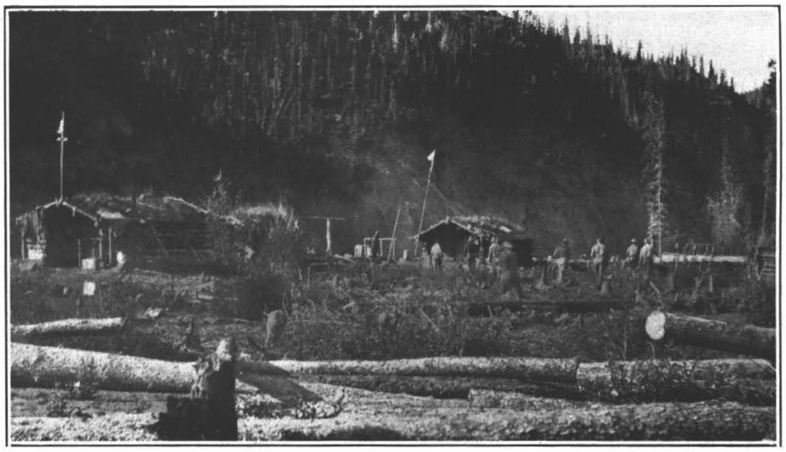
Sledding under difficulties.

by going in overland in early spring by the winter trail from Whitehorse to the head of White River, in order to be on the ground and ready for work as soon as weather and snow conditions would permit.

To facilitate the season's operations and to eliminate delays as far as possible, supplies were forwarded by contract from Whitehorse during the winter to a main base at Canyon City; and another smaller base was established, also by freighting during the winter, at the Yellowwater Lakes, about one hundred miles north of Canyon City, and oats were distributed along the trail for the use of the stock on the long journey in.

The parties which had been increased in size over previous seasons, made a quite formidable showing on the journey to Canyon City. There were fifty-one men, of whom seventeen were Canadians, and eighty-three horses, the Canadians furnishing thirty-three of these. In addition, there were the transport teams and three drivers who handled the supplies for immediate use on the way in, as well as the dunnage and camp outfit, the men making the trip on foot. Wagons were used for the transportation of supplies as far as Lake Kluane, which was crossed with sleighs on the ice, and from this point everything was packed on the horses.

The journey was made in slightly under three weeks, the first nine or ten days being over the so-called wagon-road, where the wagons often "bogged down" almost hopelessly in the mud-holes, to be extricated only by using eight or ten horses, with all hands laying to on the wheels or working with pries. On the higher portions of the trail, too, great difficulty was experienced getting the wagons through the deep snow. The Canadians made the trip a few days ahead of the United States parties and enjoyed the doubtful pleasure of "breaking trail" throughout a considerable portion of the distance.



Canyon City.

Breaking trail on Bear Creek summit.

Owing to the deep snow, the trail over the Burwash Summit west of Lake Kluane was not used. The route selected followed the Koidern valley to the Donjek River, which was crossed on the ice, thence up the Donjek to Wolverine Creek, up this creek and across the divide to the Klutlan, thence down the Klutlan to the White River and up to Canyon City. The last of the parties crossed the White on May 21 on the only remaining ice-bridge, a short half-hour before it collapsed into the swollen waters of the river.

From Canyon City the various parties proceeded to the scenes of their respective season's operations, and by the last week in May the field work may be said to have been well under way.

A base line, crossing the boundary line, was laid out and measured on the south bank of the White. For topographic control, a preliminary measurement of this base was made by triangulation from a short temporary base, thus enabling the topographic work to be begun without delay. The triangulation was first extended southward to the northern slopes of the Natazhat Range, and later northward to connect with the triangulation of 1908, after which a scheme was laid out and observed from the boundary up the valley of the White to Skolai Pass, where connection was made with several United States Geological Survey stations. It was necessary to assume a level datum for the topographic work, as had been done at the Yukon in 1907, and this was found later to be only 103 feet in error.

A windy camp.

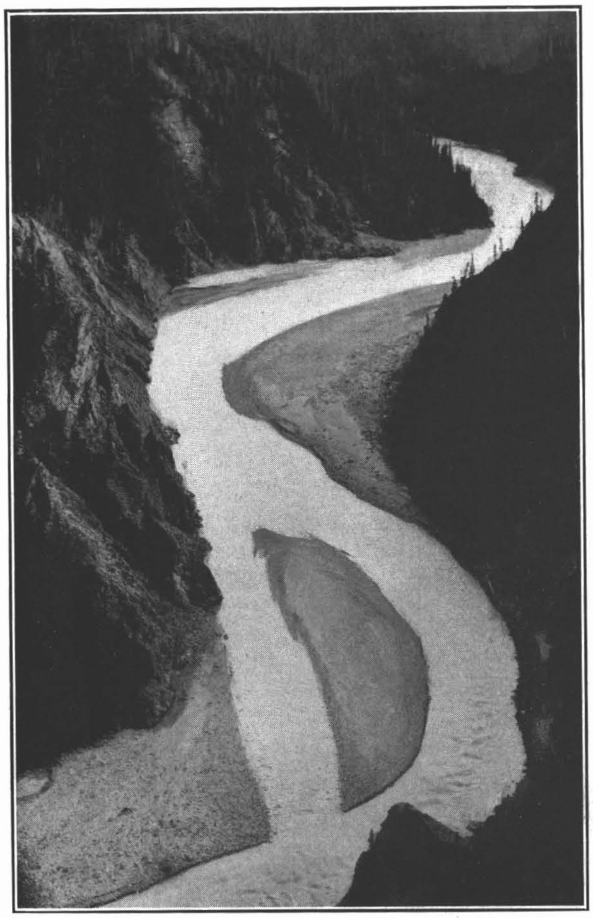
The topography was mapped by two planetable parties, one working southward from the Moosehorn Mountains, where the work of the previous year had terminated, and the other working at the southerly end, first between the White River and the Natazhat

Range, and later north from the river, meeting the northerly party on August 24 near Mirror Creek.

The line location was also advanced a stage farther south and a point was located on a northerly spur of the Natazhat Range just north of the main ridge.

Camp behind Mount Natazhat.

Strenuous attempts to occupy as topographic camera stations, both Natazhat itself and some of the high adjacent peaks were unsuccessful, on account of the weather conditions, which were unsuitable for such work in the higher altitudes. In connection with this work the range was crossed at the head of Holmes Creek, about twelve miles west of the boundary, and an attempt was made to climb Natazhat from the south, and though the summit was not reached on this occasion, considerable useful information was secured concerning the country south of the range.

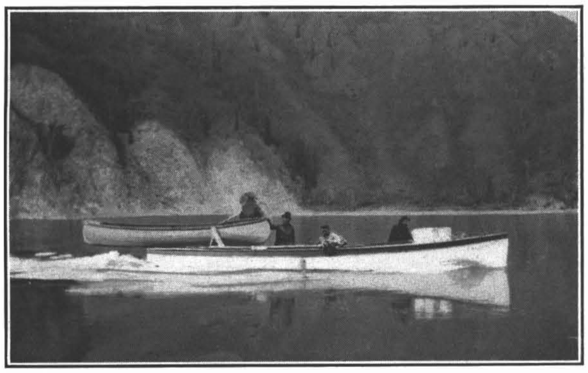


Looking up the upper canyon of the White River.

In the report of the trip behind Natazhat we read: "The trail led over the divide on glare ice, where steps had to be cut for nearly half a mile, then down a long ridge of loose scoria and out onto a badly broken fork of the Klutlan Glacier. It began to snow, but we had to go on, as it would have been impossible to re-cross the divide in the storm, and reached camp at 8.30, worn out and chilled to the bone, and found the tent down and everything wet or frozen. We shovelled away the snow for a small space with snowshoes, put up the tent as best we could and crawled into our scanty bedding. During the night it snowed 25 inches, and continued snowing the greater part of the next day. Even with the coal-oil lamp burning full blast and three men in the little seven by seven tent, the thermometer registered only 32°." And this was on the eleventh of August!

The vista was opened along the boundary from timber-line near Mount Natazhat north for a distance of about fifty miles, and some twenty-odd monuments were set and located by the triangulation.

The United States parties went out overland to Whitehorse, except one small party which, like the Canadians, went downstream in small-boats to Dawson, and thence up the Yukon by steamer, all hands passing through Whitehorse about September 25.



Reconnaissance party's launch, 1909.

During this season, a start was also made in locating the line north from the Yukon. A small United States party which came in after the opening of river navigation, accompanied by a Canadian attaché, projected about forty miles of line. They also cut the vista and set monuments along this forty miles, as well as completing the necessary reconnaissance and triangulation, but no topography was undertaken.

Leaving the United States party after the forty miles of projection had been completed the Canadian attaché chartered a launch at Dawson and made a reconnaissance trip up the Black River, with the special object of ascertaining if it would be feasible to take supplies in via this river when the work had progressed as far as the district drained by it. The net results of the trip showed that this was not practicable unless it proved to be almost impossible to transport supplies along the line as had been done south of the Yukon, the Black being shallow in many spots, and navigable for power-boats only during a short period immediately following the "break-up" in the spring.

Reconnaissance camp, Black River, 1909.

The Porcupine was also ascended as far as Rampart House in a little over four days, much to the amazement of the natives, and it was found that this river was navigable, or would be in June, for steamers of considerable size. The launch was then taken back to Dawson and turned over to the owners, having made nearly two thousand miles, most of this north of the Arctic Circle, and on rivers where the purr of a power-boat had never before been heard.

The annual joint report of the Commissioners, provided for in Article IV of the Convention of 1906, and covering this season's operations, reads as follows:—

Third Joint Report of the Commissioners for the Demarcation of the Meridian of the 141st Degree of West Longitude.

The undersigned Commissioners, appointed in virtue of the First Article of the Convention between the United States and Great Britain, signed at Washington on the 21st April, 1906, have the honor to present their third report upon the progress of the demarcation of the 141st meridian where it forms the boundary line between the United States and Canada.

The operations of the season of 1909 were conducted as follows:—

One joint party carried on the accurate prolongation of the line, northward from the Yukon River to a ridge between two main tributaries of Nation or Takandik Creek, a distance of 40 miles, and then returned to Eagle, Alaska, where a division of the party was made, part going up the Porcupine and Black Rivers for the purpose of determining the feasibility of using these routes for the transportation of supplies for the work of future seasons; the other part carrying on a scheme of triangulation for the computation of accurate measurements along the boundary, extending the triangulation 43 miles, northward, from the Yukon River to stations in the same locality as the terminus of the line.

One sub-party continued the cutting of the boundary vista, twenty feet wide, along the projected meridian, for 40 miles, and planted 12 of the small aluminum-bronze monuments. The precise levelling for the determination of a point on the meridian, referred to sea-level at Skagway, Alaska, was continued. It was completed between White Pass Summit and Whitehorse, and from the terminus of last season's operations for a distance of 164·5 miles along the Dawson wagon road to a point at Eureka Creek, about 52 miles from Dawson, October 8, distant 398 miles from White Pass Summit.

For the work South of the Yukon River, the parties marched on foot 300 miles overland early in the season from Whitehorse, to a point on the meridian determined in 1908, 1½ miles south of the White River. From this point the line was jointly projected, southward, for ten miles to a minor ridge of Mount Natazhat.

The stretch of boundary from the present terminus near Mt. Natazhat to Mt. St. Elias, a distance of 89 miles, of very inaccessible country, will not be taken up at the present time.

One party, consisting of three sub-parties, cut the vista both ways from the White River for a total distance of 60 miles, set two large monuments, one on each bank of the White River, 4 of the smaller monuments between the White River and Natazhat Ridge, and 15 between White River and Snag River.

Another party, sub-divided into 5 parties, completed a belt of topography on the scale of 1/45,000 from the main ridge of Mt. Natazhat to the hill south of the main fork of Ladue River—the most southerly point reached by the topographers in 1908.

Triangulation was carried from points near Mt. Natazhat, northward, 83 miles to the range of hills in the bend of Scottie River, connecting with stations established the previous season. In addition to this, a scheme of triangulation was run up the White River to Skolai Pass—22 miles—for the purpose of determining the positions of the mountains in the neighborhood of the boundary.

A recapitulation of the work done by the various parties in 1909 shows the following results:—

Line projection	50 miles.
Length of triangulation net	149 "
Length of topographic belt	112 "
Vista cut	100 "
Number of permanent monuments planted	33
Precise levels run	241 "

The whole survey and demarcation between the point mentioned near Natazhat Ridge and the Yukon River, a distance of 215 miles, has now been completed, with the exception of the vista cutting for a distance of 57 miles, and the placing of the final monuments for about 101 miles.

O. H. TITTMANN,
U. S. Commissioner,

W. F. KING,
H. B. M. Commissioner.

Washington, December, 1909.

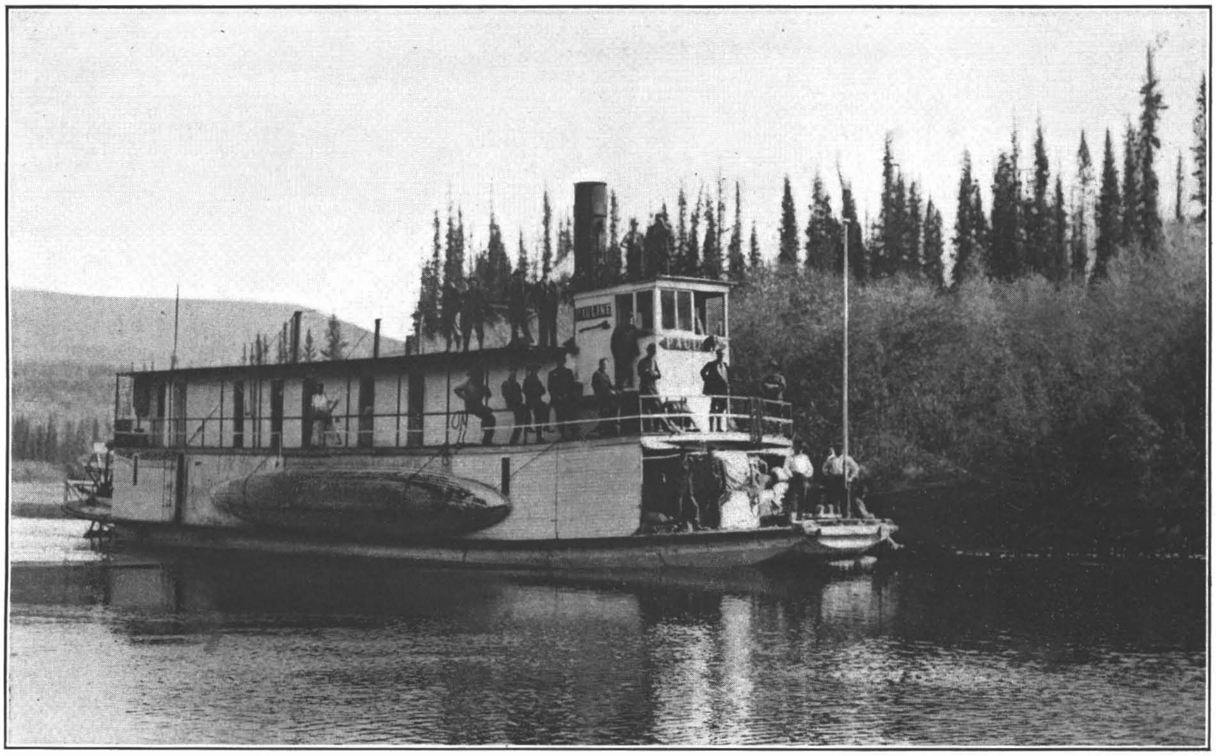
SEASON OF 1910.

PARTY ORGANIZATION.

——	For the United States.	For His Britannic Majesty.
Chiefs of Parties	Thos. Riggs, jr	J. D. Craig, D.L.S.
Assistants	A. C. Baldwin	Fred. Lambart, D.L.S.
	W. B. Reaburn	A. G. Stewart, D.L.S.
	A. I. Oliver	D. H. Nelles, D.L.S.
	W. B. Gilmore	Thos. P. Reilly.
	W. C. Guerin	
	F. S. Ryus	
	O. M. Leland	

Field Work.

At the close of the season of 1909, the survey of the boundary was practically complete from the Yukon to Mount Natazhat, with the exception of about fifty miles of vista to be cut between Ladue and Mirror Creeks, and the setting of the monuments on line between this latter point and the Sixtymile River. This work was done in 1910



The *Pauline*, White River, 1910.

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by a Canadian party, with a United States attaché, with a main base of supplies on Ladue Creek. The party left Whitehorse after the opening of navigation, on the *Pauline*, one of the smaller river steamers, and was able to get up the White as far as the mouth of Ladue River, where the men and outfit were transferred to two poling boats, which were towed up the creek by a gasolene launch as far as the boundary line. This part of the trip, a distance of about forty miles, was made in two days, a violent and timely rainstorm having raised the water so that the river was easily navigable. This party finished its field work early in September, and returned to Dawson, part via Snag Creek in small boats, and part over the Glacier trail, the horses as usual being driven overland to winter on the bars of the upper White River.

Launch with poling boats on Ladue River.

The main efforts of the season were confined to the prosecution of the work north of the Yukon, with the object of advancing it sufficiently to enable it to be attacked from the north in 1911 with Rampart House as a base of operations.

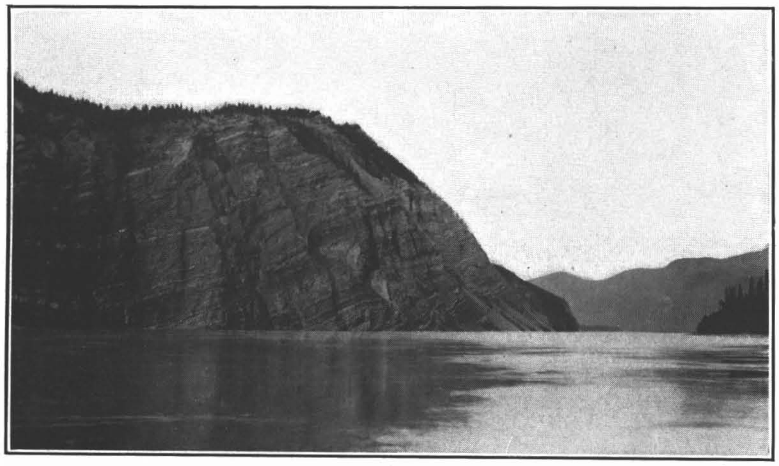
Accordingly, not only were the parties increased in size, but nearly three weeks were added to the length of the field-season by taking the men and horses in from Whitehorse over the Dawson stage trail as far as Carmacks, where they embarked for Dawson and the boundary on the steamer *Canadian*, which had wintered at Hootalinqua. Advantage was thus taken of the fact that the Lewes River opens for navigation in the spring some little time before the ice goes out of Lake Laberge, and it was thus possible to land the men at their first camp on May 24, while Lake Laberge was not passable until about June 10. The United States and Canadian Chiefs of Party, with two members of the Yukon Council, and the Superintendent of Mail Service of the White Pass and Yukon Route had the distinction of reaching Dawson on May 19 with mail, in the first small-boat of the season of 1910, after a rather hazardous trip down from Selkirk with the last of the ice, in a risky but successful attempt to keep ahead of the fleet of small-boats which always descend the river at this season each year, and among the navigators of which there is always considerable friendly rivalry as to who shall be the first to land at Dawson. This enabled all necessary arrangements to

Survey freight team crossing Takhini River on a brush bridge over the ice.

Takhini Roadhouse.

be made for the summer's work before the arrival of the parties on the steamer on the 23rd.

The mouth of Tatonduk River had been selected as base camp for the season, for although it is twenty-five miles downstream from the boundary, the river swings in to within eight miles of the line at that point. Stopping at the line-crossing merely long enough to land the topographers who were to work between the Yukon and the Tatonduk, the steamer landed the main parties at the mouth of this latter river on the evening of the 24th.



" Calico Bluff " on the Yukon River.

Fortunately the weather was fine, and in those northern latitudes at that time of year there is plenty of day light throughout the twenty-four hours, for here were fifty men, with fifty or sixty tons of camp outfit and supplies and seventy-five horses, landed on the river bank at a time of day when, in a more southerly clime, it would have been absolutely impossible to bring order out of the existing confusion before nightfall and darkness. However, in a remarkably short space of

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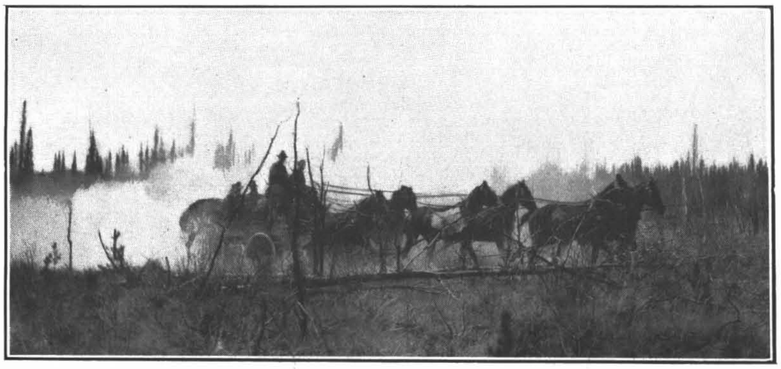


A dusty piece of trail.

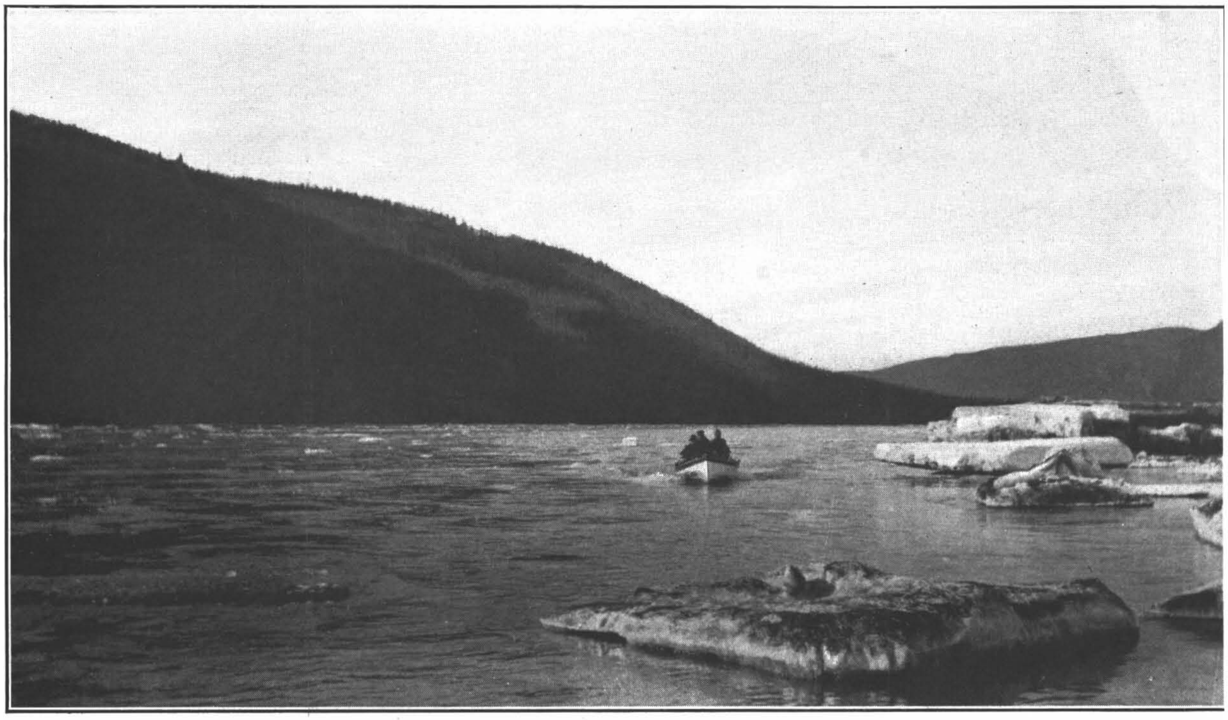
time, cook and mess tents were set up, and supplies piled neatly and covered with tarpaulins, but no sleeping tents were pitched until the following day, everyone spending that night in the open.

A day's reconnaissance discovered a trail to the beginning of the season's work, shorter than that leading up the Tatonduk, the new trail leading down the north bank of the Yukon for some five or six miles and then turning sharply inland up a draw and over a divide down to a branch of Nation River, and thence by various ridges and draws to a point on the boundary about forty miles north of the Yukon.

The same general division of the work as heretofore was adhered to this season, except that the line-projection was done by a Canadian party with a United States attaché.

The parties started inland after a couple of days spent shoeing horses and allotting them to the various parties, and in sorting and distributing the supplies.

This was the beginning of a friendly race between the projection fore-helio party and the triangulation reconnaissance party, first one and then the other forging ahead, until in August the latter outdistanced the former. However, after connecting with

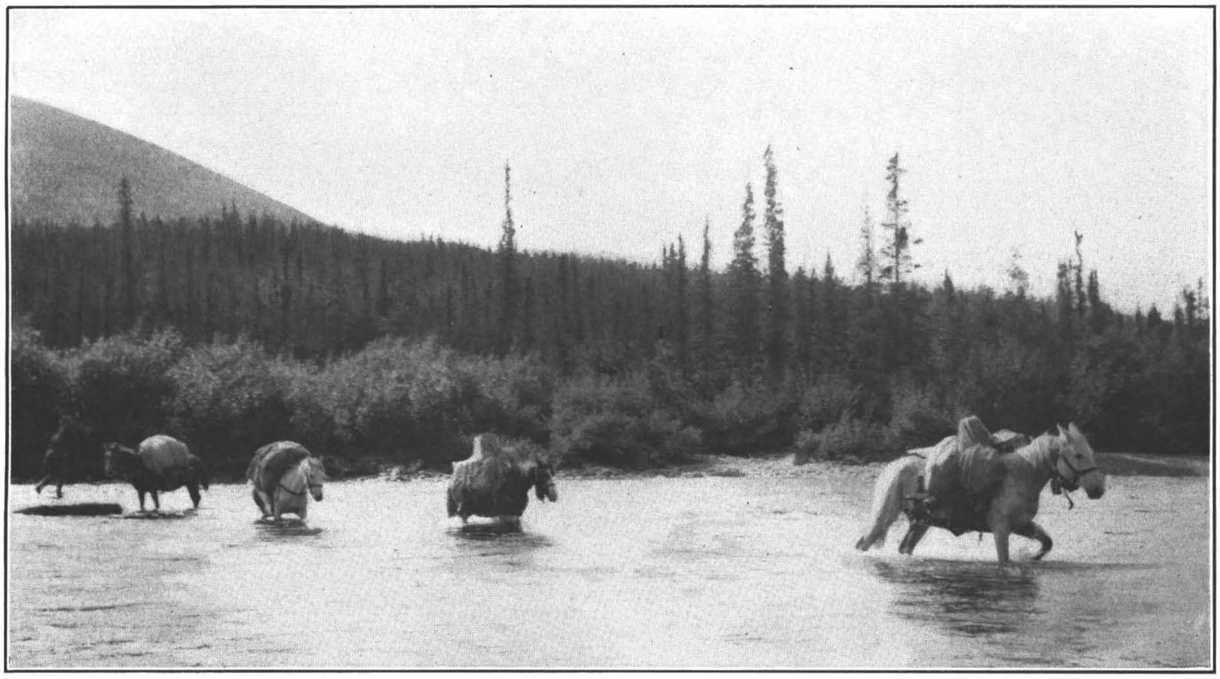


Ice in the Yukon River at Thistle.

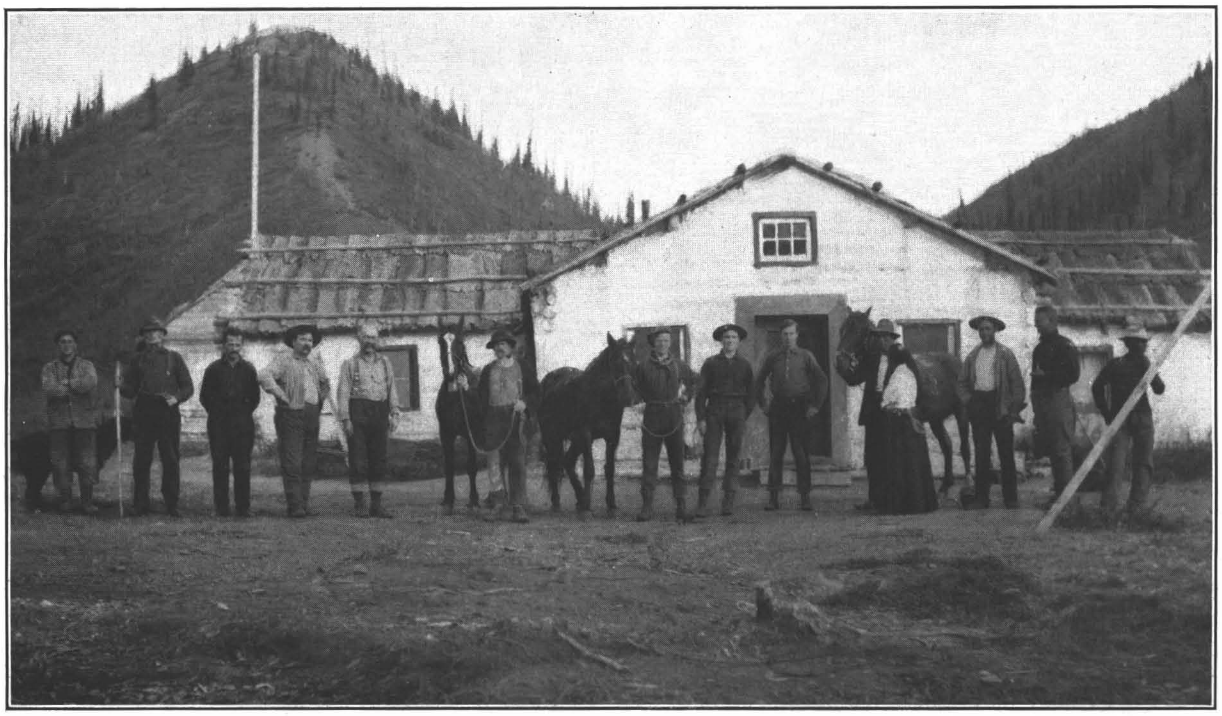
the triangulation of a small party which had gone in via the Porcupine, the reconnaissance party turned south, observing as they went, while their rivals were able to continue on, and by the close of the season had set a point on line about ten miles north of the Porcupine, thus putting this part of the work in good shape for an advantageous beginning the following season.

A "fly camp" on Kandik River.

The Porcupine triangulation party reached Rampart House by steamer about June 22, having left Whitehorse shortly after Lake Laberge was open for navigation. Their boat, which, in addition to supplies for their immediate needs, carried about fifty tons of staples and feed for use in 1911, was the first steamer to ascend the Porcupine this far, and so marked the beginning of a new era in the navigation of this river, for up to this time the Rampart House trader had laboriously brought all his supplies upstream in scows, "tracked" by Indians, while before him, the Hudson's Bay Company had taken their supplies in via Fort McPherson and over the divide to the Bell River and so down the Porcupine.

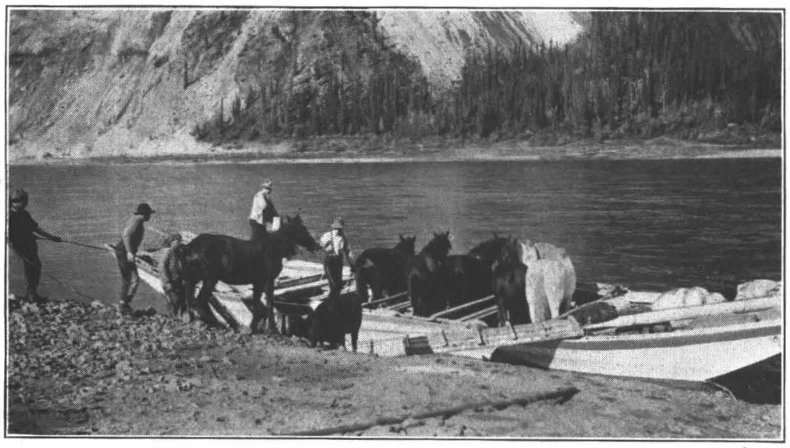


Pack-train fording the Black River.



The first horses to reach Rampart House. Turner's old survey building in the background.

This northern triangulation party selected and prepared for measurement a base on the plateau south of the river, and selected the stations for and observed on two quadrilaterals which, combined with the work of the other parties to the south, completed the triangulation from the Yukon to the Porcupine. This was accomplished by this small party of three, who, in addition, were forced to use up three weeks of their precious short season packing on their backs, from the beach to a storehouse loaned by the local trader, all the supplies and feed landed by the steamer, because the local Indians, who thought they had a corner on the market, demanded prohibitive rates for packing, and to have acceded to their demands would have created a precedent from which the survey would have suffered increasingly each season afterwards.



Loading the horses into the scow.

The topographic parties carried the topography from the Yukon across the main Black River, a distance of over one hundred miles, while the vista was opened from its terminus of 1909 to Orange Creek, a distance of sixty-one miles. This party also set thirteen monuments, the last being a few miles north of Kandik River.

Starvation Summit, on the divide north of the Yukon River.

The projection party, having finished their season's work at a point near Rampart House, were fortunately able to procure, from the local trader, a scow into which they loaded their six horses and made the trip down the Porcupine, a distance of two hundred and twenty-five miles, in a little over four days, high water in the river enabling them to make this good time. They were followed by the triangulation party in a canoe, and after a few days' wait at Fort Yukon, boarded the Northern Navigation Company's steamer *Susie*, bound up the Yukon. At Tatonduk River, five days later, they picked up the members of the other survey parties, who had been in camp there only a few days, the trip south from the vicinity of the Black River having occupied nearly three weeks. A species of hoof-rot had appeared among the horses early in the season, and despite every effort to prevent it spreading, had wrought great havoc during the summer, and had carried off nearly one-third of the stock, and had weakened many of the others.[1] This epidemic, combined with the effects of the wintry storms encountered on the divide north of the Yukon, and the killing of the feed by fall frosts, made the trip back to the river anything but pleasant, and many more horses died on the way. This sickness among the horses hampered operations greatly, and it was in a great measure due to the sacrifices made by the men in the interests of the work that such good progress was made during the season.

In 1910, the first check was obtained on the original assumed elevation of the Yukon at the boundary by the completion of a line of precise levels connecting station "G"

[1]The packers later discovered that carbolic acid in the crystal form was an effectual preventive of this rot. As soon as any signs were seen of a swelling at the back of the foot, they made a few cuts with a lancet, applied the acid crystals and bound it up as well as possible. A few applications usually effected a cure, if the swelling had been detected in its incipient stages.

The *Susie*, of the Northern Navigation Co., picking up the survey parties at Tatonduk River, September 1910.

of the boundary, afterwards Monument No. 126, with tidewater at Skagway, Alaska. This work had been commenced in 1908, when a Canadian party started a line of precise levels at Whitehorse, three seasons being necessary to carry the levels down the winter trail to Dawson and thence out the Glacier trail to Monument No. 126. From Whitehorse, another line connected at White Pass, British Columbia, with the work brought up from Skagway, Alaska, by the United States parties in 1910. The assumed datum at the Yukon was found to be in error only 38·4 feet, the correction being plus.

The annual joint report of the Commissioners, provided for in Article IV of the Convention of 1906 and covering this season's operations, reads as follows:—

FOURTH JOINT REPORT OF THE COMMISSIONERS FOR THE DEMARCATION OF THE MERIDIAN OF THE 141ST DEGREE OF WEST LONGITUDE.

The undersigned Commissioners, appointed in virtue of the First Article of the Convention between the United States and Great Britain, signed at Washington on the 21st of April, 1906, have the honor to present their fourth annual report upon the progress of the demarcation of the 141st Meridian where it forms the boundary line between the United States and Canada.

By reference to our third annual report, it will be seen that between Natazhat Ridge and the Yukon River, there remained 57 miles of vista cutting and 101 miles of monumenting to be done in order to complete the work between Mount Natazhat and the crossing of the boundary on the Yukon River.

During the past season this work was done, thus completing the boundary between Natazhat Ridge and the Yukon River. A second joint party traced the line from a point about 40 miles north of the Yukon River, the terminus of last year's work, to 10 miles north of the crossing on the Porcupine River, and the same stretch of country was covered by a belt of triangulation. The topography was taken up at the Yukon River and a belt was mapped for a distance of 144 miles northward from the initial point on the Yukon to latitude 67° 43′ N. The line cutting was begun at a point about 40 miles north of the Yukon and carried northward about 63 miles, and the monumenting was completed for a distance of 45 miles, reaching latitude 65° 55′ N. The line of precise levels connecting the tidal station at Skagway, by way of White Pass and Dawson, with a point a point on the 141st Meridian has been completed.

A recapitulation of the work done by the various parties in 1910, shows the following results:—

Line projection, 157 miles.
Length of triangulation net, 152 miles.
Length of topographic belt, 144 miles.
Distance monumented, 146 miles.
Number of monuments planted, 49.
Precise levels run, 130 miles.
Vista opened and stadia line, 118 miles.

W. F. KING,
His Britannic Majesty's Commissioner.

O. H. TITTMANN,
United States Commissioner.

December 28, 1910.

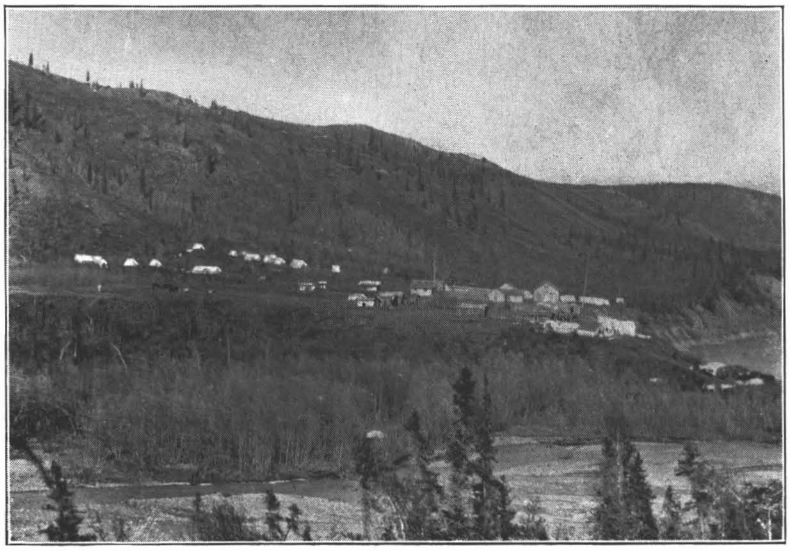
SEASON OF 1911.

PARTY ORGANIZATION.

———	For the United States.	For His Britannic Majesty.
Chiefs of Parties	Thos. Riggs, jr	J. D. Craig, D.L.S.
Assistants	W. B. Gilmore W. B. Reaburn A. C. Baldwin D. W. Eaton W. C. Guerin F. S. Ryus	D. H. Nelles, D.L.S. A. G. Stewart, D.L.S. Fred. Lambart, D.L.S. Thos. P. Reilly.

FIELD WORK.

With Rampart House as the base of operations, 1911 promised and proved to be one of the busiest seasons spent on the meridian, and great preparations were made in the spring to ensure success, for the length of time occupied in going in to and coming out from the northern portion of the work, when deducted from the all too short northern season between the spring " break-up " and the fall " freeze-up ," made it necessary that everything should go with a swing in the field, or valuable time would be lost.



Survey camp at Rampart House, 1911.

It was decided to send the men and horses, as in 1910, overland from Whitehorse to Carmacks, there to embark for Dawson. Supplies were purchased in Seattle and Vancouver, sufficient, it was hoped, for the seasons of 1911 and 1912, and a contract was entered into with the Northern Navigation Company to land these at Rampart House as early as possible in the season, taking them in via St. Michael and thence upstream by barge and steamer. It was calculated that by drawing on the supplies taken in to Rampart House in 1910, and

The Richness of the North. A shipment of 14,000 muskrat skins ready to be sent "outside."

by taking in a relatively small quantity over the ice of Lake Laberge and by steamer from the foot of the lake, the parties would be able to subsist until the main shipment should arrive.

To facilitate the handling of supplies from the base at Rampart House each Government had a launch built at Whitehorse, with which it was hoped to be able to distribute supplies to various sub-bases, particularly at the point where the line crosses the Old Crow River, about sixty-five miles north of Rampart House, and possibly up the Black River to or near the line for the monumenting and vista-cutting parties working south of the Porcupine. Each launch was about fifty feet over all, and was equipped with a 25-horsepower gasolene engine driving a stern-wheel, and with a power capstan for "tracking" or "lining" upstream. Each launch was capable of handling a barge carrying from eight to ten tons, and in addition to these two other launches were chartered for the season.

In spite of all these elaborate preparations, the season of 1911 was destined to be one of much trial and tribulation. Lake Laberge broke all precedents, and the ice failed just when it was most needed, leaving considerable freight stranded at the upper end. Another lot was caught halfway down the lake, and had to be cached there until the lake was clear, while the freight which did reach the foot had to be landed in such haste that it was in the utmost confusion. An examination disclosed the fact that considerable survey freight was in each of these lots, and that while both launches had been taken successfully to the foot of the lake, one of the barges had been pulled up on the beach near the head.

Str. *Vidette,* of the Side Streams Navigation Co., on the Porcupine River.

At Whitehorse, the Chiefs of Party, mindful of their experience "following the ice" the year before, and desirous of seeing if things were in as bad a tangle at the foot of the lake as reported, decided to go over the lake on the ice and thence to Dawson by launch. Once again they found that they had chosen the more exciting and hazardous, if shorter, route; also that the ice was

Shoeing a troublesome customer.

quite as bad as had been reported, and conditions at the foot of the lake worse even than they had imagined. In addition to the confusion incident on the enforced hasty handling of the freight, seven steamers and four launches were outfitting for the season, a couple of large scows were being repaired, and two or three hundred people were impatiently awaiting the time when they could be on their way down the river.

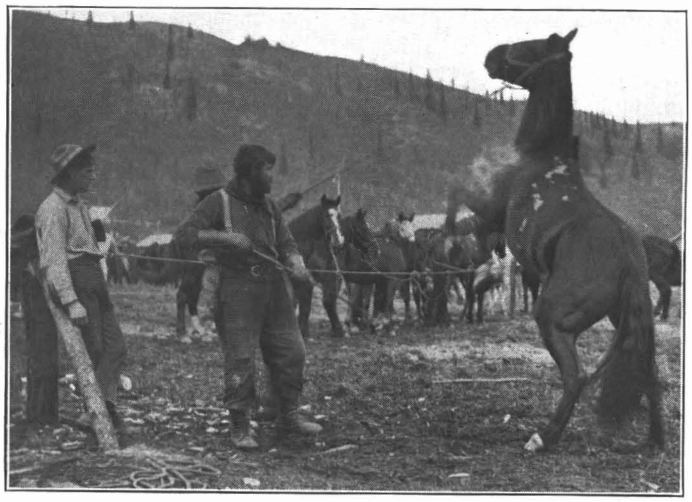
As much as possible of the survey outfit was sorted out of the six or seven hundred tons of miscellaneous freight here and loaded on the steamer *Lafrance* to be taken to Dawson. The boat grounded in the Thirty-mile River, and afterwards burned, but the survey freight was saved and followed later on a barge, and in due course reached Rampart House.

As the supplies, which had been intended to last until the main shipment should arrive via St. Michael, had been delayed at the lake, sufficient purchases were made in Dawson to replace them. Other small lots were purchased at Eagle, Circle, Tanana, and Fort Yukon.

The parties arrived in Dawson on the *Canadian* on May 26, and the next day the *St. Michael* sailed with the first consignment of the parties, considerable stock, and a quantity of supplies. A Canadian party was landed at the mouth of Kandik River, up which they proceeded in poling boats to the line, where they met their horses, these having been brought along the line from the mouth of Tatonduk River, where they had disembarked. This party continued the monumenting and vista-cutting north from where it had been dropped in 1910, and during the season opened the vista along the line and selected monument sites as far north as Salmontrout River. Very few monuments were set, however, owing to the failure of the launch to get far enough up the Black to deliver the cement and monuments to the party. The parties remaining on the *St. Michael* were transferred to the *Reliance* at Fort Yukon, and were landed at Rampart House on the evening of June 1.

The other parties, United States and Canadian, with the remaining stock and about fifty tons of freight and feed, left Dawson on the steamer *Vidette* on the morning of May 31, and arrived at Rampart House on June 6, the trip up the Porcupine being rather slow owing to the heavy load and the high stage of the river.

In 1910 the advance parties of the survey had arrived at Rampart House unannounced, at least as far



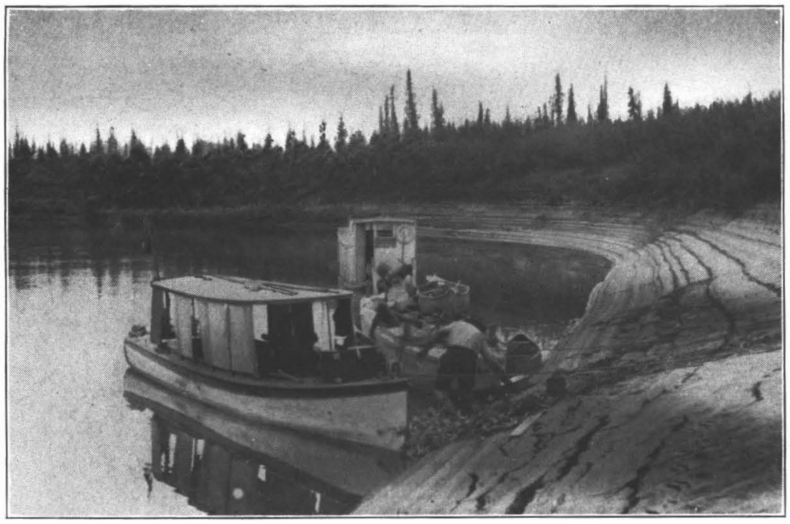
Branding.

The first pack-train starting north from Rampart House.

as the native population was concerned. During the winter of 1910-11, however, the news seemed to have been spread that the survey was coming in full force, and there was congregated at Rampart House a motley assemblage of natives and their dogs, and the parties received a cordial if unconventional welcome.

The usual two or three days of more or less orderly confusion ensued in getting the one hundred and fifty horses shod, outfits sorted and allotted, and supplies distributed to the various parties, numbering about eighty men in all, and what a wonderful time this was for the Indians! The horses commanded their greatest respect, and they would, at least at first, retire to their tents or cabins in great haste should a stray horse wander into the " village." They were puzzled to know the wherefore of the horse-shoes. " The moose and the caribou didn't need them." Having no word in their language for horse, they simply called them the " big dogs," and several of them were very desirous of becoming the owners of horses, for the fact that they could carry a load of two hundred and fifty pounds appealed to them, but their enthusiasm waned when they found they would not eat fish, which of course is the staple food of the country for man and beast. The " broncho busting " by the packers, and the breaking of the horses to the pack-saddles caused intense admiration and amazement, and the first Indian to trust himself on a horse's back was a local hero for some days.

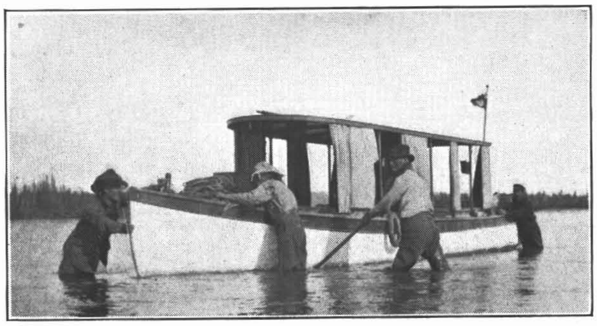
During the next week the various parties all got away for their work north and south of the river. The launches were also busy. The United States launches had been working on the Old Crow, and had succeeded in landing about twenty tons of



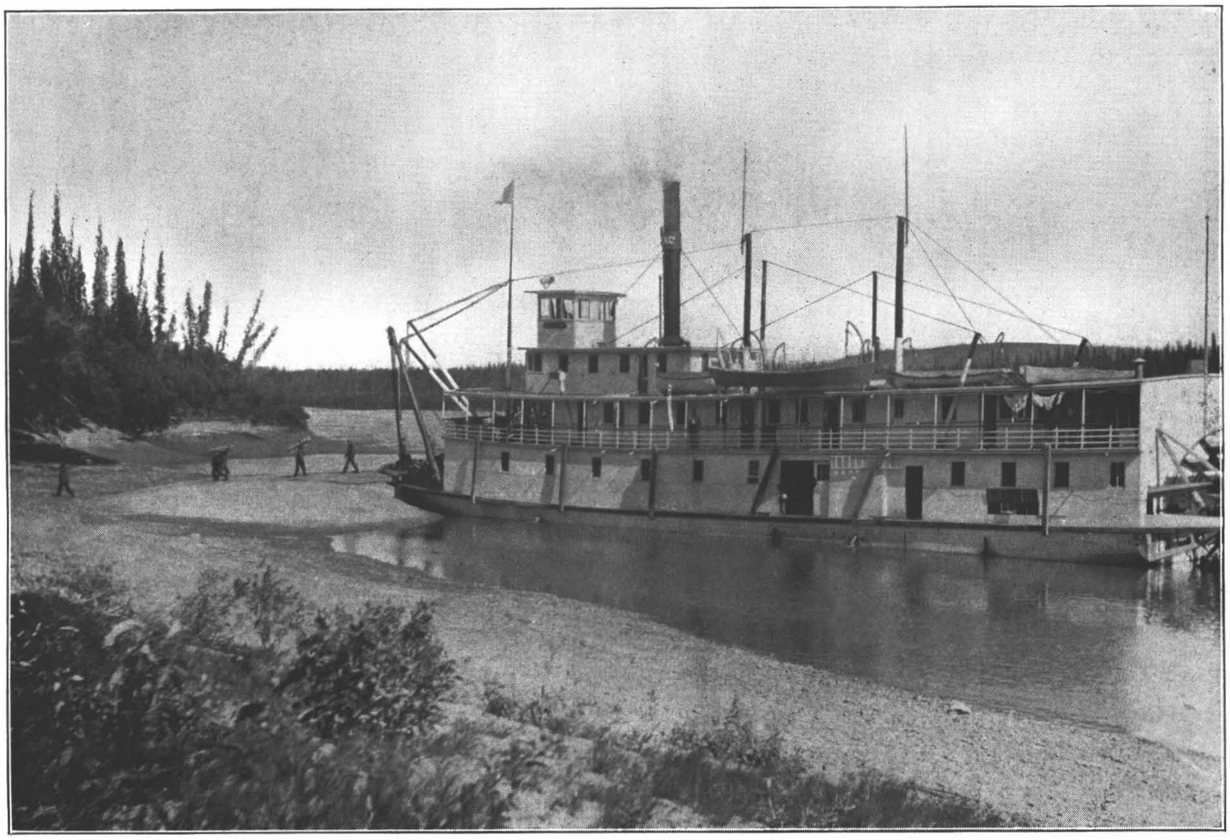
Numerous watermarks on the banks of the Old Crow River.

supplies at a point a few miles below the line-crossing. The Canadian launch, owing to the fast-falling water was able to get only two hundred miles up the Black, or about two-thirds of the distance to the line. She brought her freight to Rampart House, and as much of it as possible was sent south from there by pack-train. The smaller Canadian launch brought in mail early in June, and then was used by the Chiefs of Party in an attempt to get up the Old Crow to the line. But the spring high water had subsided, and there were no practical results from the trip, except a first-hand knowledge of the Old Crow Flats, with special emphasis on the fact that there the flies and mosquitoes were extraordinarily plentiful.

Meanwhile, although the work was progressing satisfactorily, no word had been received as to the movements of the freight coming in via St. Michael, and some anxiety was felt by the Chiefs of Party as to whether it would arrive in time, more especially as the river was falling rapidly. They therefore went to Fort Yukon on the small launch, where it was found that the steamer was expected daily, and the *Tanana* arrived on June 13, and after washing boilers, left for Rampart House with about eighty tons of freight aboard and towing a barge loaded with about two hundred and twenty-five tons. It was soon apparent that the low water was going to cause trouble, and the barge had to be dropped the second day out. By the greatest exertions, and only stopping to rest when the crew was completely exhausted, the steamer with her load was pulled, pushed, and warped upstream over the numerous shallow riffles to a point just below where Turner had been dropped in 1889, and it was found impossible to take her any farther at that stage of the water. The freight was accordingly landed, the steamer returning to the barge for another load in an attempt to relay the entire consignment up to where the first lot had been dropped. The launches meanwhile relayed between this point and Rampart House, and succeeded in getting up a considerable quantity. No monuments could be discovered in the cargo of the *Tanana*, and it appeared that they had missed connections at Vancouver, and accordingly the small launch was despatched to Circle, where by means of the wireless, it was learned that the monuments were on their way down from Whitehorse.



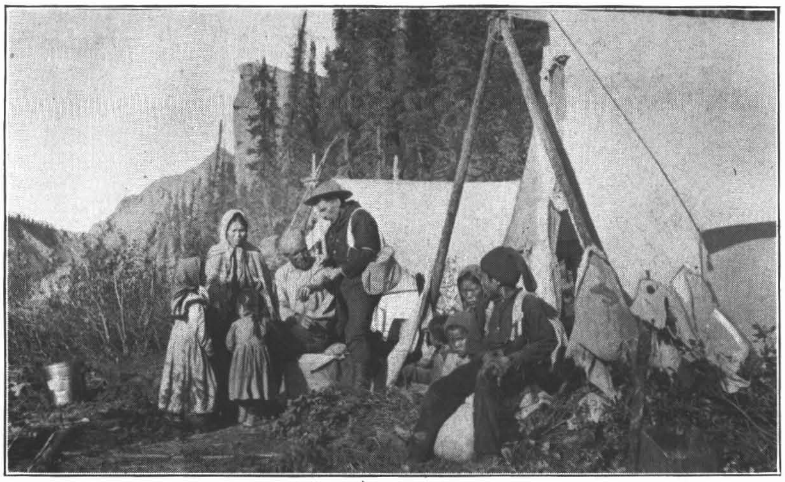
Shallow water on the Old Crow River.



The *Tanana*, of the Northern Navigation Co., "wooding-up" on the Porcupine River.

Meanwhile the *Tanana* had been making a good fight against heavy odds relaying freight, and taking advantage of a short rise of the water in the river, she had managed to get one load as far as Rampart House, but on her next trip up she struck a rock and sank, though fortunately in only a few feet of water, and after floating her, the captain returned to Circle and wired for a smaller boat to complete the work. The *Reliance* accordingly was sent up, and later on, profiting by another slight rise of the river, succeeded in getting the rest of the freight up to the post.

Circle, Alaska.

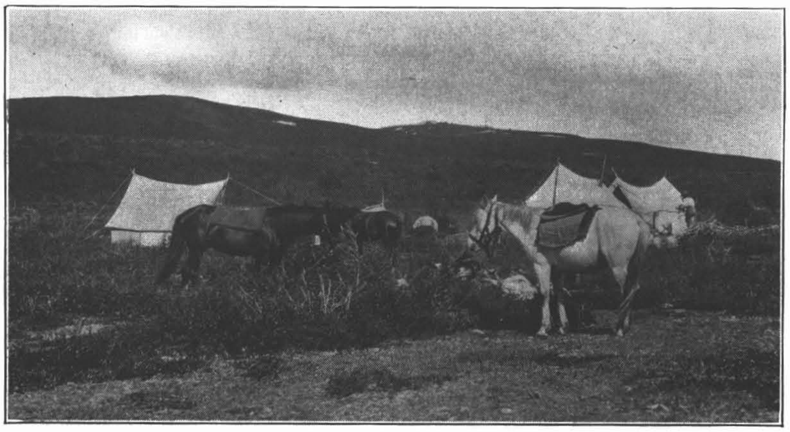


Vaccinating a half-breed family.

With the supplies almost at Rampart House, and the monuments well on the way, things again assumed a roseate hue, when suddenly trouble loomed up again. The physician attached to the United States party discovered an Indian girl at Rampart House suffering from what he diagnosed as smallpox. All there, both whites and natives, were at once placed under observation or in quarantine, everyone was vaccinated, and every precaution taken to confine the outbreak. The Yukon Government at Dawson responded promptly and liberally to a call for aid, and sent in a constable of the Royal Northwest Mounted Police to enforce quarantine, and a male nurse to assist the United States doctor, who was placed in charge of the outbreak, besides providing a plentiful supply of disinfectants and vaccine. The disease, however, was not stamped out until winter, the Government having meanwhile built a temporary hospital and sent in other nurses.

The necessity of keeping the survey parties away from Rampart House complicated matters somewhat and caused considerable inconvenience, but fortunately not one member of the survey contracted the disease. The parties re-assembled in the fall at Camp Tittmann, about sixty-five miles below Rampart House, and were taken to Fort Yukon on the steamer *Delta*, and transferred to the *Sarah*, bound for Dawson, reaching there on September 24. The horses, both United States and Canadian, were shipped to Coffee Creek, from which point they were driven to the upper White River to winter.

In spite of its many difficulties and inconveniences, and not a few hardships, the season of 1911 was very successful. In addition to the vista-cutting and monumenting south of the Porcupine, already noted, the topography which terminated in 1910 at a point about fifty miles south of the Porcupine, was carried north to Joe Creek, forty miles from the Arctic Ocean, the triangulation party finishing its work about five miles south of the creek. Two bases were measured, one being that laid out in 1910 south of the Porcupine, and the other in the valley of the Firth. The



Camp on Rapid River, north of Rampart House.

Survey pack-train crossing the " glacier " in Firth River Valley, July 1911.

line-projection party had succeeded in getting its work to within twenty-five miles of the Arctic Coast, and would probably have reached the coast itself, had the pack animals not strayed, two weeks of valuable time elapsing before they were again rounded up. North of the Porcupine the monumenting had been completed as far as the Old Crow River, and the vista-cutting and stadia measurement as far as Joe Creek.

The Geological Surveys of the United States and Canada, co-operating with the Boundary Survey, sent in small parties this season to make a geological reconnaissance of the country traversed by the line, their transportation and subsistence being furnished by the Boundary Survey parties. The Canadian[1] geologists worked south of the Porcupine and the United States geologists[2] to the north of that river.

Much thought and consideration had been given by the Chiefs of Party to the question of leaving a party at Rampart House, or somewhere north of there, during the winter of 1911–12. Advantage could be taken of considerable good working weather in the fall after the parties going out had left, and in the spring before they would be able to return, and it was thought that considerable supplies for the following season could be distributed north along the line by dog teams during the winter. On the other hand, the expense of such a party would be considerable, and it seemed advisable to avoid it if possible. At the close of the season of 1911, in view of the good

A typical Indian encampment.

[1]Cairnes: Memoir 67: " The Yukon-Alaska International Boundary." Ottawa: Geological Survey: Department of Mines: 1914.

[2]Maddren: " Geologic Investigations along the Canada-Alaska Boundary." U. S. Geological Survey: Bulletin 520 K: 1912. Advance chapter from Bulletin 520: "Mineral Resources of Alaska, 1911."

Ice going out of the Porcupine River at Rampart House, May 1912.

progress made during the season, and of the comparatively small amount of work remaining for 1912, the Canadian Chief of Party decided to take his whole party out, while the United States Chief decided to leave in a small party to distribute supplies, and, more particularly, to overhaul the launch at Rampart House, as he wished to have it available to take advantage of every possible day of the spring high water to forward supplies up the Old Crow. Accordingly a small United States party wintered at Rampart House, and as the supplies brought in on the *Tanana* contained a complete winter outfit for a party of considerable size, there was no difficulty in outfitting them properly. By a peculiar coincidence, the party wintered in the building erected and occupied by Turner and his party in 1889-90. The local trader, who had been living in it for some years, built a new home into which he was able to move just in time to permit the survey party to take up their winter quarters in the old building. It was necessary, however, to build a large warehouse in which to store, during the winter, the three hundred tons of feed and supplies.

The winter proved to be uneventful, and the weather was comparatively mild, the lowest temperature recorded being $-50°$ Fahrenheit. Early in April, supplies were taken out along the boundary trail as far as Surprise Creek, and as soon as the Porcupine opened up, the launch, which had been overhauled during the winter, was sent to the Old Crow with ten tons of supplies. The Old Crow, however, did not open until a few days later, and the launch was joined at the mouth of the river by the Canadian launch which had wintered at Dawson, and had been overhauled there. Together they worked their way upstream after the ice had broken up, and were successful in getting a considerable quantity of supplies up to the vicinity of the line, while later on the United States launch actually landed one load some miles above the line-crossing, a heavy rain giving a good stage of water for a short period.

The annual joint report of the Commissioners, provided for in Article IV of the Convention of 1906, and covering this season's operations, reads as follows:—

Fifth Joint Report of the Commissioners for the Demarcation of the Meridian of the 141st Degree of West Longitude.

The undersigned Commissioners, appointed by virtue of the First Article of the Convention between the United States and Great Britain, signed at Washington on the 21st of April, 1906, have the honor to present their Fifth Annual Report upon the progress of the demarcation of the 141st Meridian, where it forms the boundary line between the United States and Canada.

By reference to our Fourth Annual Report it will be seen that at the close of the survey season of 1910 the line-tracing had been completed from near Mt. Natazhat in latitude 61° 34′, northward, to latitude 67° 33′. During the season of 1911 the line-tracing was carried a distance of about 124 miles to latitude 69° 20′, at which point the Arctic Ocean was plainly visible but a few miles distant.

The triangulation was carried in 1911 from latitude 67° 29′ to latitude 68° 54′, a distance of 100 miles, and the topography from 66° 43′ to 69° 04′, 164 miles.

Vista-cutting and stadia measurements were carried on by two parties, one of which, working northward from the point reached last year between the Yukon and Porcupine rivers, completed 115 miles, and the other, working northward from the Porcupine River, completed 99 miles.

The final monumenting was completed on 25 miles of the line between the Yukon and Porcupine Rivers, and on 75 miles north of the Porcupine River.

The epidemic of smallpox at Rampart House, which developed from one case on July 23 to 71 cases on September 10th, delayed none of the parties in the field, as they had gotten well away from Rampart House before the disease appeared. Probably if it had not been for the smallpox, some topography would have been done in the fall in the vicinity of the Porcupine above and below Rampart House. Instead, however, of waiting there for the steamer, the parties were obliged to assemble at a point some 65 miles lower down the river.

It was not possible to use any Indians at Rampart House, as we intended, for handling the 300 tons of freight brought up the river during the summer by the Northern Navigation Company's boats, and by the survey launches. This freight was all handled by the half-dozen members of the surveys party who happened to be at Rampart, every man turning in, even to chiefs and cooks, assisted at times by the launch crews. This prevented the officers in charge of the field work from going out north along the line during the latter part of July, as they had hoped to do, to study the situation for next year. If it had not been for this delay at Rampart, it is probable that a much greater proportion of next year's supplies would have been sent at least part of the way up the Old Crow. As it is, about 30 tons only are any further than Rampart House. It is hoped however, to have the launches in early next season and to have supplies at the line before the men and horses can get across country from Rampart House.

Respectfully submitted,

O. H. TITTMANN,
United States Commissioner.

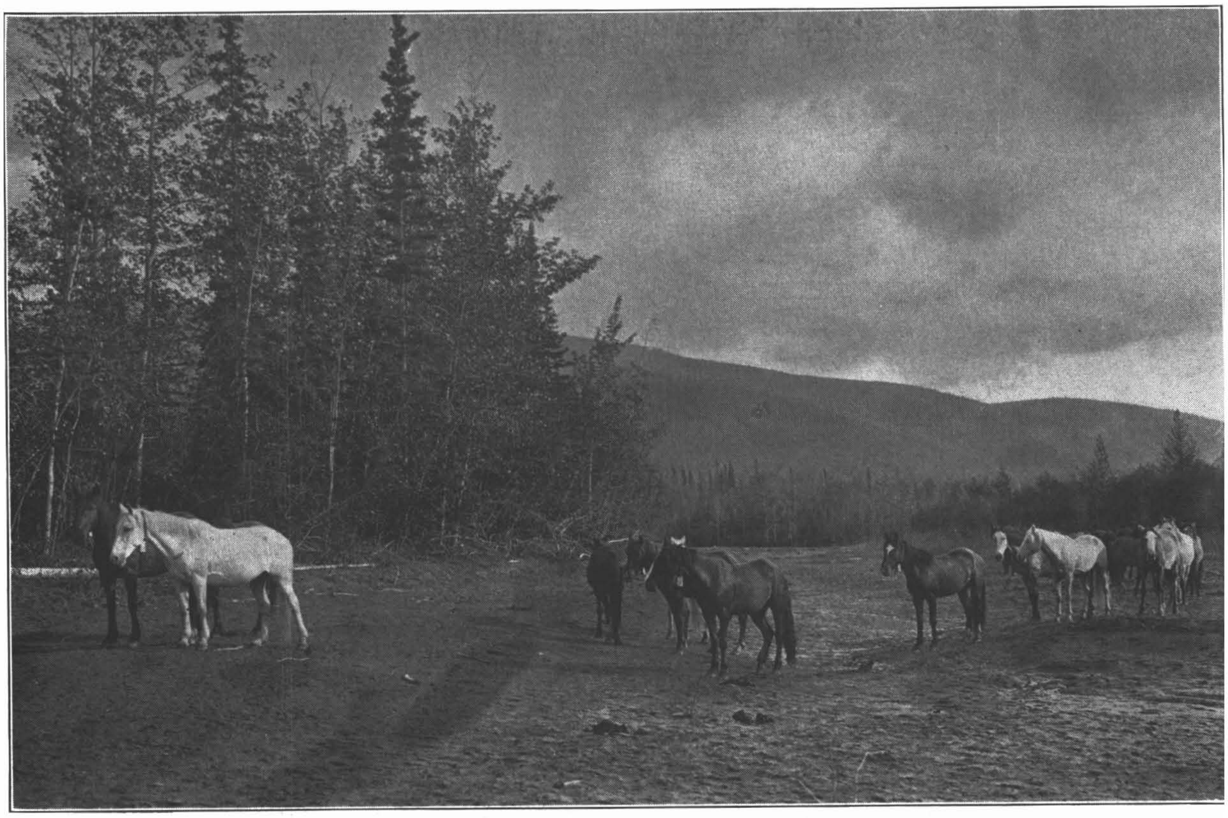
W. F. KING,
H. B. M. Commissioner.

Washington, December 29, 1911.

SEASON OF 1912.

PARTY ORGANIZATION.

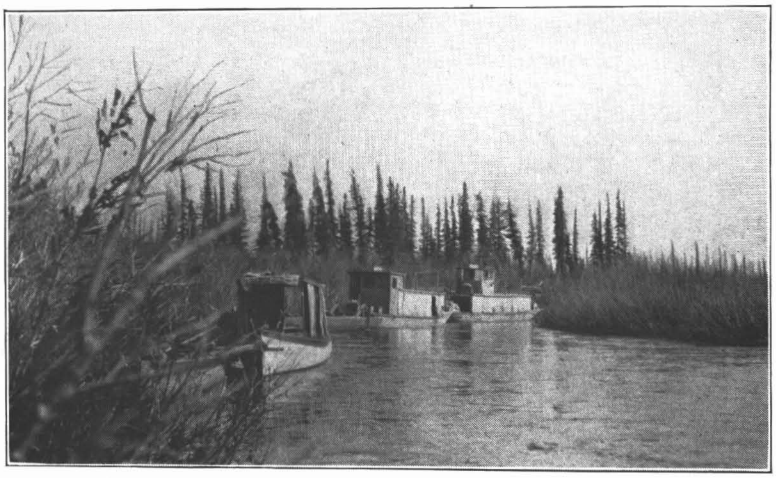
——	For the United States.	For His Britannic Majesty.
Chiefs of Parties	Thos. Riggs, jr. A. C. Baldwin	J. D. Craig, D.L.S.
Assistants	W. B. Reaburn W. B. Gilmore D. W. Eaton. W. C. Guerin F. S. Ryus C. V. Guerin	D. H. Nelles, D.L.S. Fred. Lambart, D.L.S. Thos. P. Reilly.



Survey horses after wintering on the bars of the upper White River

Field Work.

The season of 1912 opened with everyone determined to put forth every effort to complete the work through to the Arctic Ocean. It was also decided to make an attempt to connect Herschel Island with the boundary triangulation, the island being only some forty miles east of the meridian. Although under ordinary circumstances this would not have been a very great amount of work to accomplish in one season, the shortness of the season in this latitude and the distance of most of the work from the base of supplies and from steamboat navigation rendered large parties quite as much a necessity as ever, and eighty-four men and one hundred and fifty horses were employed.



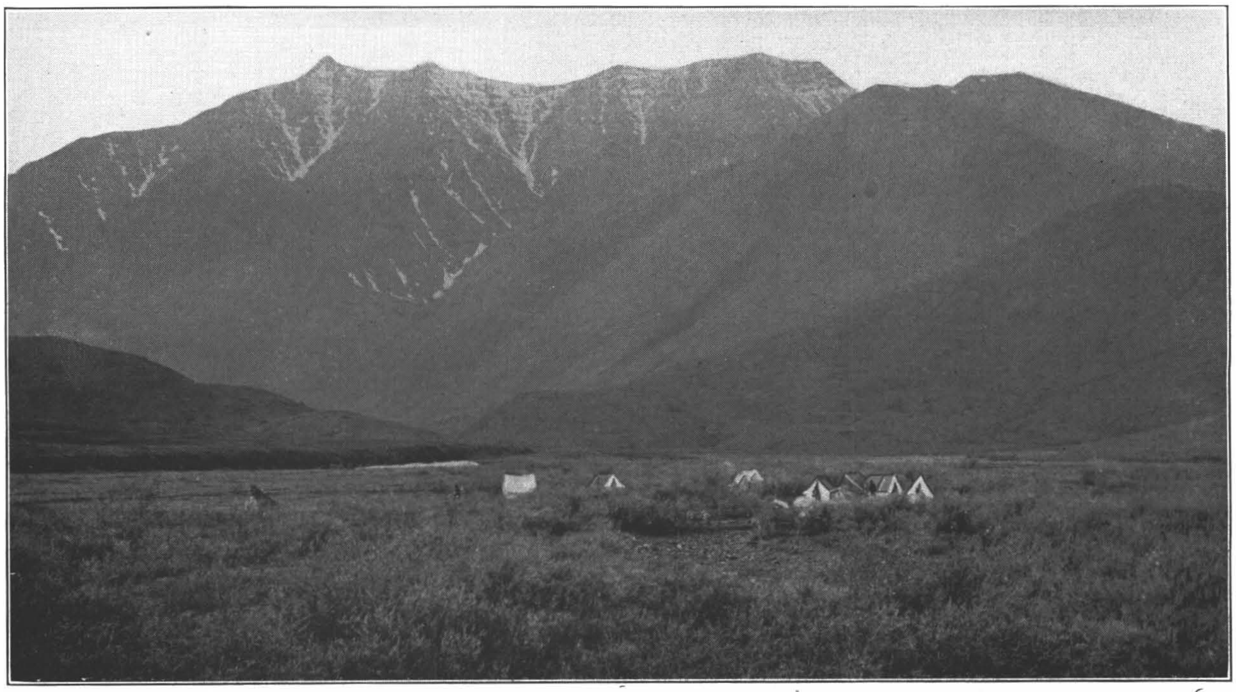
Fleet of Survey Launches on the Old Crow River, twenty miles below the Boundary.

The horses wintering on the White River had suffered severely from a scarcity of feed due to several unforeseen causes, and many of them had perished, and it became necessary to purchase others "outside" to replace them. These new horses were taken in to Dawson, as usual, down the trail from Whitehorse with the men, reaching Dawson on May 22. The horses remaining from last season were picked up at Coffee Creek, where the survey cache of blankets, saddles and eight tons of feed had been destroyed by a bush fire a few days previously.

A close examination of the inventories had shown that there were practically enough supplies in storage at Rampart House for the use of both parties, though the greater portion of these were United States property. Accordingly, very few new supplies were taken in with the parties, the Canadians agreeing to purchase what they needed from the United States parties at actual cost price, landed at Rampart House.

Yukon poling boat.

By going down with the mail by stage and launch, the Chiefs of Party were able, as usual, to reach Dawson ahead of the parties and to make all necessary arrangements in advance so that there would be practically no delay, and, leaving there on the steamers



Hospital Camp, twenty-five miles from the Arctic Ocean at an elevation of 2,500 feet. " Grizzly " triangulation station (6,566 feet) in left background.

St. Michael and *Susie*, of the Northern Navigation Company, the parties were transferred to the *Tanana* at Circle, and were landed at Rampart House in less than five days from Dawson.

This year there was no gathering of the natives to welcome the survey. Although it was practically certain that the germs of infection of the outbreak of the previous season had been carried in from Dawson in clothing sent to the Indians as a gift, the Indians themselves held the survey responsible, and gave it a wide berth in 1912.

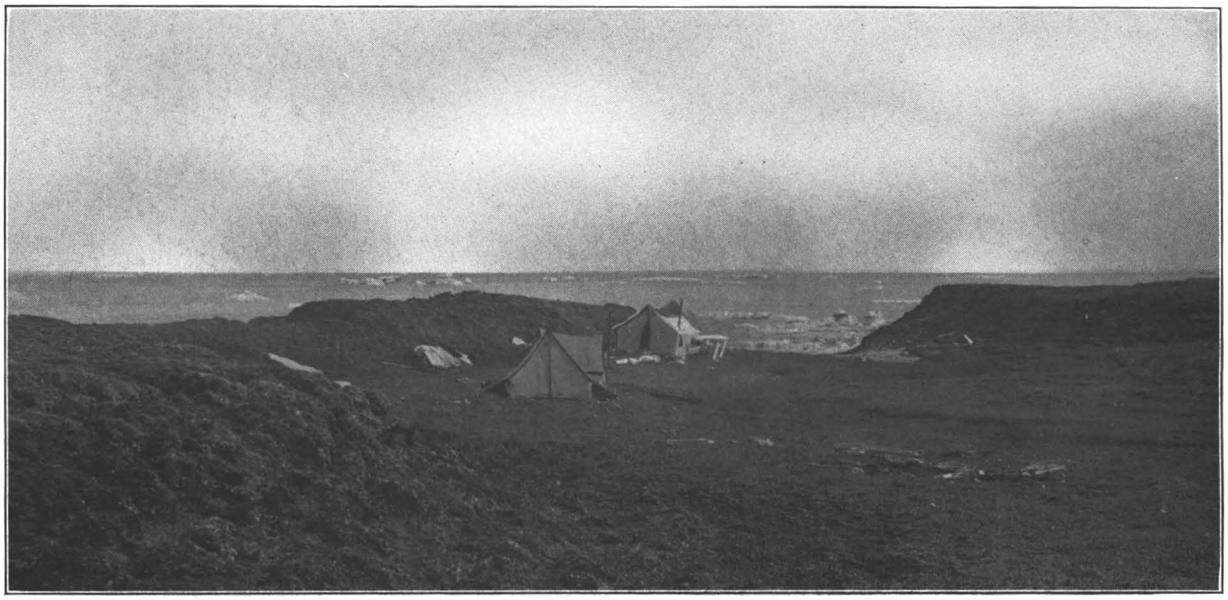
By June 5 all the parties had left for the scene of their season's work, to be followed shortly by the joint inspection and supervision party, under the Chiefs of Party, who started north on the 14th. This latter party spent a day at the Old Crow, seeing that the launches were being handled to the best advantage, and putting things in such shape that this point could be used as the main base of supplies for the season. From the point where the low water of the river forced the larger launches to cache their loads, the supplies were forwarded by two poling boats, one handled as usual by two men, and the other towed by the smaller Canadian launch until the further lowering of the water forced the latter to retire, when it was supplanted by man-power. In this manner a depot containing supplies sufficient for the season for all parties was established on the Old Crow a short distance west of the line.

After a few days' delay in the Firth valley to allow feed to be relayed ahead, a visit was made to the camp of the vista-cutting and stadia party at Joe Creek, and their plans for the season discussed. At the combined camp of the topographic and triangulation reconnaissance parties, well up towards the head of Malcolm River, and only about thirty miles from the Arctic Ocean, the chief of the latter party was found to be seriously ill of what appears to have been congestion of the lungs. Although there were few medical comforts at hand, he survived the ordeal of camp

Pack-train of survey dogs ready for the trip from Rampart House to Herschel Island.

medical methods, but spent the remainder of the season convalescing and in returning to Rampart House. His illness had put a stop to the reconnaissance work, and so had delayed the triangulation and consequently the topography. His work was taken over by the inspection party, and operations proceeded until all branches of the work had been completed through to the coast. The triangulation was extended eastward along the coast about twenty-five miles, but bad seeing conditions prevented the triangulation connection with Herschel Island, although two men who had been sent there from Rampart House occupied a heliograph station on the highest point of the island for over a month in the hope of being seen from some of the triangulation stations. The topography was brought up to the coast, and in addition an area was mapped extending along the coast to the east about six miles, and to the west fifteen miles. The inspection party having taken up projection work, set the last point on line, on the Arctic Coast, on July 18 to the accompaniment of appropriate ceremonies and the unfurling of the standards of the United States and Great Britain. The stadia work and monumenting reached the coast also, while vista-cutting ceased some thirty-five miles south of there, that portion of the country being devoid of timber, unless a few scattered patches of alder and willow could be so classified. Upon the advice of old timers at Rampart House, the various parties had been provided with oil-stoves and fuel for cooking purposes, as a shortage of wood was anticipated. It was found, however, that from the point where timber failed, by choosing camping places carefully, sufficient

At the Arctic Coast.



Camp of monumenting party at the Arctic Coast.

willows could always be found for cooking, and at the coast itself there was a plentiful supply of driftwood carried down presumably by the Mackenzie. This driftwood has been referred to by all the early explorers, and is so plentiful that it is used for a supplementary fuel supply by the steam whalers fishing along the coast and to the north.

The Arctic coast is paralleled by a strip of tundra which, in the vicinity of the line, is from twelve to fifteen miles wide, and travelling over this was found to be very trying to both man and beast. It sheltered myriads of mosquitos which arose in clouds whenever the wind dropped sufficiently to allow them out, and whether or not it was that the blood of white people and of southern horses was specially palatable to them, they certainly had most ravenous appetites. "Seeing" conditions at the coast were bad, and delayed projection and triangulation greatly. The air seemed to be in a state of continual disturbance, caused possibly by the contrast between the air-conditions over the tundra, heated almost continuously by the sun, and the adjoining expanse of ice and ice-cold water of the ocean. Haze was very persistent, and mirages were frequent, beautiful and at times awe-inspiring. On one occasion, when moving camp along

Triangulation station "Polar."

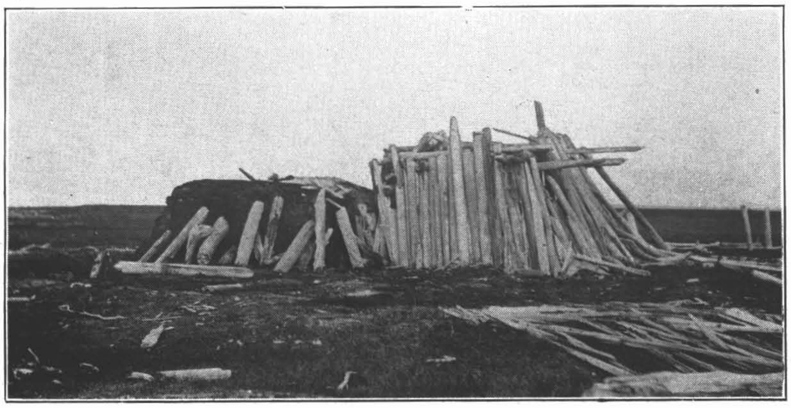
Looking west along the coast from the Boundary. Demarcation Point in the distance.

the coast, one of the pack-trains made a detour of several miles to avoid an imaginary lake. Needless to say, the packer in charge was not allowed to forget this for sometime. The sun at midnight when it approached the northern horizon assumed most fantastic shapes, but its rays, even at noon-day, seemed to be powerless to counteract the piercing effects of the prevailing east and northeast winds.

The fore-heliotrope party on their arrival at the coast on July 12 found the ice of the ocean practically solid, except for a narrow lane of water along the shore. By the 19th the ice was considerably broken up and was moving slowly to the westward under the influence of the prevailing winds, and by the 26th the ocean was practically open except for large ice-flows moving westward at some distance from the coast, or apparently stranded on a reef or in shallow water which seemed to stretch along the coast at a distance of a mile or so from the beach.

Franklin's Demarcation Point proved to be about seven or eight miles west of the line, and was a most interesting place. It had formerly been the winter rendezvous of the Eskimos of this district, but was abandoned for Herschel Island when the whalers adopted this latter point as their winter quarters. The ruins of their old huts or "barabaras" still remain on the point, and many curios were picked up in and around them. The point is not a prominent feature of the landscape as it is merely a long, low, narrow sand-spit, without a vestige of vegetation of any kind, and is only some seventy or eighty feet wide where it joins the low, monotonous coast line, and it does not project out to sea but simply forms a narrow barrier which extends nearly across the mouth of Demarcation Bay.

Only a few Eskimos were seen by the parties. One Eskimo with his family was camped on the beach at Clarence Bay, five miles east of the line, and with typical



An abandoned " barabara " at Demarcation Point.

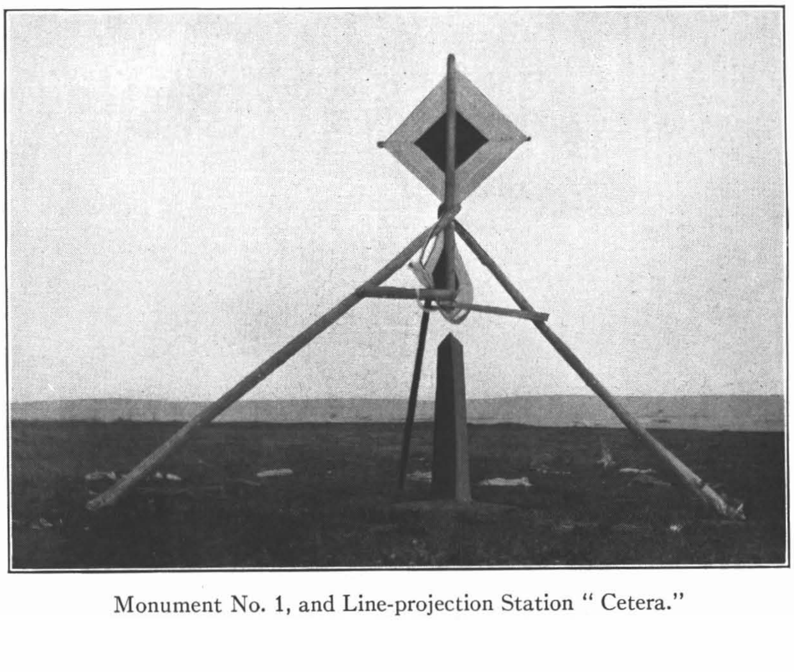
Eskimo hospitality, he invited the two members of the fore-heliotrope party to share his frugal repast of fish and tea when they visited his camp, and he took great pride in displaying the family treasures, such as a broken alarm clock, a modern trunk in good condition, and other marks of civilization which he appeared to value very highly. Most of the natives, it was later ascertained, were at Fort McPherson, where Bishop Stringer, of the Church Missionary Society, was making a visit in the course of one of his regular northern trips. Immediately after his departure, the Eskimos hastened over to see the survey, and if possible to do a little trading with the members, but they arrived too late, just as the last party was leaving for the south.

As it was a journey of nearly three weeks from the coast to Rampart House, where the parties were to meet the steamer on August 31, a start south had to be made early in the month to allow for unavoidable delays and to ensure being at Rampart House on time, and the last of the parties left the coast on the 6th of August.

On the journey south the joint inspection party resumed its own special duties and made an inspection of the monumenting and of the topographic work as far as the Porcupine, reaching there on August 16. Beginning with the large monument on the Arctic Coast, the monuments were numbered consecutively by the monumenting party as they returned south.

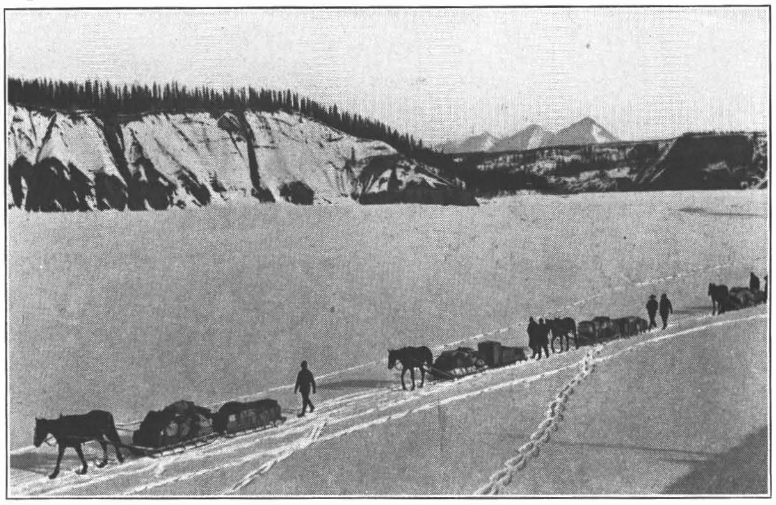
The steamer *Delta* reached Rampart House on August 30, and the parties said farewell to the spot which had been their base for three seasons, and after a good trip down the Porcupine reached Dawson in due course.

The Canadian party which had been working south of the Porcupine had been able to complete the monumenting and vista-cutting early in July, and had again started south from Rampart House, inspecting the work along the line, numbering the monuments and observing at points where weakness had developed in connecting



Monument No. 1, and Line-projection Station " Cetera."

the monuments with the triangulation. They reached the Yukon about September 10, and rafted to Eagle, where they boarded the steamer carrying the other members of the survey parties from Fort Yukon to Dawson.



Freighting up the Chitina River on the ice.

A party from the Canadian Geological Survey[1] this year completed the geology between the Yukon and the Porcupine. This party went in with the Boundary Survey to Rampart House and worked south to their 1911 work, which they passed through, resuming at the point where they had begun in 1911, and from there continued to the Yukon. Such supplies as they were unable to take with them from Rampart House were sent up Kandik River and Tatonduk River by poling boats. The United States geologists also continued their work north of the Porcupine and completed it through to the Arctic.[2]

In 1912 a beginning was made on another phase of the work on the 141st Meridian, viz., the location of the line across the glaciers and the vast ice- and snow-clad region between Mount Natazhat and Mount St. Elias. Owing to the great elevation of the Natazhat ridge at the point where it is crossed by the line, and to the rugged character of the country immediately south of there, as disclosed by the attempt to climb Natazhat in 1909, it was judged practically impossible to project the line directly south through this region by the methods which had been used up to this time. The only alternative was to go round, and the most practical way appeared to be to carry a scheme of triangulation from the western end of the White River system of 1909 across Skolai Pass, south and up the valley of the Chitina to the line. This work was undertaken by a United States party, and as practically nothing was known of the country at the head of the

A cache of horse feed.

[1]Cairnes: Memoir 67: "The Yukon-Alaska International Boundary." Ottawa: Geological Survey: Department of Mines: 1914.

[2]Maddren: "Geologic Investigations along the Canada-Alaska Boundary." U.S. Geological Survey, Bulletin 520 K. 1912. Advance chapter from Bulletin 520: "Mineral Resources of Alaska, 1911."

The sea of mountains south of Mount Natazhat. Looking east of south from triangulation station "Crag."

Chitina, except in a very general sense, the reconnaissance was largely of an exploratory nature.

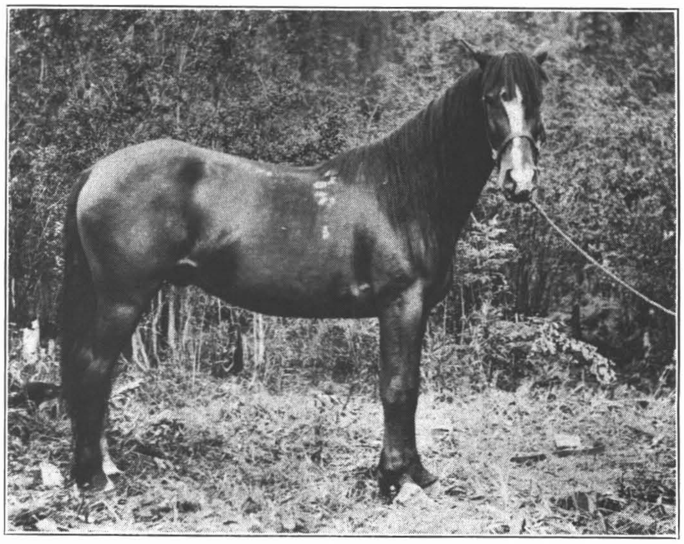
Bridging the Chitina River.

Going in from Cordova in March by the Copper River and Northwestern Railway to McCarthy, the party headed for Skolai Pass at the head of the White River, with their supplies on horse-drawn sleds. Bad weather, more especially on the higher mountains, hindered the work greatly, but four stations of 1909 were recovered and the triangulation was completed across the Pass and down Skolai Creek, and late in July a junction was effected with the work of another small party which had been working up the Chitina towards the line, in the vicinity of which, on the Chitina and Anderson Glaciers, considerable plane-table topography had been done. After meeting, the parties joined forces and measured a base in the Nizina valley and then retreated, reaching Cordova about the end of September. Near the Nizina River the boundary survey elevations based on the precise levels datum at Monument No. 126, were connected with two bench-

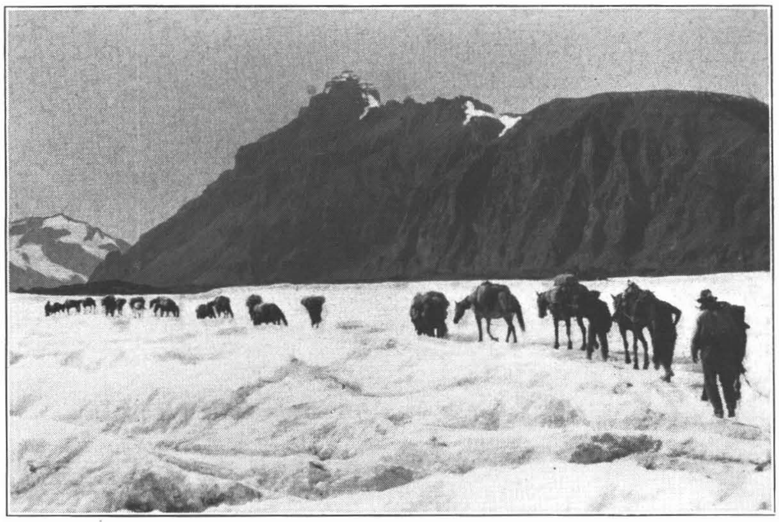
The divide (5,800 feet) between the heads of Skolai Creek and Chitistone River.

marks of the United States Geological Survey based on railway levels carried up from Cordova, the mean discrepancy being 1·6 meters.

A good season's work had been accomplished and everything was in good shape for 1913, when it was hoped to complete the projection of the line and the topography as far south as Mount St. Elias. Reading the modest account of the season's operations, one can hardly realize the hardships and difficulties met with and overcome by the parties. One section lived for some time on two sheep and some ptarmigan which they were able to shoot, and a six-year-old sack of flour which they fortunately discovered cached in a tree. One man fell over a bluff and, though unhurt, decided to leave the survey, as did another who fell into a crevasse and escaped uninjured. A horse that fell over a cliff was killed, and there were many close calls for the men climbing the steep bluffs of the snow-covered mountains. Then in the fall, snowslides having incapacitated the railway, the parties had to walk for sixty miles and descended the Copper River for eighty-five miles in overloaded small-boats.



" Cyclone," leader of the United States pack-trains for several years.



Over the white ice of the Russell Glacier. Elevation about 5,000 feet.

The annual joint report of the Commissioners provided for in Article IV of the Convention of 1906 and covering this season's operations, reads as follows:—

SIXTH JOINT REPORT OF THE COMMISSIONERS FOR THE DEMARCATION OF THE MERIDIAN OF THE 141ST DEGREE OF WEST LONGITUDE.

The undersigned Commissioners, appointed by virtue of the First Article of the Convention between the United States and Great Britain, signed at Washington on the 21st of April, 1906, have the honour to present their Sixth Annual Report upon the progress of the demarcation of the 141st Meridian, where it forms the boundary line between the United States and Canada.

By reference to our Fifth Annual Report, it will be seen at the close of the survey season of 1911, the line tracing had been completed from near Mt. Natazhat, in latitude 61° 34′, northward to latitude 69° 20′. During the season of 1912 the line was carried northward 22 miles to the shore of the Arctic Ocean in latitude 69° 39′.

The triangulation was carried in 1912 from latitude 68° 54′ to the Arctic Ocean, a distance of 51 miles, and extended eastward along the shore 25 miles, to determine the relation of the terminal monument to the general shoreline.

Topography was carried northward along the meridian by one double topographic party from latitude 69° 04′ to latitude 69° 39′, a distance of 40½ miles, and then expanded westward along the coast to longitude 141° 30′ and eastward to longitude 140° 48′. This topography takes in the natural features nearest the boundary—Icy Reef, Beaufort Bay, and Demarcation Point to the west, and Clarence Bay to the east.

Vista-cutting and stadia measurements were carried on from latitude 68° 50′ 40″ to the ocean coast, a distance of 58 miles.

Another vista-cutting and stadia party operated south of the Porcupine River a distance of 33 miles, connecting with the work completed in 1911.

The final monumenting, north of the Porcupine River, was completed to the ocean from latitude 68° 30′, where it terminated in 1911, over a distance of 80 miles, and, south of the Porcupine, over 78 miles.

In all, 56 monuments were placed this year.

The monuments were all inspected and numbered from the Arctic Coast to the Yukon River, the most northerly monument being No. 1. From the Arctic Ocean to the Yukon River there are 115 monuments in a distance of 344 miles, or an average of one monument to 3 miles.

The demarcation of the boundary line has therefore been completed north of the Yukon River. Between the Yukon River and Mt. Natazhat there remains only the inspection and numbering of the monuments which can be completed by a relatively small party during the coming season.

South of Mt. Natazhat the boundary extends to the vicinity of Mt. St. Elias, a distance of 84 miles, in a very difficult mountainous region. A triangulation party and a topographic party were sent in to make surveys preliminary to the defining of the line in this region. Triangulation was carried from trigonometric stations which had been established in Scolai Pass in 1909, down Scolai Creek, across country to the Chitina River, and up Chitina River to within about 30 miles of the boundary, a distance altogether of about 90 miles. Plane-table topography was carried across the boundary, from the mouth of Canyon Creek on the Chitina, up the valley of the latter, taking in the tops of ridges on either side, and photographs were taken from which a considerable additional area may be plotted.

Respectfully submitted,

W. F. KING,
H. B. M. Commissioner.

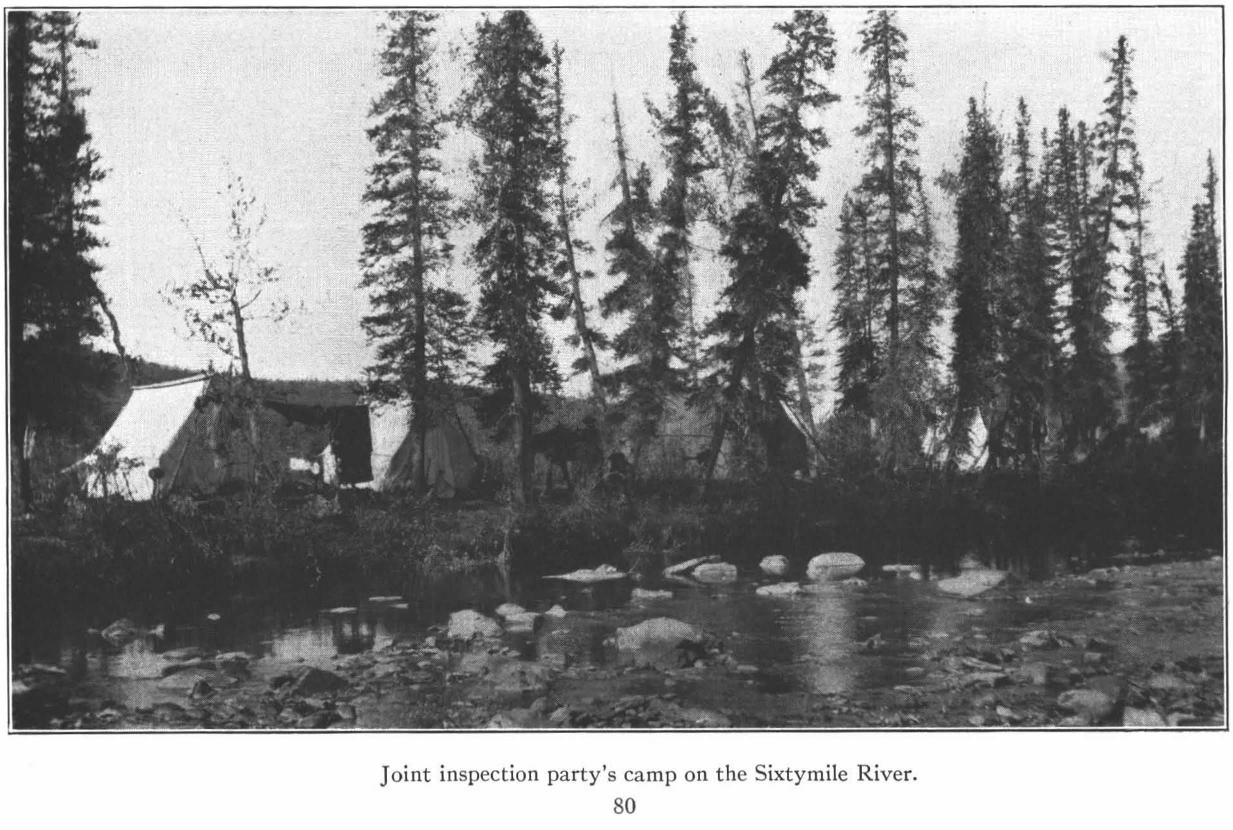
O. H. TITTMANN,
U. S. Commissioner.

WASHINGTON, December 12, 1912.

SEASON OF 1913.

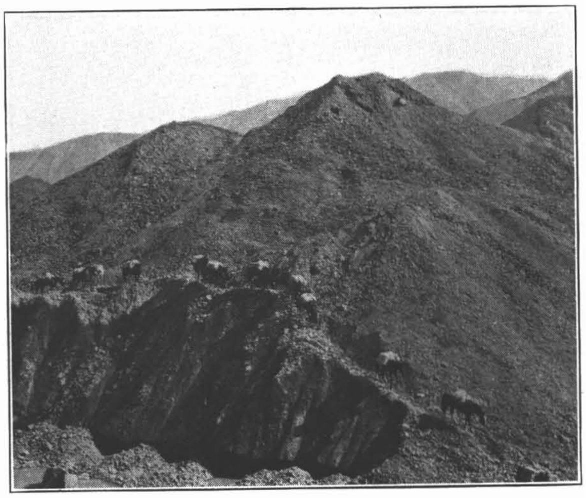
PARTY ORGANIZATION.

———	For the United States.	For His Britannic Majesty.
Chiefs of Parties	Thos. Riggs, jr. A. C. Baldwin	J. D. Craig, D.L.S.
Assistants	W. B. Reaburn D. W. Eaton C. V. Guerin	Fred. Lambart, D.L.S. T. C. Dennis, D.L.S. D. J. Fraser, D.L.S. E. W. Nesham, D.L.S. H. S. Mussell. Thos. P. Reilly.



Joint inspection party's camp on the Sixtymile River.

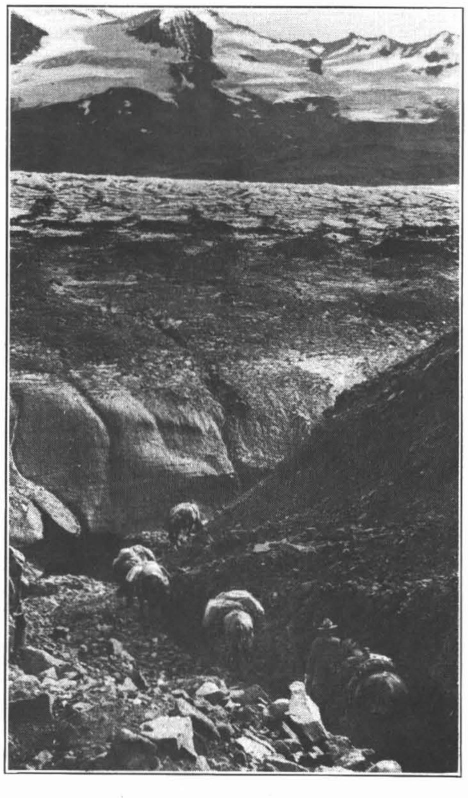
Field Work.


A ticklish spot.

In 1913 the finishing touches were given to the Yukon River—Mount Natazhat section of the line by a joint inspection party headed by the United States and Canadian Chiefs of Party. Sailing luxuriously downstream from Whitehorse to the Boundary on a comfortable steamer after the opening of navigation on Lake Laberge proved to be an agreeable contrast to the more or less strenuous trips of the preceding years, and camp was made at the Boundary on June 26.

Caches at Ladue Creek and at Canyon City had been established during the winter, so that in moving it was generally possible to take the complete camp outfit along at one loading of the horses, though the benefits of this were largely counterbalanced by the delay caused by the thick pall of smoke which hung over the whole country at the beginning of the season.

All the monuments in this section were numbered, eight new ones were interpolated at points where the line was considered insufficiently marked, these eight were connected with the triangulation, several weak points in the original triangulation were strengthened, and the last monument was set on a northerly spur of the Natazhat Range on August 21. In addition to this, a general inspection of the work was carried on with special reference to the alignment of the monuments and to the condition of their bases, these being the first monuments set, and the topography was also carefully examined. It was found that the whole work had been most carefully done, only one monument showing signs of the effects of frost.


At times the trail led between the glacier (Russell) and the valley wall.

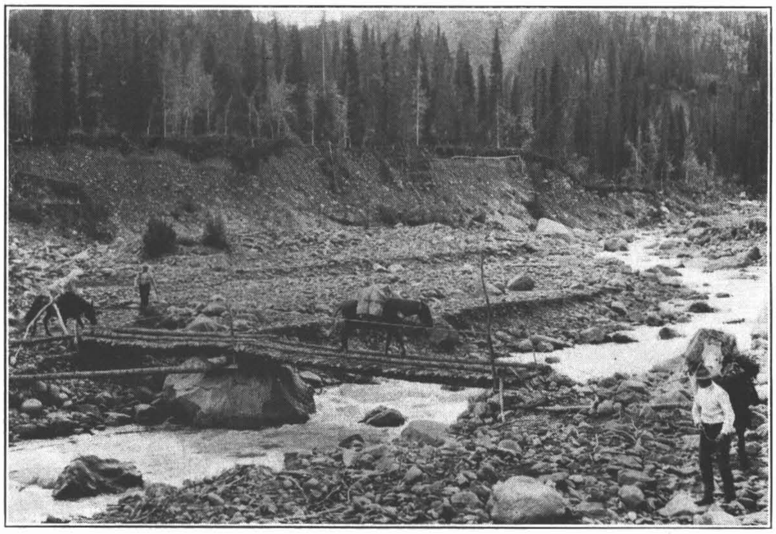
The large monument on the north bank of the White had unavoidably been set on frozen ground, which in thawing had tilted the monument to the north. This was straightened up and made permanent by the installation of a heavy crib foundation, and by tamping in a large amount of sand and gravel.

A gold strike in the Chisana District, Alaska, was a source of excitement and annoyance to the party during the latter part of the summer. News reached the party while encamped on the Ladue, that the strike had been made and that a typical "stampede" was in progress from all parts of the Yukon and Alaska. Dawson, like all

The " Goat Trail " in Chitistone Valley.

other points, had a bad attack of the fever, and everyone who could possibly get away was heading for the new " diggings." Many of the stampeders followed along the survey trail from Glacier, and there was consequently a constant stream of visitors in camp. As usual, about seventy-five per cent of the stampeders were very inadequately equipped for a trip of this description, and as they seemed to consider a Government survey party a sort of general supply depot, it became the duty of the survey to provide meals for them, to sell them what provisions could be spared, and even to provide clothing and shoes, in addition to furnishing minute directions as to how to get to the diggings. The strike also caused considerable unrest among the men of the party, but they all remained loyal and saw the survey finished before heading for the diggings.

This completed the inspection and numbering of the monuments from the Arctic Ocean to Mount Natazhat, and the party started for the outside via the upper White River and Skolai Pass. On the trail over the pass, more stampeders were encountered, this being one of the popular routes in from Cordova. The same lack of preparedness was evidenced here by the throngs on the trail. Ill-equipped, without any idea of outdoor life, and treating their poor animals outrageously, they found the mountainous trail trying and dangerous, and the quiet, steady advance of the survey pack-train, with its well-broken animals, was a source of wonder and admiration to them, for they were ignorant of the fact that most of the survey horses were " old timers " at that sort of work.



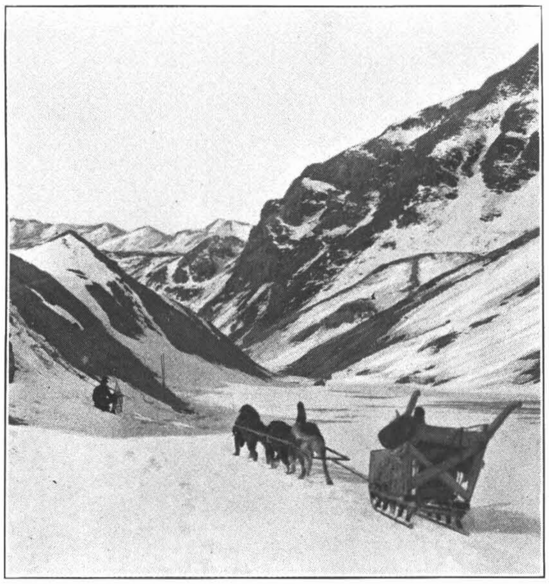
A bridge on the upper Klutlan River.

At McCarthy, on the Copper River and Northwestern Railway, most of the men, after being paid off, immediately succumbed to a severe attack of gold fever, and headed for Chisana, the rest going to Cordova by rail, and thence to Seattle.

A Canadian triangulation and photo-topographical party operated this season in the district immediately south of Mount Natazhat. They went in by the old route over the winter trail from Whitehorse via Lake Kluane, and made their base camp near the foot of Klutlan Glacier. They succeeded in extending the triangulation south of Mount Natazhat several miles, and the information secured by the camera completed the belt of topography from Mount Natazhat south to the head of the Anderson Glacier, up which the topography had been extended by the United States party in 1912.

ASCENT OF MOUNT NATAZHAT.

This Canadian party had the distinction of making one of the highest climbs attempted in connection with the boundary work, and succeeded in reaching the summit of Mount Natazhat. In making this attempt it had been hoped that in addition to securing valuable photographs it would be possible to make a connection with the Southeastern Alaska datum by observing on Mount St. Elias and possibly on other mountains of the same range, but although these were visible on the way up, the party was enveloped in clouds while on the summit, and there were no practical results from the climb.



Dog teams were used when the horses could go no farther.

Mr. Frederick Lambart, the chief of the party, writes: "At this camp (8,150 feet) on the 18th of June we thought the opportunity had at last arrived, and the early morning saw us well on our way. In slightly less than seven hours we arrived at the summit of the ridge where the instruments had been cached, and dug them out from under five feet of snow, and then went on to a prominent snow dome, three hundred and fifty feet higher up. For the last hour the clouds had been gathering,

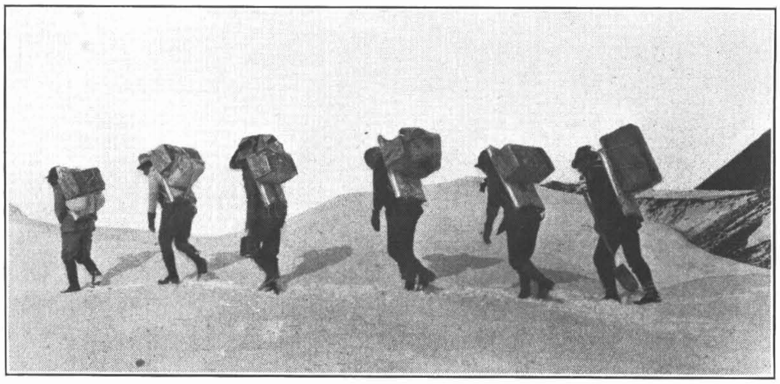
A desolate camp behind Mount Natazhat.

and we realized now that our chances were hopeless. Feeling convinced that we could not hope to spend more time and energy on the chances of getting a bright clear day in the near future, I reluctantly decided to make the best of things as they were, and leaving one of the men at this point, about eleven hundred feet below the summit, to take photographs, the rest of us succeeded in reaching the top, after nearly three hours' hard work through the deep snow. All the anticipated pleasure of reaching the summit had vanished, and our only thought was to finish and get down as quickly as possible. This we certainly did in short order, remaining at the summit only ten minutes, during which time we made six exposures with a hand camera and set a pole with a large flag. During the return journey, which took five hours, we were enveloped much of the time in clouds, and it was intensely cold, with a heavy wind from the northeast."

At the close of the season this party floated down the White and Yukon Rivers in small-boats to Dawson, and thence came outside by steamer to Whitehorse as usual.

Other Canadian and United States parties spent the season in the country between the Anderson Glacier and Mount St. Elias, the purpose of the operations being fourfold: to complete the topography as far as St. Elias, to locate points on line and to project the line across the valleys at the head of the Chitina, to locate Mount St. Elias by triangulation, and, if possible, to ascend this mountain and locate the southern end of the meridian boundary.

These parties left McCarthy in March, the supplies being freighted as far as the Chitina Glacier by horses and sleds, then by pack-horses as far as possible, then by dog-teams and, finally, when even these could not be used, by back-packing. Deep snow and temperatures as low as −40° Fahrenheit delayed the work of transportation greatly, and it was late in April before the parties reached the point where the season's work was to begin.

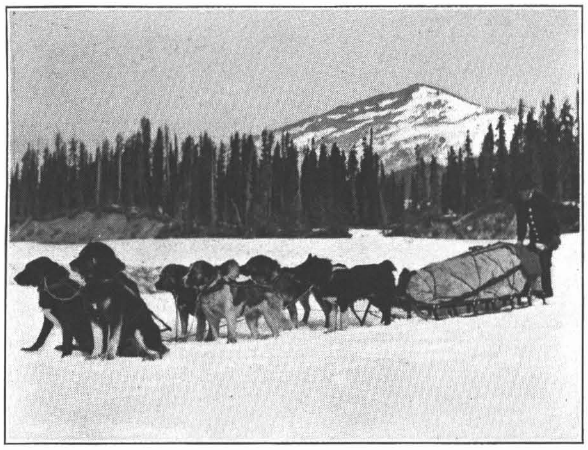


Taking in supplies meant plenty of hard work.

One United States party, with a Canadian attaché, laid out a scheme of triangulation and observed the angles as far as the Chitina Glacier, where a base was measured, and a computation and adjustment made of the work up to that point. An astronomical azimuth was also observed as a check for gross errors. The supplies being well in advance, and the work in general in good shape, about the first of June it was decided to make an attempt to climb St. Elias. After this trip, the particulars of which are given later, the triangulation was completed to the Boundary and a point was located on the meridian from which the proper azimuth was turned off and three monuments were set on line, the most southerly permanent mark on the meridian, Monument No. 191, being set on July 28 on the south side of the Logan Glacier, after which observations were secured connecting Mount St. Elias with the triangulation of the 141st Meridian.

On the summit of Mount Natazhat.

Meanwhile a United States party had completed the topography in the vicinity of the Anderson Glacier, using both the plane table and the photo-topographic camera; a Canadian party had carried a photo-topographic survey up the Logan Glacier nearly twenty-five miles above the Boundary, while the topography between the Logan Glacier and Mount St. Elias had been secured photo-topographically by a Canadian and a United States party.



A Chitina River dog team.

THE ASCENT OF MOUNT ST. ELIAS.

Mount St. Elias first became known to the civilized world when it was sighted by

Crossing the Chitina River. This sled is placed on another temporary sled to keep the load above water.

Vitus Bering in July 1741.[1] Following the example of many of the old navigators, he named the towering, snowclad peak after the patron saint of the day, thus beginning the history of a mountain which was not conquered by man until more than a century and a half had elapsed.

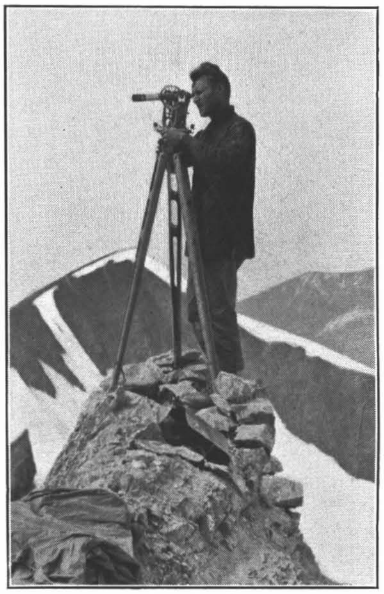
We find only brief mention of the mountain until 1874, when the United States Coast and Geodetic Survey sent W. H. Dall and Marcus Baker to make observations for its position and elevation, and to make a survey of the coast line in its vicinity, and it is in their records that we find the first mention of the vast glacier that lies between the sea coast and the foot of the mountain, and to which they gave the name of Malaspina.[2]

The year 1886 marked the beginning of a series of attempts to reach the summit of the mountain. The first of these was organized in that year by the *New York Times*, and the party, under Lieut. Schwatka of the United States Army, after landing at Icy Bay, travelled almost due north for about sixteen miles where they were forced to turn back at an elevation of about seven thousand feet.[3]

Two years later a similar attempt was made by an expedition under W. H. and Ed. Topham, of London. They followed the route of the *Times* party, but pressed round farther to the southwest flank of the mountain, and succeeded in reaching an altitude of 11,400 feet before they were compelled to retire.[4]

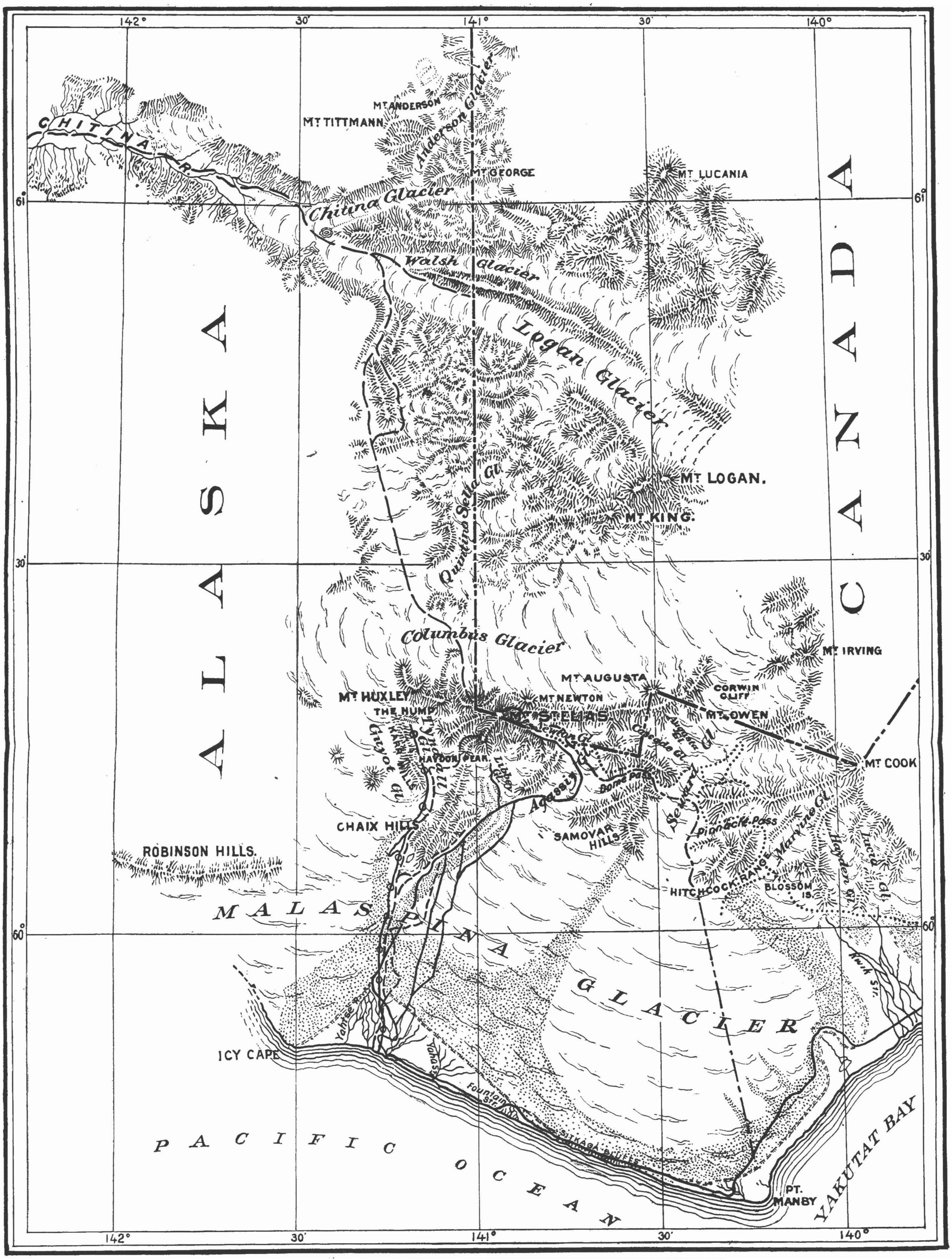
The scientific interest aroused by these two expeditions resulted in the despatch of a third in 1890 under the joint auspices of the National Geographic Society and the United States Geological Survey, under the direction of Prof. I. C. Russell. In 1890 he spent three months on the glaciers, and although he attained an altitude of only 8,000 feet, his report contains the best and most complete information of the glacial formation of the region, as well as other valuable scientific data.[5]

The following year, under the same auspices, and



Care was necessary in moving round the instrument.

[1]Bancroft's "History of Alaska," Chapters iv and v. "Tracks and Land-falls of Bering and Chirikof." Davidson. Geographic Society of the Pacific. San Francisco, 1901.
[2]"Report of the Superintendent of the United States Coast Survey for the year 1875." Washington 1878, Appendix No. 10.
[3]Schwatka: "The Expedition of the *New York Times*." Century Magazine, April, 1891.
[4]Scribner's Magazine. New York, April 1889. Alpine Journal: London, August, 1889.
[5]National Geographic Magazine, May 29, 1891.



SKETCH MAP OF THE MOUNT ST. ELIAS REGION

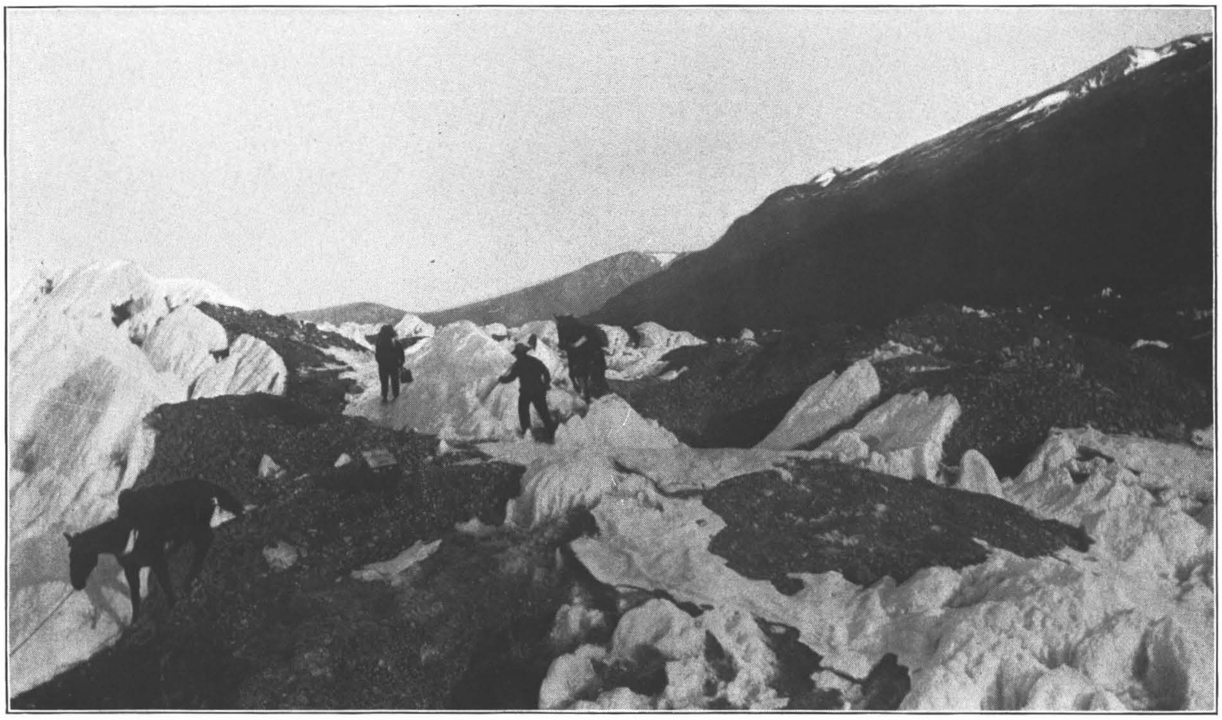
Showing routes travelled by expeditions to Mount St. Elias; that in command of le Duc d'Abruzzi being the only one to reach the summit.

SCHWATKA	1886	RUSSELL	1891
TOPHAM	1888	ABRUZZI	1897
RUSSELL	1890	BOUNDARY SURVEY	1913

INTERNATIONAL BOUNDARY

Scale of Miles

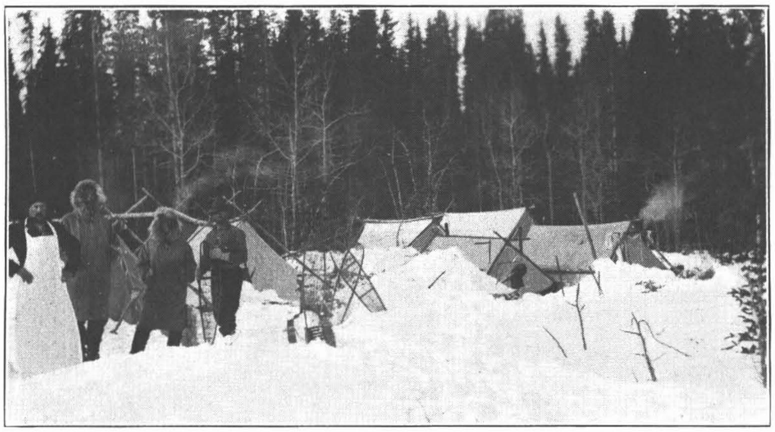
0 5 10 15 Miles



A rough spot for horses.

profiting by the experience gained on the glaciers, he met with better success, and though unable to reach the summit, he attained an elevation of 14,500 feet at a point on the northeast shoulder, from which he was able to overlook the hitherto unknown region to the north, embracing the district which was later to be the scene of operations of the boundary survey.[1]

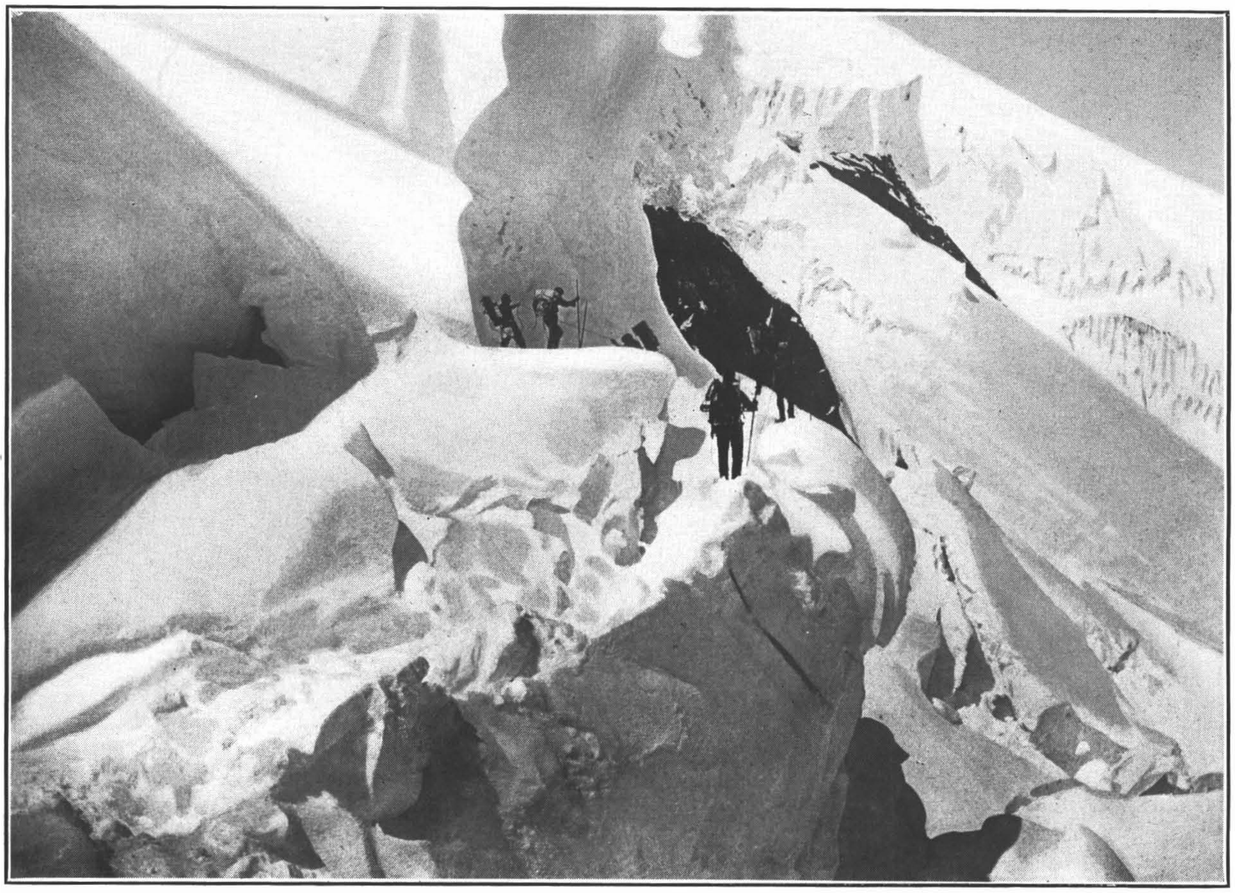
In 1892, Mount St. Elias was again a center of attraction, though for a different reason. The observations by W. H. Dall in 1874 placed the mountain in United States territory, slightly west of the 141st Meridian, When the question of the boundary between Canada and Alaska was under discussion in the early nineties, it became desirable to confirm this position by a more accurate location of the peak, and in 1892 a party of the United States Coast and Geodetic Survey, working under J. E. McGrath[2] in connection with



Camping in deep snow in March, 1913.

[1]" Thirteenth Annual Report of the United States Geological Survey," Part ii. Washington 1893.

[2]" Report of the Superintendent of the U. S. Coast and Geodetic Survey for the year ending June 1893." Washington: Government Printing Office, 1894.



" The entire day was spent crossing crevasses."

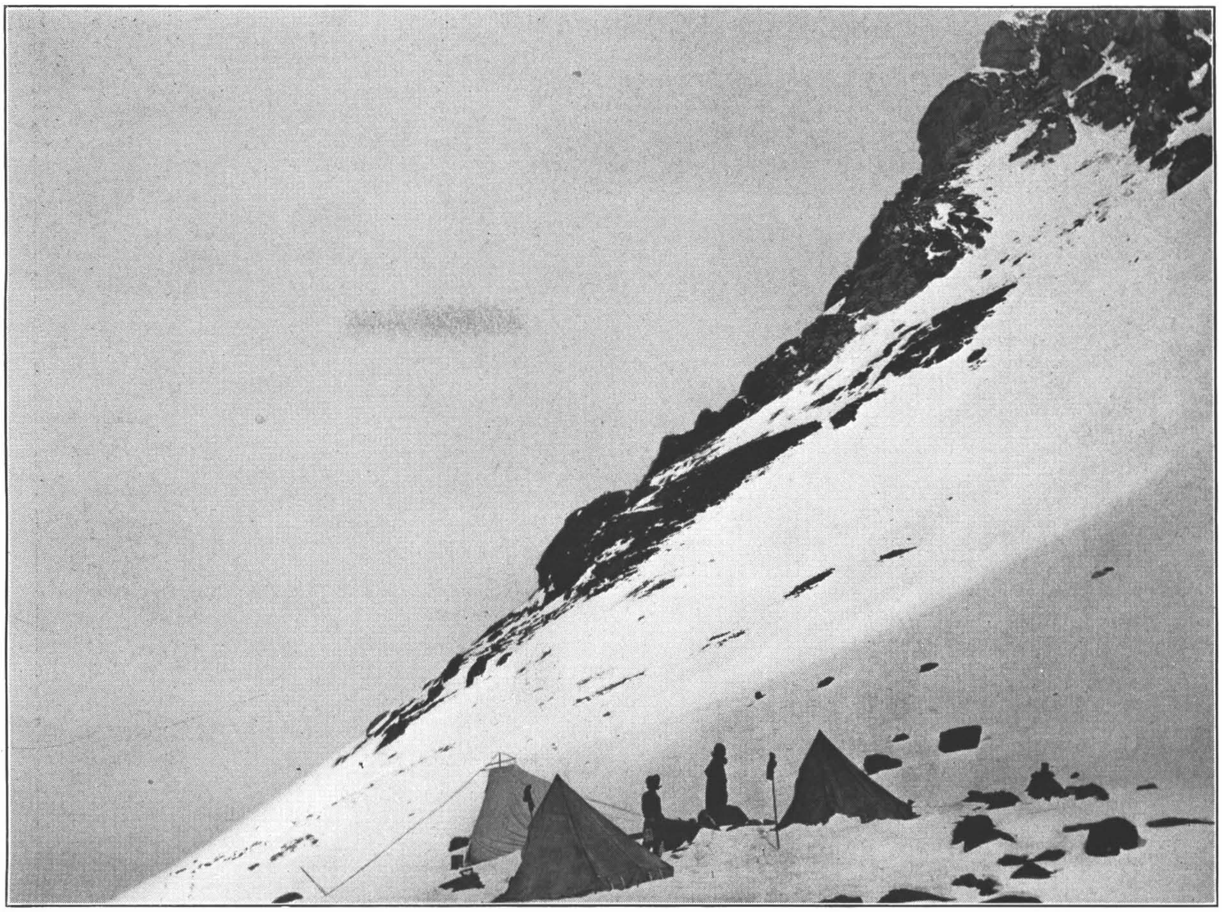
the boundary survey, made an extensive trigonometric survey in the vicinity of Yakutat Bay. This survey placed the summit of the mountain in latitude 60° 17′ 35″.10 and longitude 140° 45′ 47″.32, and it thus became one of the boundary peaks for Southeastern Alaska, as it was east of the 141st Meridian. At the same time the elevation was determined to be 18,024 feet.

The first determination of the elevation had been made in 1791 by Malaspina in the service of Spain, his observations giving 17,851[1] feet as the altitude of the summit, this figure being more nearly correct than any subsequent one until McGrath's determination of 1892.[2]

In 1897 the *New York Times* sent out their second expedition, under Mr. H. S. Bryant, to attempt to reach the summit. Attacking it from the south they were again unable to get above 8,000 feet.[3]

In 1896, the Duc d'Abruzzi decided to add to his laurels by making an attempt at the ascent of Nanga Parbat, a giant of the Himalayas, towering 26,000 feet above the sea. Leaving for India late in the year, he was forced to abandon this attempt by a famine and severe plague which was rampant in one of the provinces through

[1]Professional Paper, United States Geological Survey, No. 45, page 124.
[2]Baldwin's determination of the elevation in 1913 gave 18,008 feet.
[3]" Journal of the American Geographical Society." vol. 29, 1897, pages 203 and 353.

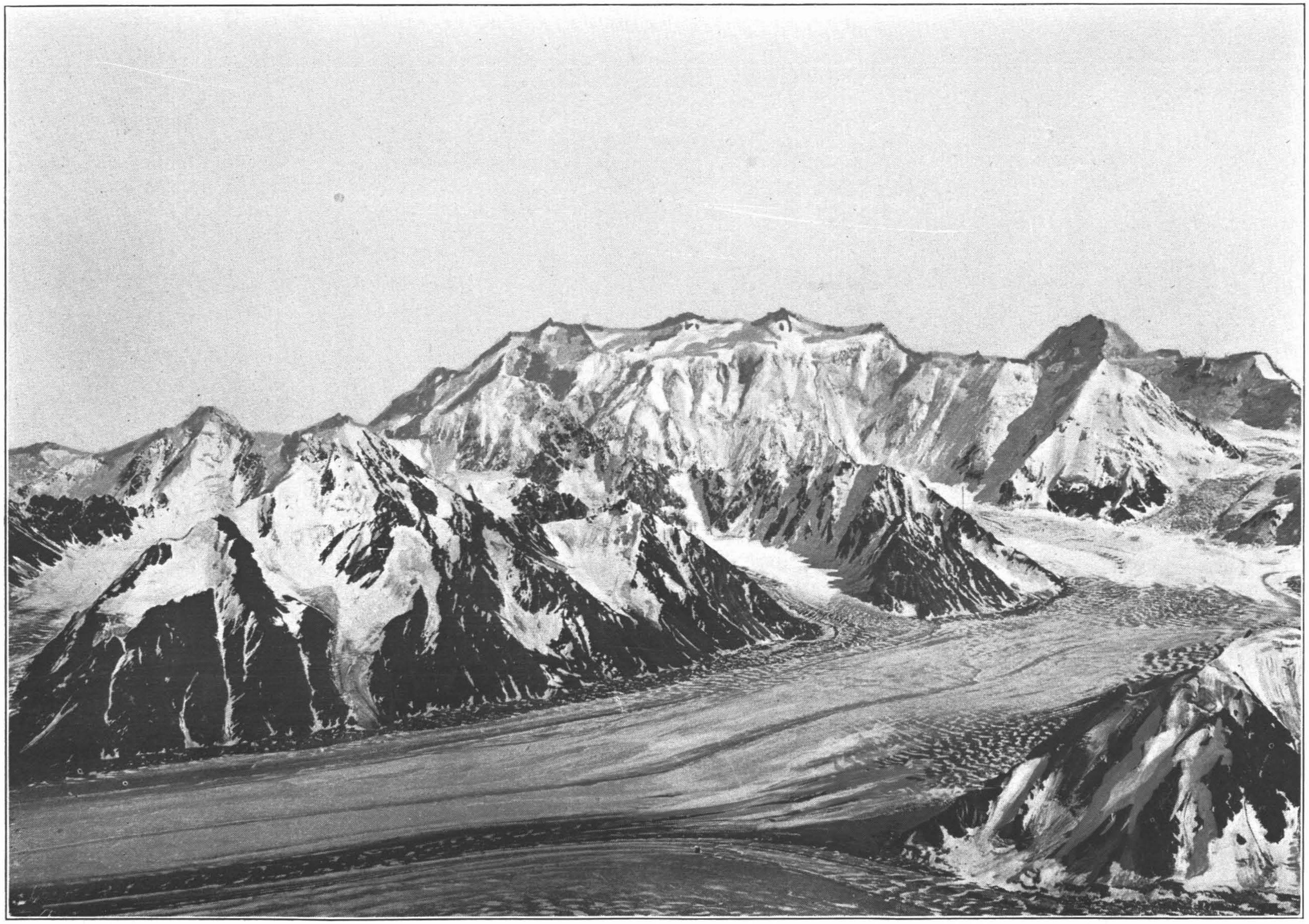


"An elevation of thirteen thousand five hundred feet."

which his caravan would have had to pass en route to the mountain. He was not to be denied a climb, however, and Mount St. Elias became his goal. With four picked Italian guides and four other companions he left Turin in April, 1897, and proceeded to Alaska by way of London, New York, and Seattle. He landed in Alaska on June 23 near the mouth of the Osar River, and after thirty-eight days of exertion and hardships on the glaciers, the gallant little band of Italians, led by the Duke himself, was rewarded by planting the tricolor of Italy on the summit of Mount St. Elias. The successful culmination of this attempt was largely due to the well-known organizing capabilities of the leader, coupled with his indomitable perseverance and the spirit of enthusiasm with which he inspired his followers.[3]

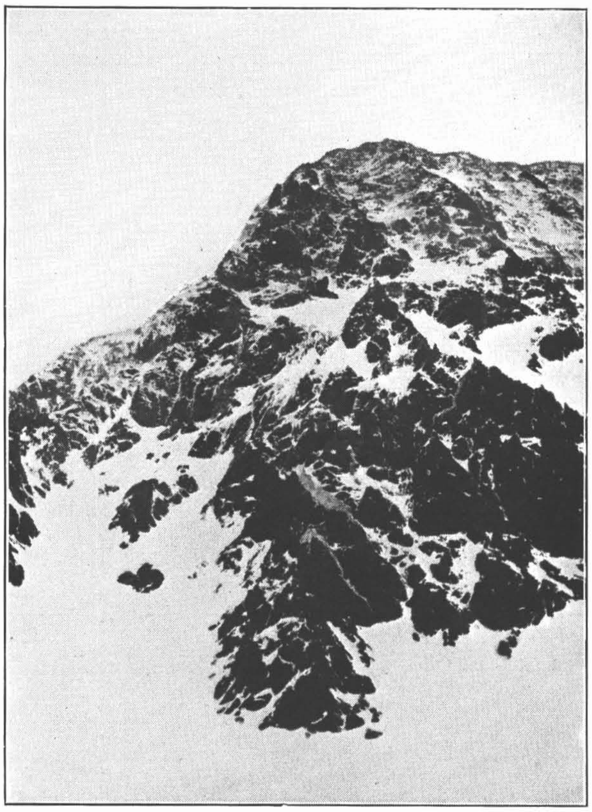
Both Russell and Abruzzi described the region north of St. Elias as consisting of snowfields, broken by many high peaks. Russell sums up his description by saying: " If the reader who is familiar with the Great Basin would fancy the most desolate portion of that arid land buried beneath a thousand feet of snow and ice, leaving only the southern slopes of the most rugged peaks exposed, he will have a mental picture of this land of desolation north of St. Elias."

[3]Abruzzi: " The Ascent of Mount St. Elias." New York: Frederick A. Stokes Company.


Mount Logan (center) and Mount King (right).

Mount King — Mount Augusta — Mount St. Elias — Mount Newton

Over this " land of desolation " passes the 141st Meridian.

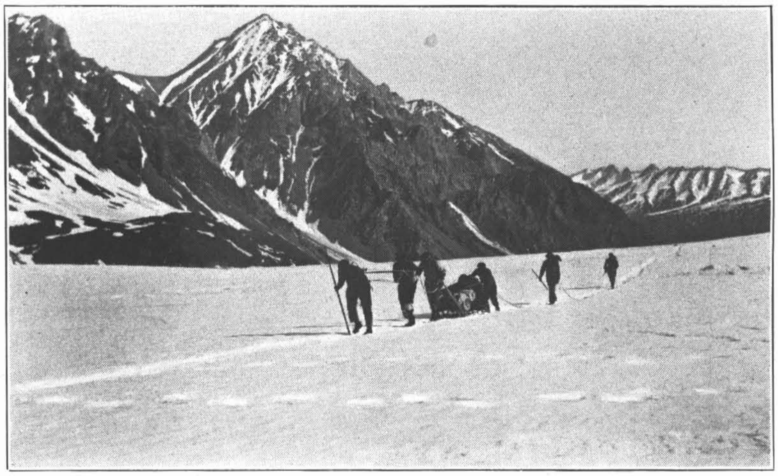


" We scaled a succession of cliffs."

Over this " land of desolation " passes the 141st Meridian south from Mount Natazhat and strikes the St. Elias range west of the summit. The commissioners having agreed that the boundary should be drawn from Mount St. Elias to the 141st Meridian on such a course parallel to the coast as should be found most suitable in the topographic conditions,[1] it was for the purpose of determining these conditions so that this course and the junction of the line with the meridian might be ascertained, that the survey party entered the St. Elias region.

Mr. A. C. Baldwin, who was in charge of the party, gives the following graphic account of the attempt made to reach the summit of the mountain:—

The party consisted of five members of the United States party and two Canadians, assisted on the first stage of the journey up to the first divide south of the Logan Glacier by two others of the United States party. The equipment selected was as light as possible to meet the conditions of glacier travel and of mountaineering. The tents were of light silk, so designed that one ordinary alpenstock was all the pole necessary for each tent. For cooking, the Lovett oil-stove was used, with a patent reflector oven, the utensils being of aluminum. Each man had an eiderdown sleeping-robe, with a rubber sheet and canvas cover or ground-sheet, and parkas and extra woolens were taken along for the higher altitudes. In addition, ice-axes, climbing ropes, snowshoes, ice-creepers, and other requisites were included in the outfit. The instrumental equipment consisted of a photo-topographical camera and plates, a 4-inch transit, two hand cameras, an aneroid barometer, and a compass.



Sledding in to Mount St. Elias.

Provisions for one month were taken, and did not differ materially from those used ordinarily on the survey work. Rice, sugar, bacon, pilot bread, dehydrated cranberries, and tea formed the principal diet and proved very satisfactory.[2]

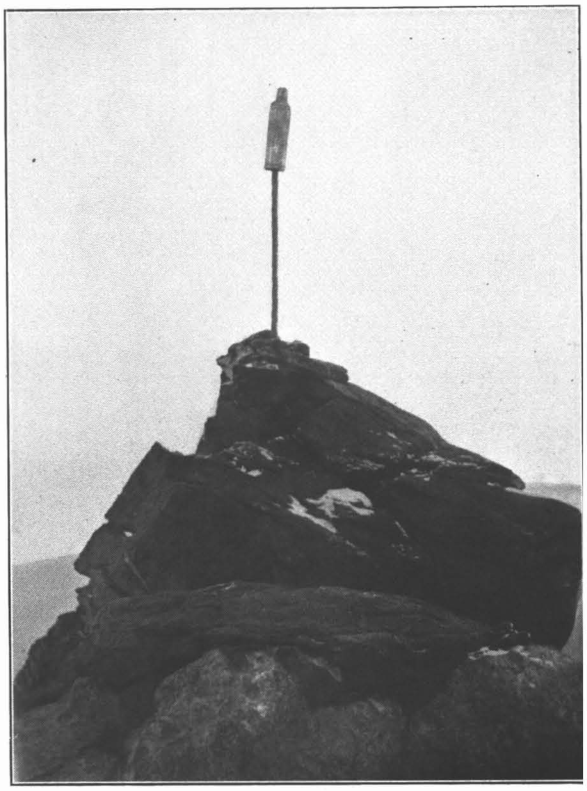
The means of transportation were two 7-foot Yukon sleds, three men being harnessed to one and four to the other, enabling an average of one hundred pounds to the man to be drawn on them.

[1]See page 23, this report. [2]Ration list, Appendix v, page 278.

At a camp in a small patch of willows on the south side of the Logan Glacier, the supplies were loaded on the two sleds which had been back-packed from the foot of the Chitina Glacier, and on June 13 sledding was begun up a small glacier flowing into the Logan from the south, about six miles being made the first day. From here on, the soft snow was from four to six feet deep, and promised to prove a serious handicap to further progress with sleds. However, adjusting snow-shoes, and roping ourselves together, three of us proceeded in single file over the expanse of snow and thus "broke trail" for a distance of six or seven miles and, in returning, tramped down the snow still more, hoping that the trail thus beaten down would freeze sufficiently during the night to support men and sleds.

On arrival at camp we found the other members of the party gathered round the oil-stoves shivering over their first meal on the ice. No one lingered over this, for a cold piercing wind from up the glacier drove us to the protection of the tents, and to blankets laid on small sharp rocks which formed a "cushion" over the solid body of the ice.

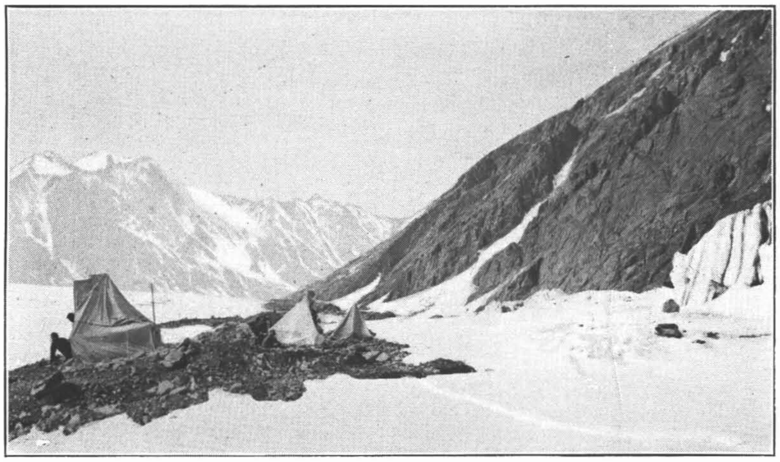
Our hopes were realized, for in the morning we found that the trail of the previous day had frozen so that it could be travelled on without the use of snowshoes, and everything was moved to the next camp. In the afternoon three of us again snowshoed ahead to break trail and if possible, to reach the divide, in order to gain a view of St. Elias, and so select the shortest and best route to its base.



"A thermos bottle on an alpenstock marked the camera station."

Gaining the summit of a 10,000-foot peak about seven in the evening, we caught our first glimpse of our goal. We were overlooking a wide valley sweeping in graceful curves southwestward towards the Pacific. From side to side it was probably twenty miles in width. A main stream of ice flowed through it, and this we took to be Columbus Glacier. Many smaller streams flowed into the main one, and all were covered with a mantle of snow whose whiteness was emphasized by the numerous black peaks that seemed just able to hold their heads above the flood of snow.

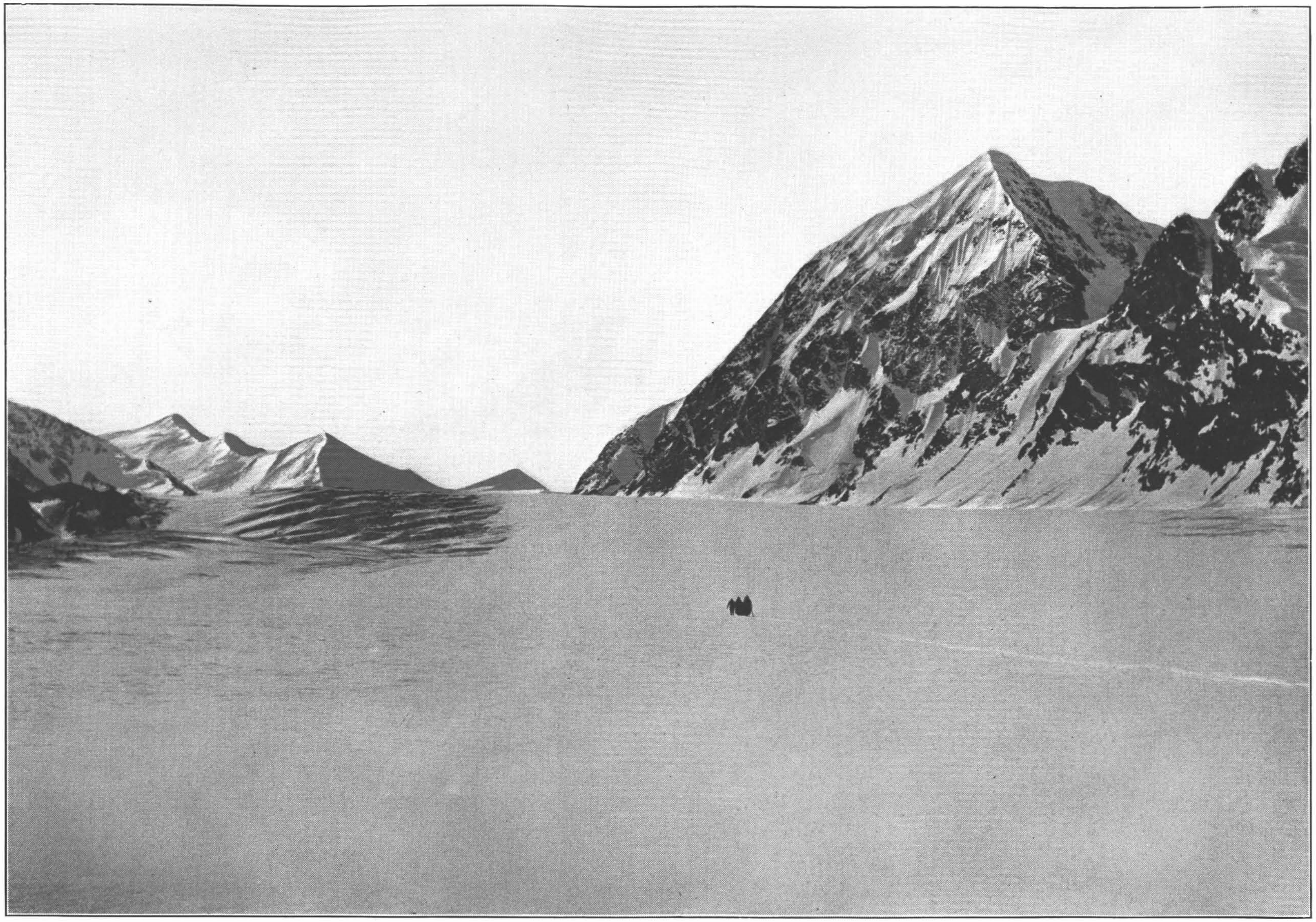
Near the head of the valley was the great towering mass of Mount St. Elias, rising nearly eleven thousand feet above the valley floor. In the evening light it recalled a huge white ghost, though in shape it resembled a great sea-lion, lying head erect, and facing the east. The summit is conical and about one thousand feet higher than a shoulder which extends two miles in a westerly direction and then breaks off precipitously for two thousand five hundred feet to a saddle connecting with the coast range of mountains.



Camp on an island of rocks.

The original plan was to attempt the ascent from the northeast, the side from which Russell and

" The great towering mass of Mount St. Elias."
Elevation of snowfields in foreground about 7,000 feet.



Nearing the summit of the divide between Logan and Columbus Glaciers.

Abruzzi had attacked it. But this idea was given up when it was seen that this route would require several additional miles of sledding, and would involve the crossing of a second divide. The north side looked possible for an ascent, but near the top a steep ice-slope would be encountered. The route from the west was shorter still, and seemed only slightly steeper than that on the north, and it was decided to make the attempt by this route.

The days spent crossing the snowfields were much the same as far as the work was concerned. Sledding was begun shortly after midnight, and was continued until the snow became too soft to travel on. The elevation ranged from seven to eight thousand feet, and there were no crevasses in the glaciers. No animal life existed except a few flies and moths, and a black insect about one-sixteenth of an inch in length that at times animated the snow. On the exposed rocks there was sometimes found a species of moss with a purple blossom. Occasionally a dead bird was seen, and later at the camp, at an elevation of 13,500 feet on St. Elias, three small birds flew overhead.

The temperature conditions were peculiar. At midnight a wind was generally blowing, and it was cold enough to freeze water in pails and to form a strong crust on the snow. At two or three o'clock the eastern sky would begin to glow, and as the sun crept higher and finally rose above the mountains it warmed the chill glacier air. By eight or nine o'clock the snow would be soft, and sledding difficult. The direct rays of the sun and the light reflected from the snow burned our faces and raised new blisters each day. In the afternoon, the tents would sometimes be uncomfortably warm, but as soon as the sun disappeared, the temperature dropped rapidly, and in a short time ice would be formed.

By June 22 we had traveled across over fifty miles of this kind of country beyond timberline, and had reached the base of Mount St. Elias. During all this time the sky had been clear, but on the 23rd a thick fog settled down over the peaks, and the weather became unsettled.

Our camp was now at an elevation of 7,500 feet, and to the east the western shoulder of St. Elias rose 9,000 feet in sheer height, too steep for the snow to cling to. At intervals, from the dizzy heights an avalanche of snow would be seen creeping down the wrinkled sides. Seconds afterwards a dull roar would be heard, and, as the moving mass gained in proportions and speed, it swept everything before it, and reaching a precipice, would shoot out in a stream like foaming water and disappear in the depths below. Long afterwards, clouds of snow-dust hung in the air and the dull rumbling continued.

It was useless to attempt to climb this west face, and therefore, on the 23rd, a reconnaissance was made up a steep glacier that led to a saddle with an elevation of 12,000 feet. The entire day was spent crossing crevasses and cutting steps and locating a feasible pack-route. Late in the afternoon we reached the saddle, and through the fog could dimly see a slope that lead to the high shoulder, and appeared to be climbable.

The following day camp was moved by sleds to the 9,500-foot level and then back-packing was begun. Camp was raised 2,000 feet at a move, packs of about forty pounds each being taken twice a day over this stretch. On the 28th of June, at five o'clock in the morning, we succeeded in getting the camp outfit to an elevation of 13,500 feet.

Looking to the south from this camp we could see below us the great Malaspina Glacier, and beyond it the Pacific Ocean. The Yahtse River was plainly visible, and in the sunlight, with every streamlet flashing, it suggested an arm of the sea. Icy Bay was also a noticeable feature, and stretching away to the west was the Coast Range at about our own level. Turning to the north we could trace our route over the snowfields as far as the Logan divide. Beyond there appeared on the horizon Mount Wrangell and Mount Blackburn and many other snow-covered peaks rivalling them in height, while one sharp peak in particular, seemingly more distant than the others, was very conspicuous. In every direction we could see a hundred miles or more, except to the northeast, the west shoulder of St. Elias cutting out the view there. It rose abruptly from camp 3,000 feet, while farther to the right, three miles distant and 4,500 feet above camp, stood our goal, the terminal cone of the mountain.

Rising at midnight on June 29 to get an early start for the final dash, we found that a dense fog had filled the valleys, and storm flurries were in evidence about the summits. Before an hour had passed snow began to fall, and it was midnight of the following day before the sky cleared, and even at that early hour the sun was lighting the summit of St. Elias. The instruments, food, and extra clothing were made up into packs, giving each man about twenty pounds, and about one o'clock a.m. the ascent was begun.

Although cameras were taken along, the difficulties of the first part of the climb proved so engrossing that picture making was forgotten entirely. We scaled a succession of cliffs, which one of the men declared were so steep that he was leaning backwards most of the time. Hands were used quite as much as feet, and to secure a firm grip on the rocks, mittens were often removed, and although we were not aware of it at the time, several finger-tips were frost-bitten. When outcrops of rock were not being traversed, the route lay over ice-slopes where the cutting of steps was necessary.

After nine hours of difficult climbing we were within a few hundred feet of the top of the west shoulder, and the rest of the climb to the summit appeared to be over a gradual slope presenting no obstacles. Four of the party only were feeling slightly the effects of the altitude, and all were confident of making the remainder of the distance, when a storm, such as is known only at high altitudes, overtook us. At first we were loath to admit that it was anything but a slight flurry, and continued the ascent. It soon became evident, however, that it was to be of more than temporary duration and that even if the summit were reached instrument work would be impossible, and so, at an elevation of a little over sixteen thousand feet, we reluctantly turned back.

The descent was accomplished not without considerable danger, and great care was necessary to keep our footing, and in one place one of the men, who had been weakened by mountain sickness, slipped on an ice-slope and was well started on a swift glissade, when one of his companions below stopped him. Camp was finally reached at five in the afternoon.

Rations were now very low and, in order to make it possible to attempt another ascent, three of the men, who had been most affected by the rarity of the atmosphere, were sent to the base camp. Three others remained with me to await fair weather, but the storm continued unabated. We rolled ourselves in our robes for warmth, and only ventured out about once in every twelve hours to eat a little rice and bacon. At midnight of the 3rd of July the bacon was gone, and only a handful of the rice remained; eighteen inches of snow had fallen, and it was still coming down. The last hope of scaling Mount St. Elias had vanished, but we still hoped to be able to secure a round of photos at camp level. About three a.m. the clouds suddenly raised, and a camera station near camp was occupied. Then packs were made up and we hastily descended to lower altitudes.

At one place where in going up we had jumped a crevasse possibly four feet wide, when coming down we found its width doubled. No bottom could be seen, and there was no alternative but to jump it again. The landing on the opposite side was a 3-foot ledge which sloped into a second crevasse. The man in the lead tied one end of the climbing rope round his waist, and taking a 50-foot run, jumped the yawning opening, and landed with great precision on the narrow ledge. The packs were then passed over on the rope and the others crossed safely.

Reaching the lower camp that evening, an inventory of provisions showed that only four days' rations remained, so the next morning, the Fourth of July, we headed back towards timber and the main cache, occupying two camera stations that day. The following day a thick fog was hanging over the snow fields, but the shortness of rations made it necessary to keep moving, and during all this day and the two following days we sledded through the fog, unable to see more than a few feet in any direction, but fortunately able to keep our course by following the tracks we had made coming in nearly a month before.

On the fourth day we reached the Logan Glacier, and made a fire of wood for the first time in thirty days, and though our camp was pitched in only a small patch of willow, we all agreed that this looked larger than any forest any of us had ever seen.

The following day, after crossing the glacier, we found the balance of the party, who were very anxious about us and prepared to start out on a relief expedition.

By a rather fortunate coincidence, the highest camp occupied by the party on their attempted ascent of Mount St. Elias, was on a small spur of the mountain on the western side, and the camera-station "Elbow" occupied by them while there, was shown by the computations to be only 128·2 meters west of the 141st Meridian. The Commissioners therefore decided that the point of intersection with the Alaska Coast boundary should be on the Meridian at the latitude of this station, the last course of the southeastern boundary thus being from the summit of Mount St. Elias to a point on the Meridian in latitude 60° 18′ 22″.29 north.

The annual joint report of the Commissioners provided for in Article IV of the Convention of 1906 and covering this season's operations, reads as follows:—

Seventh Joint Report of the Commissioners for the Demarcation of the Meridian of 141st Degree of West Longitude.

The undersigned Commissioners, appointed by virtue of the First Article of the Convention between the United States and Great Britain, signed at Washington on the 21st of April, 1906, have the honor to present their Seventh Annual Report upon the progress of the Demarcation of the 141st Meridian, where it forms the Boundary Line between the United States and Canada.

By reference to our Sixth Annual Report, it will be seen that at the close of the survey season of 1912, the survey of the meridian had been completed from the Arctic Ocean to Mt. Natazhat, with the exception of the inspection and numbering of the monuments from the Yukon River south.

South of Mt. Natazhat there remained the defining of the Boundary and the placing of monuments on available sites.

In 1913, inspection was carried from the Yukon River to the Natazhat Range. This included the placing of eight new monuments in stretches where the distances between existing monuments seemed excessive, the numbering of monuments, and the geodetic determination of the positions of the new monuments and of certain other monuments where the previous ties seemed weak.

A party projected the Boundary south over the Natazhat ridge into the valley across the Klutlan Glacier. They also extended topography fifteen miles south of the ridge, connecting with the topography carried from the Anderson Glacier by another party.

Still another party completed the triangulation, and trigonometrically located the Boundary across the Logan Glacier Valley, and marked it by placing three monuments. A base was measured on a bar below the foot of the Chitina Glacier, and check azimuths observed, which agreed with the computed azimuths brought over the Skolai Pass within 19″.

The positions of the larger mountains of this region were determined, notably Mt. St. Elias, Mt. King, and Mt. Logan. The position of Mt. St. Elias will give a comparison between the Alaska and Yukon datums.

An attempt was made to climb Mt. St. Elias for the purpose of determining the intersection of the 141st Meridian with the line drawn parallel to the coast from the summit of the mountain. After ascending to an elevation of 16,500 feet, a furious storm forced the joint party to abandon the project.

Topographic parties secured material for plotting topography along the line from Anderson Glacier to Mt. St. Elias, the sufficiency of which for completing the mapping has yet to be determined. Otherwise the field work of the whole survey is finished.

Two hundred and two monuments mark the line from the Arctic Ocean to Mt. St. Elias, a distance of 645 miles, a vista 20 feet wide is opened out through all the timber, triangulation carried north and south from the Yukon controls all positions along the the Boundary, and a belt, averaging 4 miles in width, has been mapped for practically the entire distance.

Respectfully submitted,

O. H. TITTMANN,
U. S. Commissioner.

W. F. KING,
H. B. M. Commissioner.

Washington, December 17, 1913.

L'ENVOI.

Thus the season of 1913 saw the accomplishment of the final acts in connection with the field work of the survey of the 141st Meridian. All the gaps had been filled in, all the "loose ends picked up," and the whole work was complete from the Arctic Ocean to Mount St. Elias, and it was with feelings of genuine regret that all hands from the Chiefs of Party down, said farewell to each other and to the work which had brought them together each season for so many years, and had been productive of such pleasant relationships. There can be no doubt that the completion of the work was greatly expedited by the more than friendly relations existing at all times between the parties working under the direction of the Commissioners, and by the remarkable esprit de corps shown by all connected with the work. Everyone, American and Canadian, seemed to successfully grasp the idea that the work was of paramount importance, and it was advanced with the greatest possible speed consistent with good quality, often at the sacrifice of reasonable and legitimate personal comforts on the part of the men, and the disposition of one party to assist another in every possible way was quite as apparent between Canadian and United States parties as between parties of the same nationality.

The peculiar international character of the survey rendered necessary crossings and re-crossings of the boundary at many points by the members of both the Canadian and United States surveys, and all customs formalities were waived by the Customs Departments of both Governments. The work of the survey was thus much facilitated, and the Commissioners take this opportunity of expressing their appreciation to these departments for the many unusual privileges extended to the survey, which avoided a great deal of delay that would otherwise have been inevitable in connection with the repeated crossings of the boundary, and the many shipments made each season from outside points, both Canadian and United States. They are indebted also to the Customs Officers at the various ports for their unfailing courtesy, and for the readiness with which they did all in their power to prevent delay and to expedite the affairs of the survey.

To the various transportation companies of the north, too, all credit is due for the expeditious manner in which they handled the difficult problem of "rushing in" the survey parties and their supplies each spring, and of bringing the parties safely out again each fall in the face of difficulties of transportation and navigation hardly realizable by anyone accustomed only to ordinary "outside" railroad and steamboat work. The White Pass and Yukon Route and the Northern Navigation Company deserve special mention in this regard, for without the hearty co-operation of the various officials of these companies it would have been impossible to bring the work to a close in the seven seasons actually required to complete it.

The greater portion of the supplies for the survey were purchased in Seattle and Vancouver and other outside points, but every possible assistance was given to the survey by the various traders and trading companies in the Yukon Territory and Alaska, notably the Northern Commercial Company at Dawson, Y.T., and at Eagle and Circle, Alaska, the North American Transportation and Trading Company at Dawson, Messrs. Horton and Moore at Fort Yukon, Alaska, and Mr. Dan Cadzow at Rampart House.

In addition to the chiefs of parties and sub-parties[1] connected with the work in the field, special mention should be made of the work done in the office, adjusting and computing the field observations. A large proportion of this work was done by the respective field officers during the winter seasons, but to Mr. W. F. Reynolds a great deal of credit is due for the manner in which he executed, under the direction of the Computing Division of the Coast and Geodetic Survey, the work assigned to him, and kept it up to date throughout. The work of Mr. Raymond L. Ross of the United States section of the Commission, in connection with the draughting, and the proofing of the maps after engraving, also deserves special commendation.

The eighth report of the Commissioners follows:—

Eighth Joint Report of the Commissioners for the Demarcation of the Meridian of the 141st Degree of West Longitude.

The undersigned Commissioners, appointed by virtue of the first Article of the Convention between the United States and Great Britain signed at Washington on the 21st of April, 1906, have the honor

[1] Page 102.

to present their Eighth Annual Report upon the progress of the demarcation of the 141st Meridian, where it forms the Boundary Line between the United States and Canada.

By reference to our Seventh Annual Report it will be seen that at the close of the survey season of 1913, the field work of the whole survey from the Arctic Ocean to Mt. St. Elias had been completed, with the possible exception of the section between the head of Anderson Glacier and Mt. St. Elias as to which there was some doubt at the date of the said report whether sufficient data had been secured to complete the plotting of the topography.

This doubt has since been removed, as the data secured during the season of 1913 proved to be sufficient. We have therefore to report that the field work of the whole survey and demarcation has been finished.

In this connection, however, we have to report that a strict compliance with the requirement of Article II of the Treaty, that intervisible monuments shall be established along the whole extent of the line, has been found to be impossible, for in latitude 61° 31′ the meridian crosses a high ridge extending eastward from Natazhat Mountain. On account of perpetual snow no monument can be placed on this ridge, which therefore intercepts intervisibility.

During the year 1914 the staffs of the Commissioners have been engaged in the computations of the geographic positions of the monuments and in the preparation of the maps showing the boundary and the country adjacent thereto.

These maps are made in sheets each covering 15 minutes in latitude, on a scale of 1:62,500. In all there will be 38 of these sheets, of which numbers 1 to 32, inclusive (counted southward from the Arctic Ocean), have been completed and signed by the Commissioners.

A general report of the operations of the whole survey is in preparation.

Respectfully submitted,

W. F. KING,
H. B. M. Commissioner.

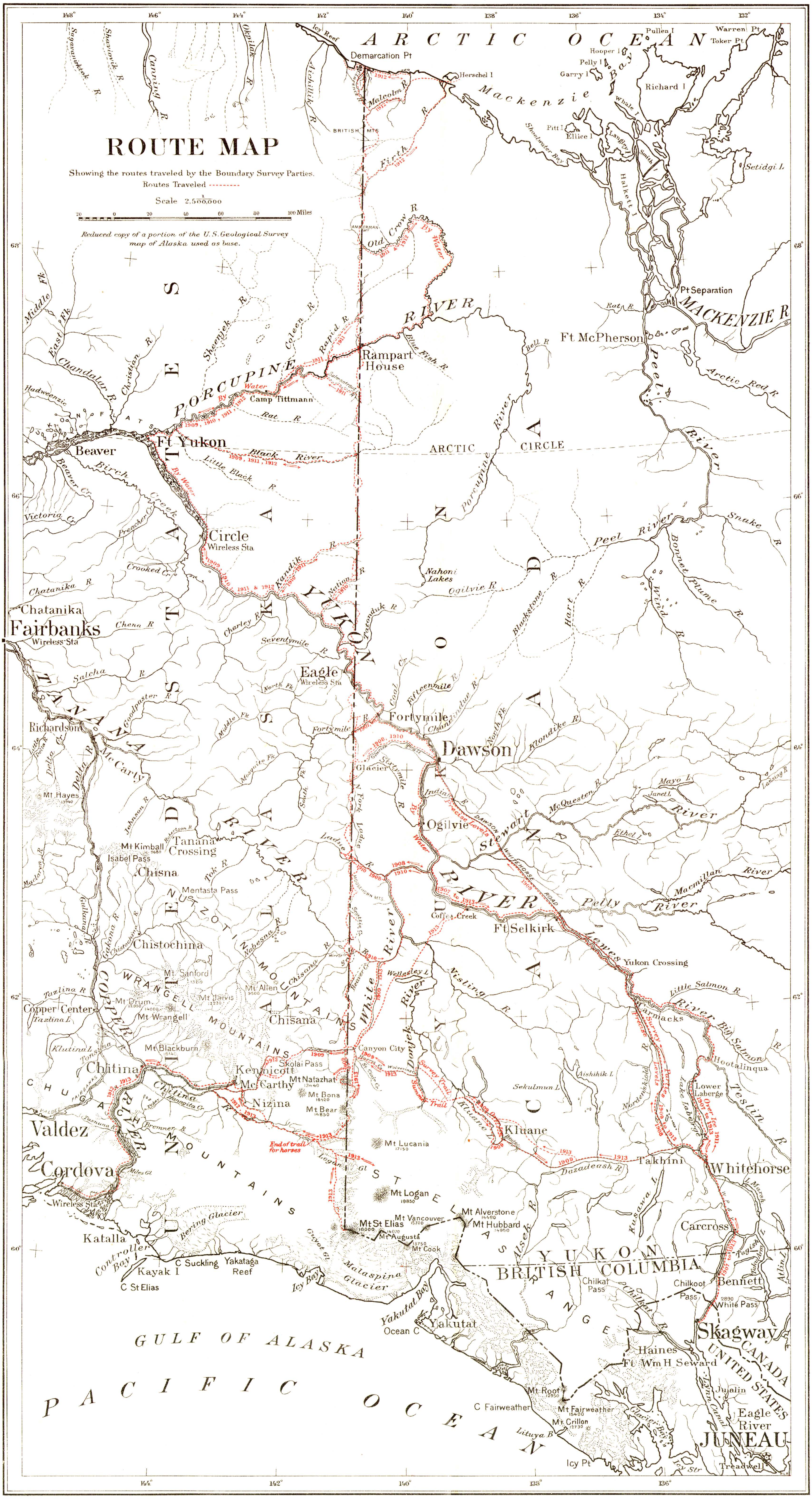
O. H. TITTMANN,
U. S. Commissioner.

WASHINGTON, January 27, 1915.

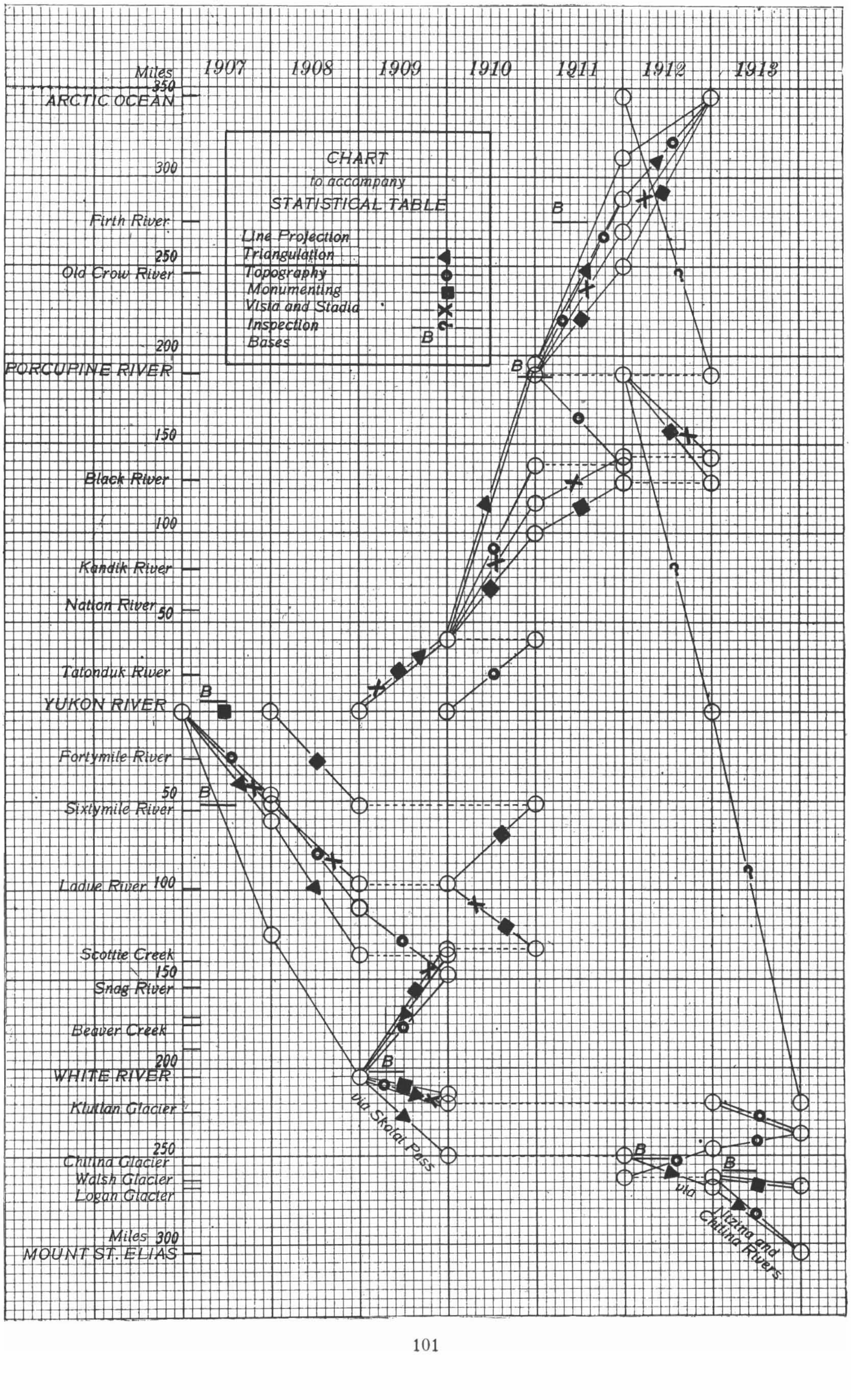
STATISTICAL TABLE SHOWING DETAILS OF THE WORK DONE EACH YEAR BY THE VARIOUS DIVISIONS OF THE SURVEY.

——	1907.	1908.	1909.	1910.	1911.	1912.	1913.	Totals.
Projection, miles	125	75	55	155	122	25	....	557
Triangulation,								
linear miles	62	77	158	154	98	164	35	748
square miles	440	670	1125	1232	826	1500	2000	7793
stations occupied	43	29	68	72	85	132	89	518
Topography,								
Planetable, lin. miles	46	64	111	140	164	47	25	597
do sq. miles	200	320	545	610	814	841	400	3730
do stations	626	730	1054	971	1057	1000	500	5938
Photo-topog., sq. miles	300	260	100	....	....	225	1500	2385
do camera stations	57	50	18	....	....	25	60	210
Geodetic levels, miles	....	141	239	130	....	....	....	510
Vista and Stadia, miles	52	44	106	118	148	88	....	556
Monuments set	2	18	32	49	34	56	11	202
Miles of line monumented	....	52	133	136	97	140	4	561
Bases measured	2	....	1	....	2	1	1	7
Azimuths observed[1]	1	....	1	....	....	....	1	3
Magnetic stations	....	50	59	64	8	7	9	197
Geodetic positions determined	64	32	185	122	59	35	112	609
Miles of line inspected	....	....	....	....	....	333	225	558
Launch mileage	....	....	1500	250	....	....	....	
4 launches	....	....	....	....	18000	....	....	
3 do	....	....	....	....	....	12000	....	31750

[1] Azimuths, other than the primary azimuth of 1907, were observed as checks merely, in accordance with the Commissioners' decision, Washington, December 12th, 1912, *et seq.*—Dominion Observatory file 771-15.



ROUTE MAP
Showing the routes traveled by the Boundary Survey Parties.
Routes Traveled
Scale 1/2,500,000
Reduced copy of a portion of the U.S. Geological Survey map of Alaska used as base.
ARCTIC OCEAN
Demarcation Pt
Icy Reef
Herschel I
Mackenzie Bay
Pullen I
Warren Pt
Toker Pt
Hooper I
Pelly I
Garry I
Richard I
Pitt I
Ellice I
Shoalwater Bay
Pt Separation
MACKENZIE R
Ft McPherson
Peel River
Arctic Red R
Rampart House
Camp Tittmann
PORCUPINE RIVER
Ft Yukon
Beaver
ARCTIC CIRCLE
Black River
Little Black R
Circle
Wireless Sta
Chatanika
Fairbanks
Wireless Sta
YUKON
Eagle
Wireless Sta
Fortymile
Dawson
Klondike R
Stewart River
Ogilvie
Pelly River
Macmillan River
Coffee Creek
Ft Selkirk
Lewes
Yukon Crossing
Little Salmon R
Carmacks
Big Salmon
Hootalinqua
Lower Laberge
Teslin R
Whitehorse
Takhini
Kluane
Carcross
Bennett
Chilkoot Pass
White Pass
Skagway
Haines
Ft Wm H Seward
Chilkat Pass
Juneau
Eagle River
Treadwell
Juneau
Atlin L
Richardson
Tanana Crossing
Mt Hayes
Mt Kimball
Isabel Pass
Chisna
Mentasta Pass
Chistochina
Mt Sanford
Mt Drum
Mt Jarvis
Mt Wrangell
WRANGELL MOUNTAINS
Mt Allen
Chisana
Mt Blackburn
Copper Center
Chitina
Kennicott
McCarthy
Nizina
Mt Natazhat
Mt Bona
Mt Bear
Canyon City
Skolai Pass
End of trail for horses
Mt Lucania
Mt Logan
Mt St Elias
Mt Vancouver
Mt Augusta
Mt Cook
Mt Alverstone
Mt Hubbard
Valdez
Cordova
Katalla
Controller Bay
Kayak I
C Suckling
C St Elias
Yakataga Reef
Icy Bay
Malaspina Glacier
Bering Glacier
Yakutat Bay
Yakutat
Ocean C
BRITISH COLUMBIA
YUKON
UNITED STATES
CANADA
GULF OF ALASKA
PACIFIC OCEAN
C Fairweather
Mt Fairweather
Mt Crillon
Mt Root
Lituya B
Icy Pt
ALASKA
CANADA



Miles
1907
1908
1909
1910
1911
1912
1913
350
ARCTIC OCEAN
300
Firth River
250
Old Crow River
200
PORCUPINE RIVER
150
Black River
100
Kandik River
Nation River
50
Tatonduk River
YUKON RIVER
Fortymile River
50
Sixtymile River
Ladue River
100
Scottie Creek
150
Snag River
Beaver Creek
200
WHITE RIVER
Klutlan Glacier
250
Chitina Glacier
Walsh Glacier
Logan Glacier
Miles
300
MOUNT ST. ELIAS
CHART
to accompany
STATISTICAL TABLE
Line Projection
Triangulation
Topography
Monumenting
Vista and Stadia
Inspection
Bases
B
via Skolai Pass
via Nizina and Chitina Rivers

SUMMARY SHOWING CHIEFS OF PARTY, AND CHIEFS OF SUB-PARTIES ENGAGED EACH YEAR ON THE VARIOUS DIVISIONS OF THE WORK, AND THE APPROXIMATE STRENGTH OF THE PARTIES.

——	——	1907.	1908.	1909.	1910.	1911.	1912.	1913.
Chief of Party..........	United States.	G. C. Baldwin Thos. Riggs, jr.	G. C. Baldwin Thos. Riggs, jr.	G. C. Baldwin Thos. Riggs, jr.	Thos. Riggs, jr.	Thos. Riggs, jr.	Thos. Riggs, jr.	Thos. Riggs, jr.
	Canadian.....	A. J. Brabazon, D.L.S.	A. J. Brabazon, D.L.S.	Fred. Lambart, D.L.S. J. D. Craig, D.L.S.	J. D. Craig, D.L.S.	J. D. Craig, D.L.S.	J. D. Craig, D.L.S.	J. D. Craig, D.L.S.
Projection.............	United States.	G. C. Baldwin	G. C. Baldwin	G. C. Baldwin Thos. Riggs, jr.	A. C. Baldwin	W. B. Gilmore	Thos. Riggs, jr.	
	Canadian.....	A. J. Brabazon, D.L.S.	A. J. Brabazon, D.L.S.	Fred. Lambart, D.L.S. J. D. Craig, D.L.S.	J. D. Craig, D.L.S.	D. H. Nelles, D.L.S.	J. D. Craig, D.L.S.	
Reconnaissance.........	United States.	W. B. Reaburn	W. B. Reaburn	W. B. Reaburn A. C. Baldwin	W. B. Reaburn	W. B. Reaburn	W. B. Reaburn Thos. Riggs, jr.	W. B. Reaburn
	Canadian.....	Fred. Lambart, D.L.S.	Fred. Lambart, D.L.S.	Fred. Lambart, D.L.S. J. D. Craig, D.L.S.			D. H. Nelles, D.L.S.	Fred. Lambart, D.L.S. T. C. Dennis, D.L.S. H. S. Mussell
Triangulation..........	United States.	Thos. Riggs, jr. W. B. Reaburn	Thos. Riggs, jr. W. B. Gilmore	Thos. Riggs, jr. D. W. Eaton G. C. Baldwin A. C. Baldwin	Thos. Riggs, jr. A. I. Oliver W. B. Reaburn W. B. Gilmore	A. C. Baldwin D. W. Eaton	Thos. Riggs, jr. W. B. Gilmore A. C. Baldwin D. W. Eaton	A. C. Baldwin D. W. Eaton Thos. Riggs, jr.
	Canadian.....	Fred. Lambart, D.L.S.	Fred. Lambart, D.L.S.	Fred. Lambart, D.L.S.	Fred. Lambart, D.L.S. A. G. Stewart, D.L.S. J. D. Craig, D.L.S.	Fred. Lambart, D.L.S. A. G. Stewart, D.L.S.	Fred. Lambart D.L.S. D. H. Nelles, D.L.S. J. D. Craig, D.L.S.	Fred. Lambart, D.L.S. T. C. Dennis, D.L.S. D. J. Fraser, D.L.S. H. S. Mussell J. D. Craig, D.L.S.
Topography— Plane table	United States.	A. I. Oliver	A. I. Oliver	A. I. Oliver W. C. Guerin	A. I. Oliver W. C. Guérin F. S. Ryus	W. C. Guerin F. S. Ryus	W. C. Guerin F. S. Ryus C. V. Guerin	C. V. Guerin
Photographic	United States.						D. W. Eaton	D. W. Eaton A. C. Baldwin
	Canadian.....	Fred. Lambart, D.L.S.	Fred. Lambart, D.L.S.	Fred. Lambart, D.L.S. J. D. Craig, D.L.S.			Fred. Lambart, D.L.S. J. D. Craig, D.L.S.	Fred. Lambart, D.L.S. T. C. Dennis, D.L.S. E. W. Nesham, D.L.S. H. S. Mussell

SUMMARY SHOWING CHIEFS OF PARTY, AND CHIEFS OF SUB-PARTIES ENGAGED EACH YEAR ON THE VARIOUS DIVISIONS OF THE WORK, AND THE APPROXIMATE STRENGTH OF THE PARTIES—*Concluded.*

—	—	1907.	1908.	1909.	1910.	1911.	1912.	1913.
Vista and Stadia........	United States.	W. B. Gilmore		L. Netland				
	Canadian.....		C. Brabazon	A. G. Stewart	Fred. Lambart, D.L.S. A. G. Stewart, D.L.S.	Fred. Lambart, D.L.S. A. G. Stewart, D.L.S.	Fred. Lambart, D.L.S. D. H. Nelles, D.L.S.	
Monumenting..........	United States.	W. B. Gilmore		L. Netland				A. C. Baldwin
	Canadian.....		Thos. P. Reilly	Thos. P. Reilly	Fred. Lambart, D.L.S. Thos. P. Reilly A. G. Stewart, D.L.S.	A. G. Stewart, D.L.S. Thos. P. Reilly	D. H. Nelles, D.L.S. Thos. P. Reilly	Thos. P. Reilly
Launch Pilots..........	United States.					F. Rotch, jr. Thos. Smith	F. Rotch, jr.	
	Canadian.....			C. M. Coghlan	C. M. Coghlan	C. M. Coghlan H. Henderson	C. M. Coghlan Rod. Thomas	
Inspection.............	United States.						Thos. Riggs, Jr.	Thos. Riggs, Jr.
	Canadian.....						J. D. Craig, D.L.S. D. H. Nelles, D.L.S.	J. D. Craig, D.L.S.
Precise Levelling.......	United States.				O. M. Leland			
	Canadian.....		D. H. Nelles, D.L.S.	D. H. Nelles, D.L.S.	D. H. Nelles, D.L.S.			
Winter Party..........	United States.					W. B. Reaburn Dr. G. T. Smith	W. B. Reaburn Dr. G. T. Smith	
Geology..............	United States.					A. G. Maddren	A. G. Maddren	
	Canadian.....					D. D. Cairnes, Ph. D.	D. D. Cairnes, Ph.D.	
Men..................	United States.	25	22	34	45	51	38	25
	Canadian.....	10	36	28	40	42	45	21
Horses................	United States.	48	45	50	76	85	57	41
	Canadian.....	....	30	36	72	81	69	27

The 141st Meridian was determined in 1906 by:
United States observer—Edwin Smith, Assistant, Coast and Geodetic Survey.
Canadian observers—Dr. Otto J. Klotz and F. A. McDiarmid, of the Dominion Observatory, Ottawa.

LIST OF MONUMENTS MARKING THE INTERNATIONAL BOUNDARY LINE ALONG THE 141ST MERIDIAN FROM THE ARCTIC OCEAN TO MOUNT ST. ELIAS.

N.B.—All monuments are of aluminum-bronze and are of the standard small type unless otherwise noted.

Number of Monu-ment.	Distance between Monu-ments	Latitude.	Eleva-tion at base	Nearest visible Monuments. Nos.	Description.
	feet.	° ′ ″	*feet.*	*Nos.*	
1		69 38 45·275	21·3	2, 3	Large monument 200 feet south of the edge of the tundra at the shore of the Arctic Ocean.
	20605				
2		35 22·608	58·6	1, 3	On the open tundra about 4 miles from the coast and 300 feet west of the open gravel bars of Clarence River.
	21566				
3		31 50·486	265·8	2, 4	On the open tundra at the beginning of the foothills.
	20370				
4		28 30·129	1261·3	3, 5	On a bare shaly ridge, the first crossed by the Line south of the coast.
	20826				
5		25 05·280	2521·5	4, 6	In the saddle of a ridge just north of a branch of Clarence River.
	12574				
6		23 01·601	2692·0	5, 7	On a spur-ridge east of Clarence River.
	10984				
7		21 13·55	2434·3	6, 8	On a dry flat table land 1 mile south of Clarence River crossing.
	20183				
8		17 55·024	5146·0	7, 9	On the summit of a ridge between Clarence and Malcolm Rivers.
	16487				
9		15 12·862	4300·3	8, 10	On the eastern end of a spur-ridge between branches of Clarence and Malcolm Rivers.
	17500				
10		12 20·73	3014·6	9, 11	On the side-hill 800 feet east of Malcolm River and about 4 miles north of the summit of the British Mountains.
	11908				
11		10 23·601	5173·2	10, 12	On the eastern spur of a sharp rocky ridge about 1½ miles north of the summit of the British Mountains.
	8575				
12		08 59·245	5332·6	11, 14	On a rocky spur ½ mile northwest of a low pass in the British Mountains.
	8593				
13		07 34·726	3752·4	14, ..	100 yards south of and below a prominent rock bluff on a southeasterly spur of the British Mountains.
	20958				
14		04 08·576	3899·2	13, 15	On the summit of a bare ridge between the forks of Aspen Creek.
	14449				
15		01 46·447	3597·9	14, 16	On the summit of the first ridge south of Aspen Creek.
	9221				
16		00 15·750	3357·6	15, 17	On the summit of a jagged shaly ridge between the forks of a creek which join one mile east of the line.
	20011				
17		68 56 58·920	3974·1	16, 18	On the summit of a ridge about 1¾ miles north of Joe Creek, and 200 yards east of the highest point.
	17137				
18		54 10·353	3572·5	17, 19	On the rocky side-hill of a ridge about 1½ miles south of Joe Creek.
	21208				
19		50 41·740	3794·9	17, 18	On the divide between Joe and Boulevard Creeks, ¼ mile east of the trail in a low flat saddle.
	12507				
20		48 38·715	4331·8	18, 21	On the east slope and about 100 feet below the summit of a sharp peak 1½ miles south of Boulevard Creek crossing.
	22565				
21		44 56·750	3449·8	20, 22	On the summit of a sharp ridge almost parallel to the Line and about 6 miles north of Mancha Creek crossing.
	10372				
22		43 14·725	3153·6	21, 25	On the westerly spur of a sharp ridge parallel to the Line and about 4 miles north of Mancha Creek crossing.
	16159				
23		40 35·777	2499·3	22, 24	On a shoulder of the end of the ridge 1 mile north of Mancha Creek crossing.
	15857				
24		37 59·798	1675·8	23, 25	On the flat 250 feet south of the most southerly branch of Firth River.
	16854				
25		35 14·006	2269·8	23, 24	On a bare flat ridge 3 miles south of Firth River.
	11436				
26		33 21·511	2682·8	23, 27	One-quarter mile west of the summit of a bare rounded hill about 6 miles south of Firth River.
	19789				
27		30 06·848	2397·1	26, 28	On a flat open ridge about 8 miles north of Ammerman Mountain.
	23947				
28		26 11·283	1831·7	27, 29	About 3 miles north of Ammerman Mountain on a low open ridge running east and west.
	17340				
29		23 20·709	2924·8	28, 30	On the side of a spur 300 feet above and ¼ mile east of the trail through a low pass in Ammerman Mountain.
	13911				
30		21 03·870	1938·5	29, 31	At the edge of the timber 2½ miles south of the low pass in Ammerman Mountain.
	14752				
31		18 38·748	1204·8	30, 32	At the north edge of the Old Crow Flats and 5½ miles south of the low pass in Ammerman Mountain.
	33763				
32		13 06·612	1023·5	31, 33	Large monument, 50 feet north of the edge of the north bank of Old Crow River.
	460				
33		13 02·084	1020·5	32, 34	On the south bank of Old Crow River, 300 feet from the water's edge.
	11410				
34		11 09·838	1032·9	33, 35	785 feet north of the edge of the north bank of Bilwaddy Creek.
	14576				
35		08 46·447	1088·1	34, 36	On slightly rising ground 2¾ miles south of Bilwaddy Creek.
	18960				
36		05 39·931	1255·6	35, 37	On a low spruce-covered ridge connecting Potato Hill with the hills to the west.
	17300				
37		02 49·744	1469·4	36, 38	On the northeasterly slope of a low brush-covered point about 3 miles north of Fish Creek Crossing.
	2382				
38		02 26·314	1479·9	37, 39	On the summit of the same slope as No. 37 and ½ mile south of it.
	30240				

LIST OF MONUMENTS, ETC.—*Continued.*

Number of Monument.	Distance between Monuments	Latitude.	Elevation at base	Nearest visible Monuments.	Description.
	feet.	° ′ ″	feet.	Nos.	
39		67 57 28·826	1181·4	38, 40	In the scattered timber on the westerly slope of the valley of Schaefer Creek and about 3 miles south of Fish Creek crossing.
	19895				
40		67 54 13·108	1303·2	39, 41	In a saddle near the end of a low ridge extending from the west into the valley of Schaefer Creek.
	15939				
41		51 36·307	1187·7	40, 42	On the north bank of Schaefer Creek, where it crosses the Line three times in less than 100 feet.
	12988				
42		49 28·530	1734·0	41, 43	On the summit of a bare steep ridge, the first south of the Old Crow Flats.
	13430				
43		47 16·408	1462·3	42, 44	On the east slope of the ridge lying between the upper forks of Surprise Creek.
	20888				
44		43 50·912	3326·0	43, 45	On the summit of the divide between Porcupine and Old Crow Rivers.
	5773				
45		42 54·12	3157·5	44, 46A	One mile south of the divide between Rapid River and Old Crow drainage on a low flat rocky point.
	20938				
46		39 28·13	2160·3	46A, 47	On the summit of a rock and gravel ridge 1 mile north of Rapid River.
	21860				
46A		35 53·073	2232·9	46, 47	On a low, bare, rock-covered ridge 3 miles south of Rapid River.
	11269				
47		34 02·207	2572·6	46A, 47A	On the summit of the ridge forming the divide between Rapid River and the headwaters of Sunaghun Creek, just north of an opening in a conspicuous rock outcrop.
	19118				
47A		30 54·12	1652·9	47, 48	Low down on the west slope of Sunaghun Creek valley, and 650 yards north of the southerly crossing of the Line and the Creek.
	7713				
48		29 38·24	2029·7	47A, 48A	On the westerly shoulder of a rocky dome east of Sunaghun Creek and 5½ miles north of Porcupine River.
	12227				
48A		27 37·94	1977·0	48, 49	On the westerly slope of a hill 3 miles north of Porcupine River.
	2822				
49		27 10·18	1920·6	48, 52	On the southwesterly slope of a hill 3 miles north of Porcupine River.
	9551				
49A		25 36·21	1286·8	51, 52	About ¾ mile north of Porcupine River and a short distance back from the edge of the plateau.
	3552				
50		25 01·261	778·6	51, ..	Large monument on the flat 670 feet north of Porcupine River, and 150 feet from the foot of the hill.
	5392				
51		24 08·211	800·6	49A, 50	On the sloping flat 250 yards south of the south bank of Porcupine River.
	12135				
52		22 08·82	2019·3	49A, 53	On the easterly slope of Canalaska Mountain, 2½ miles south of Porcupine River.
	10849				
53		20 22·089	2149·1	52, 54	About 4½ miles south of Porcupine River, and 250 yards west of the summit of a dome at the head of the valley east of Canalaska Mountain.
	12280				
54		18 21·270	1855·2	53, 55	About 7 miles south of Porcupine River on a westerly spur of a north and south ridge.
	12738				
55		16 15·946	1849·2	54, 56	2 miles south of Monument No. 54 on a westerly spur of the same ridge.
	18088				
56		13 17·990	1312·8	55, 57	In a low flat valley in which a tributary of Bluefish River heads, and 100 yards north of the north branch.
	19880				
57		10 02·396	1861·4	55, 56	On the westerly slope of a ridge at the head of the south branch of a tributary of Bluefish River.
	13950				
58		07 45·149	2488·9	59, 61	Near the southern edge of a flat ridge between Salmontrout and Bluefish drainage.
	20507				
59		04 23·38	2067·9	56, 60	On the easterly slope of a flat ridge about 3 miles northeast of the big bend in Salmontrout River.
	16365				
60		01 42·370	1362·7	59, 61	2 miles east of the big bend in Salmontrout River, on ground sloping gently to the north.
	21653				
61		66 58 09·327	2573·8	60, 62	3 miles southeast of the big bend in Salmontrout River, on the westerly slope of a high ridge.
	10645				
62		56 24·593	3019·1	61, 63	Just west of a saddle in a northwesterly spur of the ridge between Black and Salmontrout drainages.
	19461				
63		53 13·115	3472·0	62, 64	Near the northern edge of the flat-top ridge forming the divide between Black and Salmontrout Rivers.
	22452				
64		49 32·209	3794·5	63, 65	On the highest point on line between Black and Porcupine Rivers.
	13985				
65		47 14·612	3312·7	65, 68	On the summit of a ridge crossed by the Line 2 miles north of Fort Creek.
	25591				
66		43 02·815	2177·1	65, 67	On a low divide 2¾ miles south of Fort Creek.
	23921				
67		39 07·456	2481·7	66, 68	7½ miles north of Black River on a northerly spur of a prominent ridge.
	7872				
68		37 49·997	2724·5	67, 69	6 miles north of Black River on the summit of a prominent east and west ridge.
	19080				
69		34 42·26	2189·9	68, 70	2½ miles north of Black River, near the top of the southwesterly slope of a ridge.
	10874				
70		32 55·265	1735·4	69, 71	Large monument ⅓ mile north of, and 700 feet above Black River on a flat shoulder.
	19545				
71		29 42·95	1274·7	70, 72	In the Black River flats about 3¼ miles south of the river.
	20747				
72		26 18·808	2288·9	70, 71	2½ miles north of Bern Creek, on the slope of a westerly spur of a ridge running north from the creek.
	8654				
73		24 53·652	2933·9	70, 74	On the summit of the ridge immediately north of Bern Creek.
	15273				
74		22 23·373	2663·1	73, 75	2 miles south of Bern Creek on a small westerly spur of the ridge between Bern and Racquet Creeks.
	22987				

LIST OF MONUMENTS, ETC.—*Continued.*

Number of Monument.	Distance between Monuments	Latitude.	Elevation of base	Nearest visible Monuments.	Description.
	feet.	° ′ ″	*feet*		
75		18 37·19	2740·3	74, 76	3 miles north of Runt Creek on the summit of a flat-top ridge.
76	22157	14 59·177	2853·5	75, 77	1½ miles south of Runt Creek in the westerly slope of a north and south ridge.
77	6210	66 13 58·070	3011·6	76, 78	2 miles north of Teecan Creek in the lowest point of a saddle on a westerly spur of a north and south ridge.
78	19776	10 43·474	2804·3	77, 79	About midway between Teecan and Orange Creeks on a small plateau on the ridge.
79	4826	09 55·982	2826·7	78, 80	About 1 mile north of Orange Creek, on the summit of a high rock.
80	14292	07 35·350	2859·4	79, 81	1½ miles south of Orange Creek, on the easterly slope of a dome-shaped peak.
81	17782	04 40·374	3536·6	80, 82	5 miles south of Orange Creek, on the summit of a prominent bare ridge.
82	8897	03 12·83	3286·0	81, 83	7 miles south of Orange Creek, where the line again crosses the ridge on which Monument No. 81 is set.
83	17585	00 19·79	2929·3	82, 84	2¾ miles north of Siwash Creek just west of the summit of a high dome-shaped rocky peak.
84	17550	65 57 27·09	2063·9	83, 85	About ½ mile south of Siwash Creek, on the summit of a long timbered ridge.
85	12794	55 21·196	2597·1	84, 86	3 miles south of Siwash Creek, on the bare summit of a prominent timbered ridge.
86	16727	52 36·597	2740·5	85, 88	2½ miles north of Kandik River just above timber-line on the easterly slope of a saddle in the ridge.
87	16882	49 50·48	1969·9	.. ..	About 900 yards south of Kandik River, near the edge of the high bank overlooking the river.
88	20845	46 25·357	2374·8	86, 89	4½ miles south of Kandik River, on the summit of a flat ridge.
89	14430	44 03·36	2311·0	88, 91	2¾ miles north of the northerly branch of Big Sitdown Creek on the westerly side of a saddle.
90	16351	41 22·456	2167·5	.. ..	On the westerly slope of the end of the ridge between the branches of Big Sitdown Creek.
91	21975	37 46·212	3191·0	89, 92	3½ miles south of Big Sitdown Creek on a smooth bare ridge.
92	16791	35 00·982	3673·9	91, 93	On a broad flat grassy ridge forming the eastern spur of Indian Grave Mountain.
93	15857	32 24·937	3589·4	92,	2 miles north of Nation River, on the easterly shoulder of a flat-top peak.
94	17112	29 36·544	3123·6	96,	About ¾ mile north of Jungle Creek, on the westerly slope of a sharp rocky peak.
95	17063	26 48·63	1669·5	.. ..	On the north bank of Ettrain Creek.
96	16568	24 05·59	3625·5	94,	3 miles south of Ettrain Creek, on the westerly slope of a shaly ridge.
97	16377	21 24·430	4745·1	98, 99	2½ miles north of Tindir Creek in a saddle on the ridge.
98	7517	20 10·45	4224·5	97, 99	About 1 mile north of, and 2000 feet above Tindir Creek, on the summit of the ridge.
99	24049	16 13·778	4778·9	97, 98	4 miles south of Tindir Creek on the crest of a sharp southeasterly spur of a prominent dome-shaped mountain.
100	24400	12 13·65	2202·8	.. ..	Beside an old trail on the south bank of Cathedral Creek, and 100 feet from the edge of the bank.
101	16159	09 34·63	4180·6	.. ..	3 miles south of Cathedral Creek in a saddle on a high ridge.
102	26336	05 15·45	2092·0	.. ..	On a low bench about 500 feet north of Hard Luck Creek.
103	20732	01 51·42	3430·3	105 ..	2½ miles north of Tatonduk River, on the western side of a saddle near the end of the ridge.
104	14458	64 59 29·14	1095·2	.. ..	On a low bench 400 feet south of Tatonduk River.
105	27399	54 59·496	4215·4	103, 106	200 feet west of the summit of a high dome on the divide between Shade Creek and Tatonduk River.
106	17998	52 02·37	2732·1	105, 107	On the divide between Shade and Last Chance Creeks.
107	10942	50 14·68	1704·6	106 ..	On a low spur just north of Last Chance Creek.
108	13975	47 57·14	2304·6	105, 109	On the east slope of a saddle in the divide between Last Chance and Eagle Creeks.
109	14619	45 33·266	2573·4	108, 110	1½ miles south of Eagle Creek, on the summit of the ridge.
110	18064	42 35·49	1697·9	109, 113	1¾ miles north of Yukon River crossing, on the westerly slope of the ridge.
111	9028	41 06·64	1036·0	112 ..	Large monument on the north bank of Yukon River, about 150 feet above the river.
112	1537	40 51·513	879·3	111 ..	Large monument on the south bank of Yukon River, 20 feet from the edge of the bank.
113	8408	39 28·77	2477·3	110, 114	1¼ miles south of Yukon River, on the rather flat summit of the ridge.
114	9873	37 51·607	2988·9	113, 114A	3½ miles south of Yukon River, and 25 feet from the southern edge of the ridge.
	9151				

LIST OF MONUMENTS, ETC.—*Continued.*

Number of Monument.	Distance between Monuments in feet.	Latitude. ° ′ ″	Elevation at base in feet.	Nearest visible Monuments. Nos.	Description.
114A		36 21·545	2907·1	114, 115	5½ miles south of Yukon River, on the summit of a broad flat ridge.
	16448				
115		33 39·660	3395·1	114A, 115A	On the summit of a ridge about midway between Fortymile Dome and Yukon River.
	6697				
115A		32 33·75	2830·6	115, 116	2½ miles north of Liberty Fork, on the easterly slope of a ridge.
	18427				
116		64 29 32·388	2801·1	115A, 117	1¼ miles south of Liberty Fork, on the easterly slope of a north and south ridge.
	7735				
117		28 16·266	2946·5	115A, 116	2½ miles south of Liberty Fork, on the summit of a rather flat ridge.
	17813				
118		25 20·954	3271·7	117, 118A	On the westerly slope of a long saddle in the ridge southeast of Fortymile Dome.
	18282				
118A		22 21·020	2603·9	118, 119	4 miles north of Fortymile River, on an easterly spur of a ridge paralleling South Boundary Creek.
	6745				
119		21 14·635	2542·3	118A, 120	2¾ miles north of Fortymile River on an easterly spur of a ridge paralleling South Boundary Creek.
	5251				
120		20 22·955	2315·8	119, 121	1¾ miles north of Fortymile River on an easterly spur of a ridge paralleling South Boundary Creek.
	9070				
121		18 53·69	1240·3	120, 122	Large monument immediately north of Fortymile River near the southeast end of a rocky ridge between South Boundary and Sam Patch Creeks.
	3466				
122		18 19·576	1701·0	120, 121	About ½ mile south of Fortymile River, on a northwesterly shoulder of the ridge.
	11212				
123		16 29·228	1814·4	120, 123A	Near the northern edge of the rather flat ridge between Moose and Alma Creeks.
	12482				
123A		14 26·373	2348·7	123, 124	5 miles south of Fortymile River on the westerly slope of the valley near the head of Alma Creek.
	12503				
124		12 23·316	2749·0	123A, 125	On the westerly slope of Baldy Mountain, about 1¼ miles from the summit.
	21567				
125		08 51·042	3131·6	124, 125A	On the westerly slope of a small eminence about 4 miles south and west of Baldy Mountain.
	11815				
125A		06 54·75	3064·5	125, 126	On the westerly slope of a ridge lying between two forks of Hall Creek.
	10613				
126		05 10·290	4238·0	125A, 126A	In a saddle in a high rocky ridge immediately north of Davis Creek.
	5256				
126A		04 18·563	4072·6	126, 127	Near the northern edge of the flat top of the ridge immediately south of Davis Creek.
	19237				
127		01 09·217	4227·3	126A, 128	In a deep saddle in the second ridge south of Poker Creek.
	17351				
128		63 58 18·438	3824·3	127, 129	On the easterly slope of a rise in the ridge between the headwaters of Bedrock and Pat Murphy Creeks.
	14769				
129		55 53·067	3821·5	128, 132	1½ miles north of Sixtymile River on the easterly slope of the ridge.
	8506				
130		54 29·35	2622·3	131 ..	Large monument on the north bank of Sixtymile River, 100 feet above the river.
	466				
131		54 24·77	2556·3	130 ..	In the flat on the south side of Sixtymile River, 96 feet from the edge of the bank.
	10193				
132		52 44·436	3456·7	129, 133	2 miles south of Sixtymile River on the summit of the second ridge south of the river.
	21849				
133		49 09·376	5031·9	132, 135	6 miles south of Sixtymile River at the western edge of the large, flat, rocky top of the ridge.
	15363				
134		46 38·150	2576·9	.. ..	30 feet north of the north bank of North Fork of Ladue River.
	9677				
135		45 02·895	3892·0	133, 136	2 miles south of North Fork of Ladue River on the northeasterly slope of the ridge.
	19720				
136		41 48·790	3351·2	135, 138	5½ miles south of the most northerly crossing of North Fork of Ladue River.
	14896				
137		39 22·169	2581·7	136, 138	3 miles north of the junction of McElfish Creek and North Fork of Ladue River.
	15210				
138		36 52·453	1845·4	137, 140	30 feet south of the south bank of McElfish Creek, ½ mile above its junction with North Fork of Ladue River.
	14138				
139		34 33·284	1822·0	.. ..	20 feet north of the north bank of a small creek about 3 miles south of the mouth of McElfish Creek.
	7287				
140		33 21·558	2580·1	138, 141	On the first ridge crossed by the line south of Ladue valley.
	13867				
141		31 05·055	2963·0	137, 140	On the summit of the ridge 1 mile north of Deep Creek.
	18125				
142		28 06·645	3253·2	136, 143	On a broad, thinly timbered ridge, 2½ miles south of Deep Creek.
	17239				
143		25 16·946	3223·4	142, 144	10 miles north of Ladue River, on the summit of a high and rather narrow ridge.
	15462				
144		22 44·747	2728·9	143, 145	7½ miles north of Ladue River, on an easterly shoulder of the main ridge.
	12860				
145		20 38·155	1670·8	144 ..	5 miles north of Ladue River, and 80 feet north of the north bank of a small creek.
	17952				
146		17 41·441	3110·5	144, 147	On the summit of the first ridge north of Ladue River.
	9871				
147		16 04·279	1479·4	146 ..	Large monument 140 feet south of the south bank of Ladue River.
	15761				
148		13 29·122	2993·1	146, 149	On the summit of the ridge 3 miles south of Ladue River.
	16391				

LIST OF MONUMENTS, ETC.—*Continued.*

Number of Monument.	Distance between Monuments	Latitude.	Elevation at base	Nearest visible Monuments.	Description.
	feet.	° ′ ″	*feet.*	*Nos.*	
149	7337	10 47·773	3878·5	148, 150	6 miles south of Ladue River on a small rockslide on the westerly side of a flat dome at the northern end of Moosehorn Mountains.
150	12338	09 35·552	3891·6	149, 151	7½ miles south of Ladue River, on the westerly slope of a flat dome.
151	17695	07 34·099	3471·9	150, 152	10 miles south of Ladue River, on the summit of a westerly spur of Moosehorn Mountains.
152	20430	04 39·911	3099·7	151, 153	On the summit of a westerly spur near the southern end of Moosehorn Mountains.
153	18903	01 18·805	2755·0	153, 154	On the easterly slope of Mosquito Knob, 2 miles north of the headwaters of Scottie Creek.
154	16650	62 58 12·726	2283·4	153, 155	3½ miles north of the most northerly crossing of Scottie Creek, on the westerly slope of a slight rise.
155	15399	55 28·819	2147·8	154, 156	On the summit of a slight rise near the end of the ridge between Yellowwater and Scottie Creeks.
156	14933	52 57·228	1913·3	155, 157	100 feet north of the north bank of Scottie Creek, at its second crossing of the line.
157	9110	50 30·223	2656·7	156, 158	2¾ miles south of the second crossing of Scottie Creek, on the westerly slope of the ridge.
158	22269	49 00·537	3505·7	157, 159	4½ miles south of the second crossing of Scottie Creek, on the summit of the ridge.
159	9438	45 21·304	3236·5	158, 160	8 miles north of the third crossing of Scottie Creek, on the summit of a ridge.
160	19866	43 48·394	3221·1	159, 161	6½ miles north of the third crossing of Scottie Creek, on a westerly spur of the ridge.
161	13767	40 32·821	2323·8	160, 162	2½ miles north of the third crossing of Scottie Creek, on the summit of a low ridge.
162	19027	38 17·290	1831·7	161, 163	40 feet south of the south bank of Scottie Creek, at its third crossing of the line.
163	7024	35 09·970	2182·3	162, 164	3½ miles south of the third crossing of Scottie Creek, in a saddle on the ridge.
164	15832	34 00·819	2679·3	163, 165	3 miles north of Mirror Creek, on the summit of a long timbered ridge.
165	18915	31 24·952	1973·7	164, 166	100 feet north of the north bank of the north branch of Mirror Creek, which forks just west of the Line.
166	6601	28 18·739	2681·4	165, 167	1 mile north of Snag River, on the summit of a timbered ridge.
167	19418	27 13·749	2084·2	166, 168	50 feet south of the south bank of Snag River.
168	34251	24 02·578	2159·5	167, 169	3½ miles south of Snag River, and abreast of the "Little Hills."
169	30530	18 25·369	2340·2	168, 170	In the Snag Flats, 6 miles south of the "Little Hills."
170	20787	13 24·792	2584·6	169, 171	340 feet south of the east bank of Beaver Creek, at its third crossing of the line.
171	14154	10 00·136	3446·1	170, 172	On the summit of the steep rock slope, 1½ mile north of the second crossing of Beaver Creek.
172	7750	07 40·779	4234·9	171, 173	2 miles south of the second crossing of Beaver Creek, on the easterly shoulder of the ridge.
173	13414	06 24·48	3168·0	172, 174	750 feet south of Baultoff Creek, and 100 feet above it.
174	5630	04 12·401	5566·3	173, 175	3 miles south of Baultoff Creek, on the summit of a sharp ridge.
175	9692	03 16·971	5561·8	174, 176	On the summit of the sharp ridge immediately south of Eureka Gulch.
176	19215	01 41·545	5454·4	175, 176A	4½ miles north of the first crossing of Beaver Creek, at the northern edge of the plateau.
176A	3876	61 58 32·361	3867·0	177, 178	One-half mile north of the first crossing of Beaver Creek, on the easterly slope of the ridge.
177	8781	57 54·199	3450·5	176A, 178	One-quarter mile south of, and overlooking the first crossing of Beaver Creek.
178	18742	56 27·741	5515·2	177, 180	1½ miles south of the first crossing of Beaver Creek, at the top of the steep northern face of the ridge.
179	17521	53 23·209	4205·1	180 ..	5½ miles south of the first crossing of Beaver Creek, on the westerly slope of the ridge.
180	11188	50 30·700	6791·0	179, 181	7 miles north of White River, on the summit of a high rocky peak.
181	24046	48 40·542	6447·3	180, 182	5 miles north of White River, on the summit of the first ridge north of the river.
182	5272	44 43·781	3125·2	181, 183	Large monument 80 feet north of the edge of the cut bank of gravel, on the north side of White River valley.
183	4452	43 51·867	3089·6	182, 184	Large monument ¾ mile south of White River, 20 feet south of the edge of the bank south of the flats.
184	20589	43 08·025	3475·5	183, 185	1½ miles south of White River, on the westerly slope of the ridge.
185	4005	39 45·307	3548·6	184, 186	10 feet south of the south bank of Kletsan Creek.
186	11434	39 05·882	3799·7	185, 187	Three-quarters of a mile south of the crossing of Kletsan Creek.

LIST OF MONUMENTS, ETC.—*Concluded.*

Number of Monument.	Distance between Monuments	Latitude.	Elevation at base	Nearest visible Monuments.	Description.
	feet.	° ′ ″	*feet.*	*Nos.*	
187		37 13·302	4363·5	186, 187A	3 miles south of the crossing of Kletsan Creek, on a low ridge covered with volcanic ash.
	8596				
187A		35 48·659	5733·1	186, 187	5 miles south of the crossing of Kletsan Creek, on the easterly slope of a high ridge.
	260975				
189		60 52 58·901	8593·0	.. ..	On the summit of the ridge between Logan and Walsh Glaciers.
	3893				
190		52 20·562	5660·0	.. ..	One-quarter mile north of the north edge of Logan Glacier, and 900 feet above it.
	17790				
191		49 25·380	5303·7	.. ..	One-quarter mile south of the south edge of Logan Glacier, and 500 feet above it. This is the most southerly monument.

We certify that the foregoing is a true list of the permanent monuments established on the International Boundary between the United States and Canada along the 141st Meridian from the Arctic Ocean to Mount St. Elias, in accordance with Article II of the Convention between the United States and Great Britain, signed at Washington April 21, 1906; and that the boundary is a straight line joining adjacent monuments southward from the Arctic Ocean to Monument No. 191, from which point it continues southward along the 141st Meridian to the point of intersection with the coast boundary line, latitude 60° 18′ 22″·3, longitude 141° 00′ 00″, on the western shoulder of Mount St. Elias, as shown on the maps accompanying this report.

J. J. McARTHUR,
His Britannic Majesty's Commissioner.

E. C. BARNARD,
United States Commissioner.

DESCRIPTIONS OF FIELD METHODS, INSTRUMENTS, COMPUTATIONS AND MAPS.

TELEGRAPHIC LONGITUDE AT THE YUKON IN 1906.

The observatory was erected on the south bank of the Yukon about three hundred and fifty feet east of Ogilvie's line, and it was connected by a loop with the adjacent Canadian Government telegraph line, thus giving connections with Fort Egbert (Eagle City), Alaska, and with Vancouver.

The observers at these points were:—

Vancouver.......Dr. O. J. Klotz, Dominion Observatory, Ottawa.
Fort Egbert......Edwin Smith, Assistant, C. & G. Survey, Washington.
Boundary........F. A. McDiarmid, Dominion Observatory, Ottawa.

Observations were commenced on August 19, 1906, and were completed by September 3, six determinations of differences of longitude being made between both Fort Egbert and Vancouver and the Boundary. The instrument used at the Boundary was C. & G. Astronomical Transit No. 18.

All the observers used transit instruments equipped with the travelling wire micrometer, and no observations were made for personal equation, as it was then thought that the transit micrometer practically eliminated this. A complete night's work consisted of two time sets of twelve or fourteen stars each. Each time set was observed in two parts, six or seven stars in clamp east, and the others in clamp west. Each half set contained one polar star for the determination of the azimuth of the instrument. Signals were exchanged between the sets, thus reducing to a minimum the effect of errors of clock rate. All observations were recorded automatically on a chronograph.

During these observations the chronometers were kept at as constant a temperature as possible by leaving them in their transportation boxes, which were lined with three inches of hair padding. In this manner the variation of the temperature of the chronometers was kept within about two degrees.

In connection with the longitude work, experiments were carried out to ascertain if the times of transmission of signals going in opposite directions were identical. A possibility of difference arose from the fact that the line Vancouver to Boundary was in four sections, and at the several relay stations separate sets of two relays each were used to repeat signals going north and south, respectively. Although these repeaters, of the Weiny-Phillips type, were all alike, and their adjustments very similar, there could be no absolute assurance that they all did their work with equal rapidity, hence a small difference between transmission times north and south was possible, or even probable. The result of these experiments tended to show that the time of transmission from Boundary to Vancouver was 0·022*s*. less than that in the opposite direction, though it was not very certain whether the difference was apparent or real, owing to the non-interagreement of certain of the results.

The computed longitude of the observation pier is 9*h*. 24*m*. 00·027*s*., or, the pier is 17·62 feet west of the 141st Meridian. This distance was measured off and a permanent mark set on the boundary, this being the first point actually located on the meridian.

The final result for the longitude was obtained by a solution of the different longitude triangles connecting the pier near the 141st Meridian with Montreal, Harvard, and Seattle, these being assumed to be absolute points for longitude.

DIFFERENCE OF LONGITUDE BETWEEN FORT EGBERT (EAGLE), ALASKA, AND BOUNDARY, YUKON TERRITORY.

	Difference of Chronometers.			Difference of chronometer corrections, ΔT	Difference of longitude $\Delta \lambda$	v.
	From western or Egbert signals.	From eastern or Boundary signals.	Mean.			
1906.	*s.*	*s.*	*s.*	*m.* *s.*	*s.*	*s.*
Aug. 19	48·144	48·145	48·144	− 1 38·188	−50·044	−0·046
" 22	41·291	41·290	41·291	− 1 31·275	−49·984	+0·014
" 23	37·181	37·182	37·181	− 1 27·154	−49·973	+0·025
" 25	27·758	27·762	27·760	− 1 17·756	−49·996	+0·002
" 28	10·077	10·075	10·076	− 0 59·988	−49·912	+0·086
" 29	02·057	02·056	02·057	− 0 52·136	−50·079	−0·081
				Mean.	−49·998	±0·016

Observers:—Fort Egbert, Edwin Smith.
Boundary, F. A. McDiarmid.

At Boundary, the observatory was on the south bank of the Yukon River, and is 352 feet east of the "Ogilvie Line," and about 20 feet south from the bank of the river.

At Fort Egbert the station was located a little southeast of the United States Military Telegraph Office.

DIFFERENCE OF LONGITUDE BETWEEN VANCOUVER, BRITISH COLUMBIA AND BOUNDARY, YUKON TERRITORY.

	Difference of Chronometers.			Difference of chronometer corrections ΔT	Difference of longitude $\Delta \lambda$	Probable error.	v.
	From western or Boundary signals.	From eastern or Vancouver signals.	Means.				
1906.	*h. m. s.*	*s.*	*s.*	*s.*	*h. m. s.*	*s.*	*s.*
Aug. 22	1 11 50·247	49·790	50·018	−18·421	1 11 31·597	± 0·049	−0·001
" 25	11 30·723	30·284	30·504	+ 1·046	31·550	± 0·022	−0·046
" 27	11 14·084	13·635	13·859	+17·770	31·629	± 0·017	−0·033
" 29	10 57·959	57·516	57·738	+33·886	31·624	± 0·027	−0·028
" 31	11 08·610	08·203	08·406	+23·255	31·661	± 0·018	−0·065
Sept. 2	11 05·078	04·657	04·868	+26·637	31·505	± 0·019	+0·091
			Weighted	Mean.	1 11 31·596	± 0·009	±0·016

Observers:—Boundary, F. A. McDiarmid.
Vancouver, Dr. Otto Klotz.
Average transmission time, 0·218*s*.

At Vancouver, the observatory was at Brockton Point in Stanley Park.

At Boundary, the observatory was on the south bank of the Yukon River, and was 370 feet east of the "Ogilvie Line," and about 20 feet south from the bank of the Yukon River.

DIFFERENCE OF LONGITUDE BETWEEN SEATTLE, WASHINGTON, AND SITKA, ALASKA.

	Difference of Chronometers.			Difference of chronometer corrections. △ T	Difference of longitude. △ λ	v
	From western or Sitka signals.	From eastern or Seattle signals.	Mean.			
1905.	*m.* *s.*	*m.* *s.*	*m.* *s.*	*m.* *s.*	*m.* *s.*	*s.*
May 24[1]	58 38·146	58 37·827	58 37·986	−06 36·716	52 01·270	−0·055
" 25[1]	46·314	46·004	46·159	− 44·985	01·174	+0·041
" 26[1]	54·596	54·280	54·438	− 53·150	01·288	−0·073
" 27[1]	59 03·095	59·02·807	59 02·951	−07 01·749	01·202	+0·013
" 28[1]	11·856	11·560	11·708	− 10·437	01·271	−0·056
June 13[2]	61 26·908	61 26·614	61 26·761	−09 25·539	01·282	−0·007
" 18[2]	62 08·960	62 08·707	62 08·834	−10 07·755	01·079	+0·136
				Mean.....	52 01·215	± 0·019

Observers:—[1]Sitka, J. E. McGrath.
[1]Seattle, Edwin Smith.
[2]Sitka, Edwin Smith.
[2]Seattle, J. E. McGrath.
Average time of transmission, 0·148*s.*

At Sitka, transit No. 18 was mounted on a concrete pier in the Astronomical Observatory of the United States Coast and Geodetic Survey Magnetic Station.

At Seattle, transit No. 19 was mounted on a concrete pier on the old grounds of the Washington State University, 26·34 meters east and 61·62 meters north of the station of 1886.

Reduction from 1905 station to 1892 station, +0·446*s.*

Hence the astronomic longitude of the 1892 station has been increased from 9*h.* 01*m.* 21·48*s.* as given by 1892 chronometric observations, to 9*h.* 01*m.* 21·935*s.* in the 1905 telegraphic observations, an increase of 0·455*s.*

DIFFERENCE OF LONGITUDE BETWEEN SITKA, ALASKA, AND VALDEZ, ALASKA.

	Difference of Chronometers.			Difference of chronometer corrections, △ T	Difference of longitude, △ λ	v
	From western or Valdez signals.	From eastern or Sitka signals.	Mean.			
1905.	*m.* *s.*	*m.* *s.*	*m.* *s.*	*m.* *s.*	*m.* *s.*	*s.*
Sept. 25	39 33·579	39 33·488	39 33·534	+ 4 11·103	43 44·637	+0·137
Oct. 14	37 34·767	37 34·629	37 34·698	+ 6 10·053	·751	+0·023
" 27	36 06·511	36 06·390	36 06·450	+ 7 38·436	·886	−0·112
Nov. 24	32 43·735	32 43·605	32 43·670	+11 01·122	·792	−0·018
" 25	32 35·210	32 35·078	32 35·144	+11 09·661	·805	−0·031
				Mean.....	43 44·774	± 0·028

Observers:—Valdez, J. E. McGrath.
Sitka, Edwin Smith.
Average time of transmission, 0·064*s.*

At Sitka, transit No. 18 was mounted on a concrete pier in the Astronomical Observatory of the United States Coast and Geodetic Survey Magnetic Station.

At Valdez, transit No. 19 was mounted 5·244 meters from the center of Observatory triangulation station.

DIFFERENCE OF LONGITUDE BETWEEN VALDEZ, ALASKA, AND EAGLE (FORT EGBERT), ALASKA.

	Difference of Chronometers. From western or Valdez signals.	Difference of Chronometers. From eastern or Eagle signals.	Difference of Chronometers. Mean.	Difference of chronometer corrections, $\triangle T$	Difference of longitude, $\triangle \lambda$	v
1905.	m. s.	m. s.	m. s.	s.	m. s.	s.
July 18	19 52·736	19 52·656	19 52·696	+23·571	20 16·267	−0·062
" 22	52·922	52·859	52·890	+23·345	·235	−0·030
" 25	52·834	52·764	52·799	+23·470	·269	−0·064
Aug. 22	53·283	53·243	53·263	+22·865	·128	+0·077
" 26	49·930	49·870	49·900	+26·227	·127	+0·078
				Mean	20 16·205	± 0·022

Observers:—Valdez, J. E. McGrath.
Eagle, Edwin Smith.
Average time of transmission, 0·031*s*.

At Valdez, transit No. 19 was mounted 5·244 meters from the center of Observatory triangulation station.

At Eagle (Fort Egbert) transit No. 18 was mounted on a concrete pier a little southeast of the United States Military Telegraph Office.

DIFFERENCE OF LONGITUDE BETWEEN VANCOUVER, BRITISH COLUMBIA, AND SEATTLE, WASHINGTON.

	Difference of Chronometers. From western or Vancouver signals.	Difference of Chronometers. From eastern or Seattle. signals.	Difference of Chronometers. Mean.	Difference of chronometer corrections, $\triangle T$	Difference of longitude, $\triangle \lambda$	Probable error.	v.
1905.	m. s.	m. s.	s.	s.	m. s.		s.
June 1	2 17·676	2 17·577	17·626	−50·647	3 08·273	± 0·027	−0·086
" 7	36·155	36·012	36·084	−32·073	·157	± 0·018	+0·030
" 8	38·758	38·632	38·695	−29·372	·067	± 0·026	+0·120
" 9	41·773	41·651	41·712	−26·468	·180	± 0·029	+0·007
" 13	53·855	53·727	53·791	−14·405	·196	± 0·021	−0·009
" 14	57·434	57·316	57·375	−10·854	·229	± 0·018	−0·042
			Mean		3 08·184		
			Weighted	mean	3 08·187	± 0·017	±0·019

Observers:—Vancouver, Dr. Otto Klotz.
Seattle, Edwin Smith and J. E. McGrath.
Average transmission time, 0·063*s*.

At Vancouver the observatory was at Brockton Point in Stanley Park.

At Seattle, the transit was mounted on concrete pier in the old State University grounds.

ADJUSTMENT OF LONGITUDE DIFFERENCES.

Stations.	Longitude differences (observed).	Correction for closure.	Adjusted longitude differences.
	h. m. s.	*s.*	*h. m. s.*
Montreal[1] — Cliff St.	+0 08 31·388	+0·001	+0 08 31·389
Cliff St. — Dominion	−0 00 01·775	−0·048	+0 00 01·727
Harvard[1] — Dominion	−0 18 20·543	+0·047	−0 18 20·590
Cliff St. — Vancouver	+3 09 38·352	+0·048	+3 09 38·400
Vancouver — Seattle[1]	−0 03 08·187	+0·062	−0 03 08·249
Vancouver — Boundary	+1 11 31·596	+0·008	+1 11 31·604
Seattle[1] — Boundary[2]	+1 14 39·786	−0·033	+1 14 39·753

[1] Harvard, Montreal, and Seattle are stations in the adjusted longitude net of the United States, and their values for longitude are assumed absolute.
[2] See table below for adjustment of the Seattle–Boundary loop.

By combining the different equations obtained in closing this loop and solving by the method of least squares, we get the following adjusted longitudes:—

	h.	*m.*	*s.*
Montreal	4	54	18·634
Ottawa (Cliff St.)	5	02	50·023
Ottawa (Dominion)	5	02	51·750
Vancouver	8	12	28·423
Boundary (via Vancouver)	9	24	00·027
Boundary (via Egbert)	9	24	00·027

ADJUSTMENT OF SEATTLE—BOUNDARY LOOP.

Stations.	Longitude differences (observed).	Correction for loop closure.	Adjusted longitude difference.
	h. m. s.	*s.*	*h. m. s.*
Seattle — Sitka	+0 52 01·215	−0·008	+0 52 01·207
Sitka — Valdez	+0 43 44·774	−0·008	+0 43 44·766
Valdez — Eagle	−0 20 16·205	−0·008	−0 20 16·213
Eagle — Boundary	−0 00 49·998	−0·009	−0 00 50·007

The correction of 0·033*s* between Seattle and Boundary resulting from the loop closure was distributed evenly between the stations in the loop. From the above longitude differences we get the following adjusted longitudes:—

	h.	*m.*	*s.*	*s.*
Seattle	8	09	20·274	±0·055
Sitka	9	01	21·481	±0·058
Valdez	9	45	06·247	±0·064
Eagle	9	24	50·034	±0·068
Boundary	9	24	00·027	

AZIMUTH OF THE LINE.

The initial point on the Boundary having been located by measuring 17·62 feet east from the longitude observation pier, a second point on the line was obtained by placing on the hill to the south of the observatory, at a distance of about one and one-quarter miles, a mark consisting of the usual box with slit and light. The azimuth of the line from the center of the pier to the mark was then observed, the off-set from the mark to the meridian computed, and a second permanent mark set on the line.

In determining the azimuth of the line from the pier to the mark, the method of "azimuth from stars near culmination" was used. The transit (C. & G.S. Astronomical Transit No. 18) which had been used for the longitude work was employed for azimuth also, the observers being G. Clyde Baldwin of the Coast and Geodetic Survey, for the United States, and F. A. McDiarmid, of the Dominion Observatory, for Canada, the accepted azimuth being the mean of the results of their observations.

For convenience, the azimuth mark was set approximately in the center of the field of the instrument. A complete observation consisted of ten readings on the mark, ten on the star noting the times, reading the striding level, reversing the instrument in the wyes and again reading the level, ten readings on the star noting the times, and ten on the mark. All readings on both star and mark were made by the micrometer, and the star was observed just before and just after crossing the meridian. Great care was necessary in reading the striding level, as any errors here entered directly into the azimuth results with more than their full value.

If b is the inclination of the axis when the west end is high, and if z is the zenith distance of the star, the correction of the azimuth due to level is b cot z. In high latitudes the value of z is always small, and the correction for level is considerable.

The following formula was used in the reduction of the azimuth:—

$$-\tan A = \frac{\sin t}{+\cos\varphi . \tan\delta - \sin\varphi\cos t}$$

where A = the azimuth of the star.
φ = the latitude of the place of observation,
δ = the declination of the star,
and t = the hour angle of the star.

If α is the right ascension of the star, and T is the chronometer time of observation and ΔT is the error of the chronometer, $t = (T + \Delta T - \alpha)$.

In the azimuth work on the 141st Meridian ΔT is determined from time sets as for longitude determinations. The curvature correction for stars observed at culmination is practically zero.

The correction for diurnal aberration is given by

$$0''\cdot 32 \frac{\cos A . \cos\varphi}{\sin z}$$

where A = the azimuth of the star,
φ = the latitude of the place of observation,
and z = the zenith distance of the star.

The record of the observations follows:—

Observer—F. A. McDiarmid.

Date.	Star.	Azimuth.	v.	v².
1907.		° ′ ″	″	
April 29	α Ursae Minoris	180 00 01·94	−0·19	0·0361
" 30	α "	179 59 59·83	+1·92	3·6864
May 1	α "	180 00 01·76	−0·01	0·0001
" 2	α "	180 00 01·97	−0·13	0·0169
April 30	6 "	180 00 01·94	−0·19	0·0361
May 2	6 "	180 00 01·91	−0·16	0·0256
April 30	43 Helvetii Cephei	180 00 01·64	+0·11	0·0121
May 2	43 "	180 00 01·34	+0·41	0·1681
April 30	Groombridge 944	180 00 01·63	+0·12	0·0144
" 30	δ Ursae Minoris	180 00 02·33	−0·58	0·3364
May 2	δ "	180 00 03·10	−1·35	1·8225
" 2	Groombridge 750	180 00 01·66	+0·09	0·0081
				6·1628

Mean 180° 00′ 01″·75

Probable error $= \pm \cdot 6745 \left(\frac{6\cdot 1628}{12 \times 11}\right)^{\frac{1}{2}} = \pm\ 0''\cdot 145$

Azimuth of mark = 180° 00′ 01″·75 ± 0″·145

Observer—G. Clyde Baldwin.

Date.	Star.	Azimuth.	v.	v².
1907.		° ′ ″	″	
May 1	α Ursae Minoris	180 00 03·10	−0·36	·1296
" 1	43 Helvetii Cephei	180 00 02·29	+0·45	·2025
" 1	Groombridge 750	180 00 03·77	−1·03	1·0609
" 1	" 944	180 00 03·30	−0·56	·3136
" 1	δ Ursae Minoris	180 00 02·54	+0·20	·0400
" 7	α "	180 00 04·17	−1·43	2·0449
" 8	α "	180 00 04·19	−1·45	2·1025
" 8	43 Helvetii Cephei	180 00 04·50	−1·76	3·0076
" 14	α Ursae Minoris	180 00 01·33	+1·41	1·9881
" 14	43 Helvetii Cephei	180 00 01·28	+1·46	2·1316
" 14	Groombridge 750	180 00 02·15	+0·59	·3481
" 14	δ Ursae Minoris	180 00 00·20	+2·54	6·4516
				19·9110

Mean 180° 00′ 02″·74

Probable error $= \pm \cdot 6745 \left(\frac{19\cdot 9110}{12 \times 11}\right)^{\frac{1}{2}} = \pm\ 0''\cdot 262$

Azimuth of mark = 180° 00′ 02″·74 ± 0″·262

Mean of two sets = 180° 00′ 02″·25[1]

LATITUDE AT THE YUKON.

In connection with the longitude work, the latitude of the pier was determined by Mr. McDiarmid using "Talcott's zenith distance method." This consists in the measurement, by means of a zenith telescope, of the difference of zenith distances of two stars of nearly equal zenith distance, but on opposite sides of the zenith. The astronomical transit used in the time work was readily converted into a zenith telescope by attaching to the setting circle a good level, and by turning the eye-piece through an angle of 90° in order to have the micrometer wire move in zenith distance instead of longitudinally across the meridian.

[1]The astronomic azimuth is here reckoned from north as zero, while in the list of geographic positions it is reckoned from south as zero, westward around the horizon.

If δ and δ' are the declinations of the south and north stars, and z and z' their zenith distances, the latitude is given by the equation

$$\varphi = \frac{(\delta + \delta')}{2} + \frac{(z - z')}{2}$$

the quantity $(z + z')$ being measured on the micrometer and level.

The record of the observations follows:—

Latitude 64° 40′, + tabulated seconds.

F. A. McDiarmid, Observer.

C. & G. S. Catalogues & Reports, 1876. App. No. 7. Stars.	1906 Aug. 23.	Aug. 25.	Aug. 27.	Aug. 28.	Aug. 30.	Aug. 31.	Mean.
1873 1874					52·87		52·87
1873 1885					52·37		52·37
1885 1897					52·01		52·01
1921 1931	49·87				53·37		51·62
1940 1955		48·96			49·89	52·43	50·42
1961 1962	50·47			52·17	52·76	53·10	51·49
2004 2008	49·14	48·72		50·61			49·49
2010 2041	50·26	51·54	52·01	49·01			50·70
2045 2048	52·95	51·79	50·79	52·38			51·98
2086 2098		51·95	48·54	52·13			50·87
2113 2125			52·37				52·37
2129 2138		51·55	53·04	50·34			51·64
2156 2175			50·54				50·54
56 59		52·66					52·66
82 94		49·52					49·52
1899 1916					52·08		52·08

Mean Latitude 64° 40′ 51″·42

LINE PROJECTION.

The method used in prolonging the meridian north and south from the Yukon, on the azimuth there determined for it, was practically the same as that employed by the Mexican Boundary Commission in 1893.[1] A few modifications suggested by the first season's experience were introduced, and will be referred to later.

The instructions issued with reference to tracing the line were as follows:—

The line is to be traced in the following manner, starting at a point on the 141st Meridian. The position of a forward point (or points) near the meridian is to be determined relatively to it by micrometric measurements made independently by each observer. The observers will then compute the distance of such forward point (or points) from the meridian and will each deduce the position of a point on the meridian from the results obtained by him. The mean of these two positions will then be marked upon the ground as a point on the true meridian. This new point will serve as the starting point from which the next forward station on the meridian is to be found and established in the same manner. The micrometric measurements by each observer to fix a forward point (or points) from a given station shall consist of not less than nine pointings on the back point and of not less than nine pointings on the forward point (or points). It is expected that the two positions of a forward point on the meridian deduced from the separate observations of the two observers will, in at least 50 per cent of all the cases, subtend an angle at the instrument of less than 3″ (15 millimeters per kilometer). If, in any case, this subtended angle is greater than 10″ (50 millimeters per kilometer) additional observations must be secured until the agreement falls within this limit.

[1] "Report of the Boundary Commission." United States Senate Document No. 247, 55th Congress, 2nd Session, Washington, 1898 Part II, Appendix IV.

Observing at a line-projection station. Indian Grave Mountain in the background.

The instrument used was a Berger & Sons $6\frac{1}{4}$-inch repeating theodolite, the telescope being equipped with a micrometer eyepiece magnifying twenty-five diameters. The focal length was 27 cm. and the diameter of the objective, 33 mm. One division of the micrometer head equalled $1''\cdot72$ nearly.

The projection party established points on the meridian at distances apart varying from two or three to twenty-five miles, being governed in their choice of points by the character of the topography. Most of these "main points" were situated on more or less prominent ridges, and an effort was made to have them not less than 10 nor more than 20 miles apart, distances between these limits being found the most practical both for the projection party and for the stadia party following later.

Main projection stations were lettered south and north from the Yukon A, B, C, etc., and A_1, B_1, C_1, etc., respectively, station Z being on a northerly spur of Mount Natazhat and Z_1 near the Arctic Coast, with the two stations north of it named Et and Cetera.

Heliotropes of the ordinary pattern mounted on tripods were used as fore- and back-sights and for communication, while the instrument party had a British Army pattern heliograph for communication purposes. A modification of the Morse code was used, together with special code signals relating to various features of the work. The fore-heliotrope party, by reporting on the condition of river crossings, good camping places, available feed and other features of interest, was often able to save considerable time for the parties following.

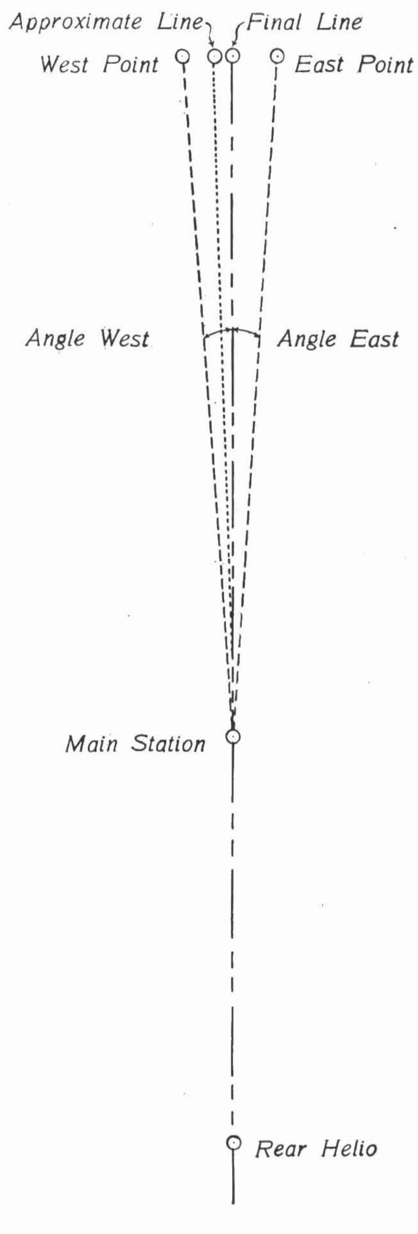
As intimated above, 10 to 15 miles proved to be the most economical working distance for the heliotropes.[1] There were several sights of 25 miles or over, and the fore and rear heliotropes were sometimes able to communicate with each other when as much as 45 miles apart. One great difficulty experienced with the three parties so widely separated was the delay caused by the fact that only under the very best weather conditions were all three heliotropes in sunshine at the same time, and it was found to be more expeditious to keep the three stations closer together, as there was then a greater chance that all would be able to work at the same time.

The procedure at each station might be described as an elaboration of the ordinary transit and picket method of ranging out a line, substituting for the graphic mean of several settings of the picket, the arithmetical mean of a number of micrometer readings on a fixed target.

The transit having been carefully set over the last point determined on the line, and the rear heliotrope over some other known point on the line, usually the last previously determined point, all was in readiness to determine a new point ahead. Setting the micrometer at collimation, which was easily determined by a short series of direct and reverse readings on the rear heliotrope, and transiting through, the fore-heliotrope man, who was showing his light from the ridge on which the new station was to be set, was instructed by means of the heliograph, which direction, east or west, and about how far, to move so that his light would appear about midway between the two vertical wires of the micrometer. This was usually accomplished in two or three moves, as the first move, though merely an estimate, furnished a scale by which to judge the distance between the heliotrope and the line.

The fore-heliotrope man, on being signalled that he was on approximate line, selected and marked two points about $1\cdot5$ meters apart, one on either side of the line, and set his heliotrope over one of them. It was important that he should

[1] "Summary of Line Projection," page 122.



DIAGRAM

ILLUSTRATING

METHOD OF LINE PROJECTION

[NOT TO SCALE]

mark these points before showing his light, so that he would not move his heliotrope, after it had been read on, before marking the point, and thus lose the point and render necessary a repetition of the readings. The readings being completed, the heliotrope was set over the second point which was likewise read on. The distance between the two points had meanwhile been carefully measured by the fore-heliotrope man and was now transmitted to the instrument party and, using this as a base and knowing the deflection angles to the two points as read by the micrometer, a simple proportion gave the position of the true line with reference to either point. This position was then communicated to the fore-heliotrope man, who measured the offset to the true line, marked the position and erected a signal in the usual manner.

The original scheme followed in these micrometric measurements was as follows:—

1. Set the micrometer approximately at its "collimation reading."

2. Point approximately on the rear signal with telescope direct using the upper or lower tangent screw and then leave both horizontal circles clamped until the completion of the set.

3. Point three times with the micrometer on the rear signal, transit through and point three times with the micrometer on the forward signal, reverse the telescope in the wyes and point three times on the rear signal. This constitutes one "set."

4. Level the horizontal axis with the stride level after the approximate pointing on the rear signal at the beginning of the set, and relevel, between, not during, sets as often as necessary.

5. In making the computation of the angle of deflection,

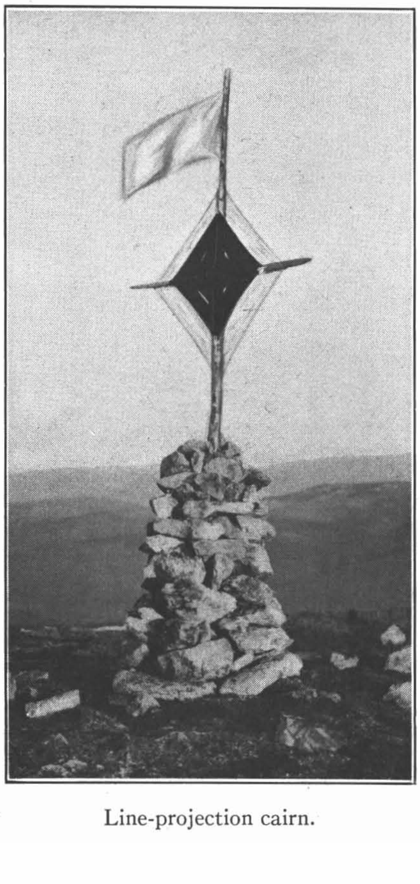
(*a*) Take the means of the pointings in each group of three;

(*b*) Take out the collimation value,

$$C = \frac{(Back\ D + Back\ R)}{2}$$

(*c*) Then the angle of deflection, $= \pm\ (Back\ D - C) \pm (Forward\ D - C)$, in which the algebraic signs must be studied out for the particular instrument and conditions.

The observations were made in alternate sets by a United States and a Canadian observer. If the means of their first three sets did not agree to within 5″ (2·8 divisions of the micrometer head) each took another set and continued doing so until the means of all their sets agreed to within the above limit, no set being discarded unless there was some special reason to doubt it.



Line-projection cairn.

During the first season, the observing scheme was slightly changed so that one "set" (see section 3 above) consisted of two groups of three pointings each on the fore as well as on the rear signal, four groups of three pointings each thus constituting a set. It was also found that clearness in recording was greatly aided by substituting "circle east" and "circle west" for "direct" and "reverse." This modified programme of observing gave a better value for the collimation by taking the mean of the four groups instead of two only, and it also provided a check on the value of the deflection angles by using, in addition to the formula in section 5 (*c*) above, the corresponding formula, $\pm$ (*Back* $R-C$) $\pm$ (*Forward* $R-C$). It was found, however, to be simpler and more expeditious in practice to make the check by the formula

$$\frac{\pm\ (CE.\ S-CW.N)\ \pm\ (CE.N-CW.S)}{2}$$

where CE = circle east, CW = circle west, S = sighting south and N = sighting north. The sign of each expression in brackets in the above was + or − (east or west) according as the numerically smaller term of the expression was + or − (east or west).

It was found necessary on one or two occasions for some special reason, such as shortness of provisions or lateness of the season, to use the cairn on the rear station as the backsight rather than to wait for clear weather for the heliotrope.

The only exception to this method of tracing the line occurred in the region between Mounts Natazhat and St. Elias where, as detailed in the narrative,[1] it was impossible to project the line south in the usual manner, and the only place between these two points where it was found practicable to mark the line was in the vicinity of the Logan and Walsh Glaciers, where three monuments were set. Here the line was established in accordance with the decision of the Commissioners, who agreed that when a point on the 141st Meridian on Chitina River or Glacier had been determined, the line north and south from that point should be drawn on the azimuth derived from the triangulation. Astronomical observations for azimuth taken at this point or at other convenient points were to be used as a check merely.

SUMMARY OF LINE PROJECTION.

Year.	Number of sights.	Longest sight.	Shortest sight.	Average sight.	Total mileage, approximate.
		miles	miles	miles	
1907	10	45·0	0·3	13·12	125·5
1908	8	27·0	2·0	9·4	75·0
1909	4	17·5	10·0	13·0	52·0
1910	11	21·0	5·8	14·1	155·0
1911	9	24·1	6·2	13·6	122·5
1912	3	12·2	3·9	8·5	25·5
	45	45·0	0·3	12·35	555·5

[1] Page 75 *et seq.*

LINE PROJECTION DIVERGENCE TABLE.

South from the Yukon River.

Rear Point.	Inst. Station.	Advance Point.	Length of foresight.	Position of Observers' independent lines relative to line marked. United States.	Position of Observers' independent lines relative to line marked. Canadian.	Remarks.
			Miles.	Feet.	Feet.	
	Bald.....	Determined by offset from Az. Station East.....				17·619 feet.
	Mac......	Determined by offset from Az. Mark East......				17·762 feet.
Mac.......	Bald.....	Rom.....	0·4	E 0·018	W 0·018	Stations Bald, Mac, Rom. and Brab were used to get the line up out of the Yukon Valley.
Rom.......	Bald.....	Mac No. 2	1·5	W 0·044	E 0·044	
Rom.......	Mac No. 2	Brab.....	2·1	W 0·152	E 0·152	
Mac 2.....	Brab.....	C........	2·2	W 0·022	E 0·022	Stations A and B are not shown, as they were intermediate only and did not affect the direction of the line.
Brab.......	C........	D........	1·9	W 0·005	E 0·005	
C..........	D........	E........	4·8	W 0·039	E 0·039	
D..........	E........	F........	9·5	E 0·113	W 0·113	
D..........	E........	G........	32·7	E 0·752	W 0·752	
E..........	G........	H........	4·6	W 0·052	E 0·052	
E..........	G........	I........	18·1	E 0·120	W 0·120	
G. H.......	I........	J........	8·5	E 0·057	W 0·057	
I. M.......	L........	K........	19·9	W 0·152	E 0·152	
I..........	M........	L........	1·4	E 0·065	W 0·065	
G. H. J.....	I........	M........	53·5	E 0·765	W 0·765	
M..........	O........	N........	14·1	E 0·151	W 0·151	
I..........	M........	O........	23·6	W 0·012	E 0·012	
M..........	O........	P........	6·0	E 0·233	W 0·233	
O..........	P........	Q........	3·7	W 0·059	E 0·059	
P..........	Q........	R........	7·5	W 0·045	E 0·045	
P..........	R........	S........	6·6	E 0·433	W 0·433	
R..........	S........	T........	23·7	W 2·592	E 2·592	
R..........	S........	U........	27·7	E 1·047	W 1·047	
S..........	U........	V........	1·1	E 0·028	W 0·028	
S..........	U........	W........	15·7	E 0·375	W 0·375	
U..........	W........	X........	2·1	....	....	United States Observer only, Canadian ill.
W..........	X........	Y........	6·4	....	....	" "
W. X. Y....	Z........	....	10·1	....	....	Z lined in with W, X and Y.

North from the Yukon.

Brab.......	C........	A_1.......	6·9	W 0·026	E 0·026	
Brab.......	C........	B_1.......	17·8	E 0·049	W 0·049	
C..........	B_1.......	C_1.......	9·9	E 0·364	W 0·364	
C..........	B_1.......	D_1.......	16·7	E 0·777	W 0·777	
B_1..........	D_1.......	E_1.......	7·7	W 0·279	E 0·279	
D_1..........	E_1.......	F_1.......	5·9	E 0·361	W 0·361	
E_1..........	F_1.......	G_1.......	15·7	E 0·399	W 0·399	
F_1..........	G_1.......	H_1.......	20·3	E 0·002	W 0·002	
G_1..........	H_1.......	I_1.......	13·9	E 0·238	W 0·238	
H_1..........	I_1.......	J_1.......	10·7	E 0·231	W 0·231	
I_1..........	J_1.......	K_1.......	12·6	E 0·542	W 0·542	
J_1..........	K_1.......	L_1.......	14·9	W 0·366	E 0·366	
K_1..........	L_1.......	M_1.......	13·5	W 0·065	E 0·065	
L_1..........	M_1.......	N_1.......	21·0	W 0·108	E 0·108	
M_1..........	N_1.......	O_1.......	14·6	W 0·011	E 0·011	
N_1..........	O_1.......	P_1.......	15·8	W 0·350	E 0·350	
O_1..........	P_1.......	Q_1.......	11·3	E 0·321	W 0·321	
P_1..........	Q_1.......	R_1.......	21·6	W 0·098	E 0·098	
Q_1..........	R_1.......	S_1.......	24·1	E 4·696	W 4·696	
R_1..........	S_1.......	T_1.......	11·5	E 0·177	W 0·177	
S_1..........	T_1.......	U_1.......	11·4	W 0·075	E 0·075	

LINE PROJECTION DIVERGENCE TABLE—*Con.*

NORTH FROM THE YUKON—*Concluded.*

Rear Point.	Inst. Station.	Advance Point.	Length of foresight.	Position of Observers' independent lines relative to line marked. United States.	Position of Observers' independent lines relative to line marked. Canadian.	Remarks.
			Miles.	Feet.	Feet.	
T_1.........	U_1.......	V_1.......	6·3	W 0·049	E 0·049	
U_1.........	V_1.......	W_1.......	9·6	W 0·318	E 0·318	
V_1.........	W_1.......	X_1.......	14·1	E 0·187	W 0·187	
W_1.........	X_1.......	Y_1.......	10·3	W 0·091	E 0·091	
X_1.........	Y_1.......	Z_1.......	18·6	W 0·094	E 0·094	
Y_1.........	Z_1.......	Et.......	3·9	W 0·141	E 0·141	
Z_1.........	Et.......	Cetera....	10·8	E 0·259	W 0·259	

TRIANGULATION, INCLUDING RECONNAISSANCE AND BASE MEASUREMENTS.

The boundary for practically its whole length, except the Natazhat–St. Elias section, was "straddled" by a triangulation net which gave control for the topography, checked the line projection, gave distances along the line and enabled geographic positions to be computed for all monuments set.

In the Natazhat—St. Elias section, as already explained in the general narrative, the triangulation, instead of following the line, was diverted up the valley of the White River, across Skolai Pass, thence down the Chitistone and Nizina valleys and up the Chitina valley to the vicinity of the line, thus avoiding the rough and almost inaccessible country along the boundary.

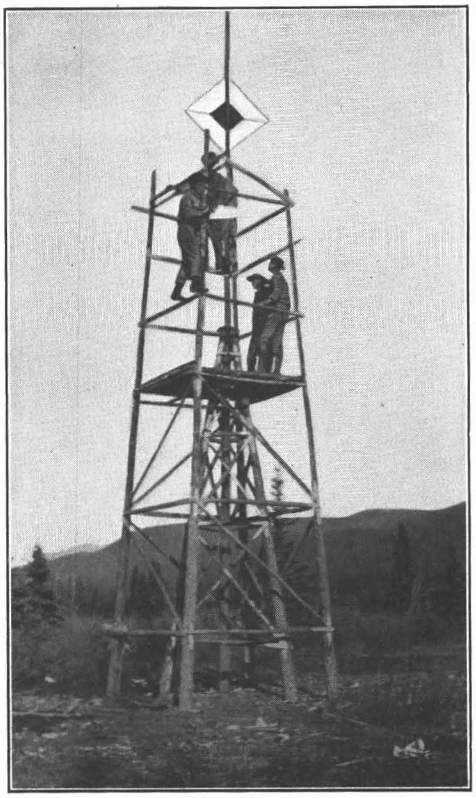
This triangulation was carried out under the "General Instructions of the United States Coast and Geodetic Survey" for tertiary triangulation, though the greater portion of the work was sufficiently well done to class as secondary.

RECONNAISSANCE.

The reconnaissance, covering the selection of triangulation points and the erection of the signals, was done by plane table, using the same method as employed by the United States Geological Survey on the Lower Colorado, and by the United States and Canada Boundary Commission on the 49th Parallel through the Cascade Mountains.

On a scale of one mile to the inch, a starting base was projected on the plane-table sheet, such, for instance, as a line joining two points whose positions were already known. These points were then occupied, the plane table oriented with the opensight alidade and lines drawn to hills or ridges on which stations might possibly be located. These latter points were then occupied, location being made by resection, intersection, or by the three-point method, and the strongest figure was selected, the lines of sight verified by the binoculars, and the signals erected. This method of reconnaissance, used by a capable man with a good sense of topography, was found to be a most satisfactory and expeditious way of covering a given area with a triangulation net.

The plane table employed was 17 by 20 inches, with a special roller at each end carrying 15 feet of heavy waterproof paper, which was simply rolled along as the work progressed, instead of changing the sheets in the usual manner. An ordinary 10-inch open-sight alidade was used, and the tripod had a Johnson head.



Signal and scaffold at West Base, White River.

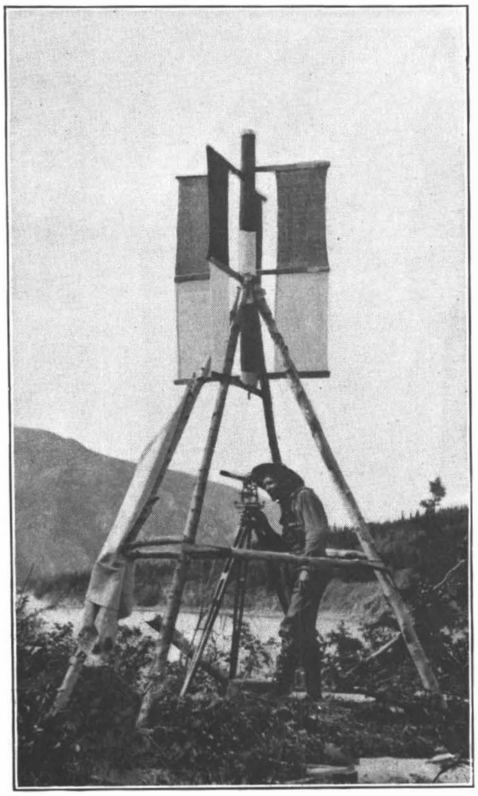
The instrument work on the triangulation proper was done with Berger & Sons' $6\frac{1}{2}$-inch theodolites similar to those used on line projection, without the micrometer eye-piece, and with the horizontal circles reading by verniers to 10 seconds and the 4-inch vertical circles to 30 seconds. The horizontal angles were determined by three observations on the angle "direct" and three "reverse," then three "reverse" and three "direct" on the explement. The horizon was always closed at main scheme stations, and the error of closure divided equally among the angles. If the closing error averaged more than 1·5 seconds per angle, enough additional observations were made to ensure the location of the error. If the average closing error of all the triangles in a quadrilateral exceeded 6 seconds, enough stations were re-occupied to bring the error within the limit. On vertical angles, at least one reading "direct" and one "reverse" were made on each object sighted.

Where necessary, a wind shield was used to protect the instrument from the effects of the wind. This shield was usually made of silk about five feet by eight feet, and was supported on alpenstocks or other poles, or by cairns.

The signals were of two general classes, tripod and cairn. A pole, 12 to 16 feet in length, formed the signal proper, usually with the targets facing the principal lines of sight. These targets were generally of white cotton and about three feet square with a black centre about one foot square. To enable them to be picked up more easily and to assist in identification, a small "flutter" or flag was often used at the tip of the pole. The pole was supported by other poles as braces, where possible, using three or four as most convenient, but where poles were scarce a stone cairn was substituted, usually about five feet in height and three to four feet in diameter at the base. These latter signals proved very satisfactory, especially on skyline stations, but were rather inconvenient as they took some time to build and had to be either torn down and rebuilt after they had been occupied, or had to be occupied eccentrically, whereas the tripod signal could be easily lifted aside or, if high enough, the lower part of the center pole could be cut away and the station occupied without disturbing the signal.

Practically the only exceptions to this general classification were where towers and scaffolds had to be erected to ensure sufficient elevation, as, for instance, on some of the bases.

In all cases the stations were marked by a drill-hole in rock in place, if possible, or in a stone set flush with the general surface of the ground, the drill-hole being surrounded by a triangle cut in the rock to assist in recovering and identifying it.



Yukon River, East Base.

Bases.

During the progress of the work seven bases[1] were measured in connection with the triangulation, their location being as follows:—

Base No. 1	Yukon River	South bank, crossing the line.
2	Sixtymile River	North side, west of the line.
3	White River	South bank, crossing the line.
4	Porcupine	On plateau, south of the river.
5	Firth River	Across valley, west of the line.
6	Nizina River	On gravel bars, opposite Dan Creek.
7	Chitina River	On gravel bars, upper river.

These bases were measured in the usual manner with a 50-meter invar tape at a tension of fifteen kilogrammes and supported at the center, the base line having been previously prepared by opening out and clearing, and by setting stakes every 25 meters, each alternate stake having a small piece of brass attached to it on which the tape length was marked with a sharp awl. A thermometer was attached to the tape a few feet from each end and the temperatures recorded, and a line of levels was run over the tops of the stakes to get the correction for slope. The usual precautions were observed as to measuring at night, and while there was little wind, and at least two measurements were made of each base.

Considerable difficulty was experienced in some places in making the base line stakes solid owing to the shallow depth at which frost was encountered. By digging holes in the frozen ground with a pick and by bracing the stakes strongly, they were made quite firm and stable. The base ends, where possible, were marked by small concrete piers set flush with the ground, with a bolt or screw to mark the exact point.

Adjustment of the Triangulation along the 141st Meridian.

As detailed in the summary herewith, the triangulation was adjusted in sections, adopting the located Boundary Line as the true 141st Meridian, and the positions of all triangulation points on the Boundary Line were held thereon.

South of the Yukon.—1907—From the Yukon Base to the Sixtymile Base, 53 miles.
There were fifty-three closed triangles in the main scheme of this triangulation.
The maximum triangle closure was $10''\cdot3$.
The average triangle closure was $2''\cdot99$.
The maximum correction to an observed direction was $2''\cdot7$.
The average correction to an observed direction was $0''\cdot87$.
The probable error of an observed direction was $\mp 1''\cdot12$.

[1] For further particulars, see page 130.

The length carried from the Yukon Base to the Sixtymile Base by observed angles has a discrepancy of 16 in the sixth place of logarithms or about 1 in 27,000. The work was adjusted by quadrilaterals and the discrepancy between the Sixtymile Base and the Yukon Base was distributed in the two quadrilaterals preceding the Sixtymile Base. The discrepancy was but 7 in the sixth place of logarithms or about 1 in 62,000.

1908—From the Sixtymile Base to the line "Scottie—Tanana," 77 miles.

For the adjustment of this triangulation the line "Divide—Crag," as determined by the previous adjustment, was considered fixed. The work was adjusted in one piece, two line-points, M_1, (Monument No. 150), and O, (near Monument No. 158), being included in the adjustments. There were forty-six closed triangles and four concluded triangles in the main scheme.

The maximum triangle closure was 11″·4.

The average triangle closure was 3″·3.

The maximum correction to an observed direction was 4″·0.

The average correction to an observed direction was 0″·94.

The probable error of an observed direction was ±1″·21.

The positions of the triangulation stations were computed, using the adjusted angles, and it was found that the Line at M_1 was 0″·120 west of the 141st Meridian, and that the azimuth of the line M_1—O was 8″·9 too great. To hold the positions of the stations M_1 and O on the meridian it was necessary to put into the adjustment a longitude equation and an azimuth equation. In this adjustment the maximum correction to an observed direction was 3″·7; the average correction to an observed direction was 0″·97; the probable error of an observed direction was 1″·26.

1909—From the line "Scottie—Tanana" to the White River Base, 74 miles.

The line "Scottie—Tanana" as determined by the previous adjustment was considered fixed. The work was first adjusted by quadrilaterals, the line point Z, one mile and a half south of Monument No. 187A, being included in the last quadrilateral south on the meridian.

In the adjustment of the main scheme there were eighty-five closed triangles and four concluded triangles.

The maximum triangle closure was 14″·8.

The average triangle closure was 3″·7.

The maximum correction to an observed direction was 5″·9.

The average correction to an observed direction was 1″·16.

The probable error of an observed direction was ±1″·56.

After the adjustment by quadrilaterals it was found that the discrepancy in the length of the White River Base was 19 in the seventh place of logarithms, or 1 in 227,000. After computing the positions it was found that the line point Z was 0″·484 west of the meridian. To hold the position of this point on the meridian, an adjustment was made by selecting the best chain of triangles running through the scheme and distributing the longitude and length discrepancies in them. The remaining triangles in the main scheme were then computed by the use of two sides and the included angle.

1912—From White River Base to the westward through Skolai pass to the Nizina Base.

The line "Bend—Skolai" of the previous adjustment was considered fixed. The work was first adjusted by quadrilaterals. In the main scheme there were thirty-six closed triangles and eighteen concluded triangles.

The maximum triangle closure was 15″·9.

The average triangle closure was 6″·45.

The maximum correction to an observed direction was 6″·8.
The average correction to an observed direction was 1″·80.
The probable error of an observed direction was ±2″·47.

After the triangles had been computed there was a discrepancy of 80 in the sixth place of logarithms or about 1 in 5,400 in the length of the Nizina Base. This was distributed in the best chain of triangle between the line "Skolai—Bend" and the Nizina base.

1913—From the Nizina base to the Chitina Base and east and south of the 141st Meridian and Mount St. Elias.

The line "Finis—Terminus" of the previous adjustment was considered fixed. The work was first adjusted in the field, and the monuments placed on the 141st Meridian.

In the office the work was adjusted in one piece and the monuments held on the 141st Meridian.

In the main scheme there were forty-two closed triangles and twenty-two concluded triangles. The discrepancy in the length of the Chitina River base was 45 in the sixth place of logarithms, or about 1 in 9,800.
The maximum triangle closure was 27″·7.
The average triangle closure was 6″·72.
The maximum correction to an observed direction was 10″·9.
The average correction to an observed direction was 2″·55.
The probable error of an observed direction was ±3″·13.

NORTH OF THE YUKON.—1909—From the Yukon Base to the line "Nation—View, N.E.," 41 miles.

The line "Loop—Plateau" of the 1907 adjustment was considered fixed
The work was adjusted first by quadrilaterals.
The maximum triangle closure was 8″·7.
The average triangle closure was 3″·01.
The maximum correction to an observed direction was 3″·4.
The average correction to an observed direction was 1″·00.
The probable error to an observed direction was 1″·33.

The position of the line-point E_1, (Monument No. 99), which was connected with the main scheme was found to be 0″·041 east of the 141st Meridian; also the azimuth of the line E_1 to "Back" was 3″·4 too great. These discrepancies were distributed in the best chain of triangles between the lines "Bush—Blow" and "Back—Pack."

1910—From the line "Nation—View, N.E." to the Porcupine Base, 153 miles.

The line "Nation—View" as determined by the previous adjustment was considered fixed. The work was first adjusted by quadrilaterals. Owing to the fact that a base was to be measured in 1911, near the Porcupine, it was decided to carry the final adjustment only as far as the line-point M_1, (near Monument No. 64).

In the adjustment of the main scheme there were seventy-two closed triangles and six concluded triangles.
The maximum triangle closure was 8″·8.
The average triangle closure was 2″·4.
The maximum correction to an observed direction was 3″·4.
The average correction to an observed direction was 0″·71.
The probable error of an observed direction was ±0″·96.

After the adjustment by quadrilaterals and the positions of the points had been computed, it was found that the line-point M_1 was $0''\cdot 406$ east of the 141st Meridian. This discrepancy was distributed in the best chain of triangles between the line "Nation—View, N.E." and the line-point M_1.

The line "Storm—Salmon" was now considered fixed, and the rest of the 1910 work was adjusted with the Porcupine Base.

The computation of the work as adjusted by quadrilaterals showed a discrepancy of 43 in the sixth place of logarithms, or about 1 in 10,000 in the length of the Porcupine Base; also the position of the line-point O_1, (near Monument No. 53), was found to be $0''\cdot 155$ east of the 141st Meridian. These discrepancies were distributed in the best chain of triangles between the line "Storm—Salmon" and the Porcupine Base.

1911—From the Porcupine Base to the Firth Base, 92 miles.

In the adjustment of this work the line "Cone—Nassau" of the previous adjustment was considered fixed. An adjustment by quadrilaterals was made first. In the main scheme there were seventy-one closed triangles.

The maximum triangle closure was $7''\cdot 0$.
The average triangle closure was $2''\cdot 95$.
The maximum correction to an observed direction was $3''\cdot 1$.
The average correction to an observed direction was $0''\cdot 89$.
The probable error of an observed direction was $\pm 1''\cdot 13$.

After the computation of the triangles and the positions of the points, there was a discrepancy of 28 in the sixth place of logarithms, or about 1 in 15,000 in the length of the Firth Base; also the position of the line-point V_1, (Monument No. 20), was found to be $0''\cdot 579$ west of the 141st Meridian. These discrepancies were distributed in the best chain of triangles between the line "Cone—Nassau" and the line-point V_1.

1912—From the Firth Base to the Arctic Ocean, 58 miles.

In the adjustment of this work the line "Siwash—Turner" of the 1911 adjustment was considered fixed. An adjustment by quadrilaterals was made first.

In the main scheme there were twenty-five closed triangles and ten concluded.
The maximum triangle closure was $13''\cdot 0$.
The average triangle closure was $5''\cdot 10$.
The maximum correction to an observed direction was $5''\cdot 3$.
The average correction to an observed direction was $1''\cdot 55$.
The probable error of an observed direction was $\pm 1''\cdot 98$.

After the positions of the points were computed it was found that position of the line-point Cetera, (Monument No. 1), was $0''\cdot 234$ too far west. This discrepancy was distributed through the best chain of triangles between the line "Siwash—Turner" and the line-point Cetera.

Base.	Date Measured.	Weather.	Section.	Direction.	No. of Tape lengths.	Mean Temperature. Centigrade.	Correction for Temperature.	Set up and set back.	Tape Correction	Length of section.	Mean length of section.	Mean elevation.	Grade Correction.	Reduction to Sea Level.	Adopted Length of Base.
							Meters.	*Meters.*	*Meters.*	*Meters.*	*Meters.*	*Meters.*	*Meters.*	*Meters.*	*Meters.*
Firth............	Aug. 14, 1911.	cloudy	1	F	20	8·7	−0·0666	+0·0155	+0·1664	1000·1153					
		"	1	B	20	11·6	−0·0336	−0·0185	+0·1664	1000·1143					
		overcast	1	F	20	13·0	−0·0177	−0·0285	+0·1664	1000·1202	1000·1194	(Entire			
		"	1	B	20	12·4	−0·0245	+0·0140	+0·1664	1000·1279		Base)	(Total)	(Total)	
		cloudy	2	F	21·5	9·3	−0·0642	+6·8805	+0·1793	1081·9956					
		"	2	B	21·5	11·5	−0·0374	+6·8635	+0·1792	1082·0053	1082·0004	530·66	−0·0317	−0·1729	2081·9152
Porcupine.......	June 19, 1911.	clear, sunny.	1	F	20	7·6	−0·0791	+0·3005	+0·1664	1000·3878					
			1	B	20	8·8	−0·0654	+0·2767	+0·1664	1000·3777	1000·3828				
			2	F	20	7·2	−0·0839	0·0000	+0·1664	1000·0825					
			2	B	20	7·8	−0·0770	−0·0075	+0·1664	1000·0819	1000·0822				
			3	F	20	10·2	−0·0496	−0·0200	+0·1664	1000·0968		(Entire			
			3	B	20	12·2	−0·0268	−0·0597	+0·1664	1000·0799	1000·0884	Base)	(Total)	(Total)	
			4	F	4	10·0	−0·0104	+0·0217	+0·0333	200·0446					
			4	B	4	10·7	−0·0088	+0·0190	+0·0333	200·0435	200·0440	526·04	−3·2373	−0·2630	3197·0971
Yukon..........	June 22, 1907.	....	1	F	30	7·98	−0·1121	−0·2595	+0·2496	1499·8780					
			1	B	30	6·34	−0·1402	+0·2195	+0·2496	1499·8899	1499·8840	281·02	−1·0758	−0·0659	1498·7423
Sixtymile........	Sept. 11, 1907.	cloudy	1	F	20	10·77	−0·0431	−0·1495	+0·1664	999·9738					
			1	B	20	12·29	−0·0258	−0·1460	+0·1664	999·9946	999·9842	1029·66	−3·5132	−0·1604	
			2	F	20	12·98	−0·0179	0·0000	+0·1664	1000·1485					
			2	B	20	13·74	−0·0093	−0·0055	+0·1664	1000·1516	1000·1501	995·36	−0·6808	−0·1555	
			3	F	11	15·61	+0·0065	+1·9685	+0·0915	552·0665					
			3	B	11	15·54	+0·0061	+1·9703	+0·0915	552·0679	552·0672	975·72	−0·0808	−0·0842	2547·5266
White River.....	May 27, 1909.	cloudy	1	F	20	9·61	−0·0562	−0·0600	+0·1664	1000·0502					
		"	1	B	20	9·31	−0·0596	−0·0590	+0·1664	1000·0478	1000·0490	888·58	−0·0532	−0·1390	
	May 29, 1909.	"	2	F	20	5·25	−0·1058	0·0000	+0·1664	1000·0606					
		"	2	B	20	6·20	−0·0950	−0·0080	+0·1664	1000·0634	1000·0620	882·14	−0·0382	−0·1380	
		"	3	F	7	10·37	−0·0167	−4·5060	+0·0582	345·5355					
		"	3	B	7	11·13	−0·0136	−4·5056	+0·0582	345·5390	345·5372	877·42	−0·0358	−0·0474	2345·1966
Nizina River	Sept. 10, 1912.	hazy and calm.	1	F	20	2·60	−0·0147	−0·0000	−0·0542	999·9311					
			1	B	20	4·14	−0·0138	−0·0062	−0·0542	999·9258	999·9284				
			2	F	20	5·86	−0·0128	+0·0500	−0·0542	999·9830					
			2	B	20	6·63	−0·0123	+0·0441	−0·0542	999·9776	999·9803	(Entire			
			3	F	11	8·04	−0·0063	0·0000	−0·0298	549·9639		Base)	(Total)		
			3	B	11	8·64	−0·0061	−0·0032	−0·0298	549·9609	549·9624				
			4	......	....	....	....	+2·7071	....	....	2·7071	475·49	−0·1183	−0·1902	2552·2697
Chitina River....	May 20, 1913.	....	1	F	20	7·75	−0·0111	+0·0700	−0·0563	1000·0026					
			1	B	20	7·20	−0·0114	+0·0722	−0·0563	1000·0045	1000·0035		(Total)		
			2	F	16	5·40	−0·0099	+0·0521	−0·0451	799·9971					
			2	B	16	3·40	−0·0108	+0·0518	−0·0451	799·9959	799·9965	612	−0·4418	−0·1730	1799·3852

Equation of tape used in measuring Firth, Porcupine, Yukon, Sixtymile and White River Bases, $L=50\ m. + 8\cdot32\ mm. + (t - 14\cdot56C)\ 0\cdot568\ mm.$

Equation of tape used in measuring Nizina Base, $L=50\ m. - 2\cdot710\ mm. + (t - 27\cdot6\ C)\ 0\cdot0294$ mm.

Equation of tape used in measuring Chitina Base, $L= 50\ m. - 2\cdot815\ mm. + (t - 27\cdot4\ C)\ 0\cdot02815\ mm.$

Elevations along the 141st Meridian.

The final elevations along the 141st Meridian are based on the elevation of a bench-mark at Monument No. 126 and the mean sea-level of the Arctic Ocean.

The elevation of the bench-mark at Monument No. 126 depends on the elevation of a bench-mark established at Skagway, Alaska, determined from three years' continuous readings on an automatic tide gauge established there in 1908. During the years 1908, 1909, and 1910 a line of precise levels[1] was run from the bench-mark at Skagway over the White Pass and Yukon Railroad to Whitehorse, along the wagon road to Dawson and thence by wagon road and trail to Monument No. 126, where a bench-mark was set and the elevation determined.

From the bench-mark at Monument No. 126 the elevations were carried to the north and south by reciprocal vertical angles between triangulation stations. The elevations to the north were carried 385 miles, through 135 stations with 337 differences of elevation, to the Arctic Ocean, where for two weeks, in 1912, the range of the tide was observed on a graduated stake and was found to be less than one foot. The mean sea-level thus determined showed that the elevation determined by vertical angles was 2·66 meters (8·73 feet)too great. This discrepancy was distributed by means of a least-square adjustment of the observations.

The elevations to the south of Monument 126, when carried through the triangulation a distance of 275 miles and connected with the United States Geological Survey bench-mark in the valley of the Nizina River showed a discrepancy of 1·6 meters (5·25 feet), which was not distributed.

[1] See narrative, pages 41, 48 and 55.

TABLES OF GEOGRAPHIC POSITIONS.

Explanation of Positions, Lengths and Azimuths, and of the Yukon Datum.

The lengths as shown in the tables are all reduced to sea-level, and depend on the various bases measured during the progress of the survey.[1] If the actual length of a line simply reduced to the horizontal is desired, it may be obtained with all the accuracy ordinarily needed by adding to the sea-level length as given, a correction equal to

$$\text{(length of line as given)}\ \frac{\text{mean elev. of the two ends of line in meters}}{6{,}370{,}000}$$

The maximum error made in the use of this approximate formula for the correction does not exceed $\frac{1}{450{,}000}$ of the length for any portion of this triangulation.

All the positions and azimuths have been computed upon the Clarke spheroid of 1866, as expressed in meters, but after a spheroid has been adopted and all the angles and lengths in a triangulation have been fully fixed, it is still necessary, before the computation of latitudes, longitudes, and azimuths can be made, to adopt a standard latitude and longitude for a specified station, and a standard azimuth for a line from that station. For convenience, the adopted standard position (latitude and longitude) of a given station, together with the adopted standard azimuth of a line from that station, is called the geodetic datum.

The Yukon Datum, upon which depend the positions and azimuths given in these tables, may be defined in terms of the position of station "Boundary" at the Yukon River, astronomically determined, as follows:—

Latitude	64° 40′ 51″·42	±0″·164
Longitude	141° 00′ 00″·00	
Azimuth to station "Bald",	270° 00′ 00″·00	

Points then are said to be upon the Yukon Datum when they are connected with station "Boundary" by a continuous triangulation through which the corresponding latitudes, longitudes and azimuths have been computed on the Clarke spheroid of 1866, as expressed in meters, and starting from the above data.

Connection Between the Yukon Datum and the Southeast Alaska Datum at Mount St. Elias.

The Yukon Datum is based upon one astronomic station "Boundary," near the crossing of the 141st Meridian and the Yukon river.

The latitude of this station was determined by Mr. F. A. McDiarmid in 1907, other determinations having been already made near here by Mr. Smith in 1905-6, and by Mr. McGrath in 1889-90.

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[1] See page 130.

By accepting Mr. McDiarmid's determination of the latitude of "Boundary," and using the triangulation of the United States Geological Survey for connections, the following station errors appear:—

McGrath,	1889–90	$A - G = -3''{\cdot}38$
Smith,	1905–06	$A - G = +0''{\cdot}45$

where A is the astronomic value, and G the geodetic.

This station is situated on the south bank of the Yukon River, and the topography of the surrounding country indicates that the deflection of the vertical here would produce a positive error in the latitude. The amount of the error is of course unknown.

The longitude was determined by telegraphic method,[1] Seattle to Sitka, Sitka to Valdez, Valdez to Eagle (Fort Egbert), and Eagle to Boundary, by Edwin Smith, J. E. McGrath, and F. A. McDiarmid; and Seattle to Vancouver, Vancouver to Boundary by F. A. McDiarmid, Dr. Otto Klotz, Edwin Smith, and J. E. McGrath; and an adjustment of this loop gave the longitude of "Boundary," upon which the Yukon Datum is based. Triangulation carried south from here for about 4½ degrees gave the position of Mount St. Elias as latitude 60° 17′ 36″·24 and longitude 140° 55′ 45″·35.

The latitude of the Southeast Alaska Datum is based upon thirty-two astronomical latitude stations. These stations are connected by triangulation, and a datum was selected that would make the algebraic sum of the station errors zero.

The maximum station error is 8″·96.

The average station error is 2″·55.

Eighteen of the station errors are plus and fourteen minus.

Since a large number of latitude stations are used, and the number of plus and minus corrections are so nearly even, the addition of more latitude stations would cause little change in the datum, hence this selection could not be very much improved.

The longitude is based upon eight astronomic longitudes, all of which are chronometric. A longitude was chosen such that the sum of the station errors would be zero. In 1905 the longitude of Sitka was determined telegraphically, and this caused a change in the astronomic longitudes of five of the stations used, making the mean of the station errors 4″·14 instead of zero.

The maximum station error is 38″·75.

The average station error is 11″·76.

Since the omission of one station from those forming the datum would change it by nearly five seconds, this adopted longitude cannot be considered accurate.

Three mountains, Mount Fairweather, Peak 12430 of Award, and Peak 9,500 of Award, were determined on this datum, though no triangulation was executed for a considerable area surrounding these mountains on account of the precipitousness and inaccessibility of the region.

A base was measured and an azimuth determined in the Alsek River region, and observations made upon these mountains. The resulting determination of the position of Mount Fairweather was considered better than that of either Peak 12,430 or of Peak 9,500 and the Southeast Alaska Datum was accordingly carried through this position, triangulation from here giving the position of Mount St. Elias as 60° 17′ 28″·77 latitude and 140° 55′ 43″·11 longitude.

[1] See narrative, page 110 *et seq.*

The difference between the values for the position of Mount St. Elias on the two datums is $7''\cdot47$ (231m.) in latitude and $2''\cdot24$ (34m.) in longitude, this discrepancy being due to one or more indeterminate causes.

It is more than probable that the parties working from the north and from the east did not actually determine the same point on Mount St. Elias, as they could easily have sighted on points 100 to 200 meters apart.

A station error is to be expected in the latitude determination upon which the Yukon Datum is based, and this station error might make the latitude too great, thus easily accounting for the discrepancy.

By adding or omitting astronomic stations in the Southeast Alaska Datum, the longitude could be changed as much as five seconds of arc, and in carrying the Southeast Alaska Datum through Mount Fairweather there may have been an error of more than a second of arc in either the latitude or the longitude.

Arrangememt of Tables.

In the table of positions and elevations all azimuths as shown are reckoned continuously from true south around by west to 360°, south being 0°, west 90°, north 180°, and east 270°. The latitude and longitude of each point are given on the Yukon Datum, also the length and azimuth of each line observed over, whether in one or both ways. Along with the latitude and longitude of each point the lengths and azimuths are given of lines from that point to other points of the triangulation. No lengths or azimuths are repeated, and for a given line the length and azimuth will generally be found opposite the position of the first mentioned of the two stations involved.

The elevation, when known, of each point is also shown in meters and feet, this elevation, unless otherwise specified, referring to the top of the surface mark at a station, or to the top of the peak in the case of a mountain.

For the convenience of the draftsman a column of "seconds in meters" is given in which is placed the length in meters of each small arc of a meridian or parallel corresponding to the seconds of the given latitude or longitude. To facilitate further the use of the tables, a column is given of the logarithms of the lengths. It must be remembered that it is the logarithm which is first derived from the computation, the lengths given in this table being then derived from the corresponding logarithms.

The rule followed has been to give latitudes and longitudes to thousandths of seconds only for points the positions of which are fixed by fully adjusted triangulation.

In the columns giving azimuths, distances, and logarithms of distances, the accuracy is indicated to a certain extent by the number of decimal places given, it being understood that in each case two doubtful figures are given. In some cases there is very little doubt of the correctness of the second figure from the right, while in a few cases some doubt may be cast on the third figure from the right.

The tables are in two sections, the first containing the stations of the triangulation scheme; and the second, the monuments and the line projection stations.

The positions are arranged in order of decreasing latitudes from the Arctic Ocean to the Mount Natazhat region, and, for the triangulation stations, from there consecutively, beginning on the White River in the vicinity of the Boundary, following up the river, across Russell Glacier, down the Nizina River and up the Chitina to the Logan Glacier and Mount St. Elias.

These tables may be conveniently consulted by using as finders the sketches on pages 265 to 272 and the index on pages 298 to 305 of this publication. In the third column of the index will be found for each point a reference to the page on which its description is given, in the fourth column the page on which its elevation above sea-level will be found, and in the fifth column the number of the sketch in which it appears.

The following conversion tables are inserted for the convenience of those who may wish to convert the distances or elevations given in this publication from meters to feet or from feet to meters.

CONVERSION TABLES.

Lengths—Feet to meters (from 1 to 1,000 units.)

[Reduction factor: 1 foot = 0·3048006096 meter.]

Feet	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.
0		**100**	30·48006	**200**	60·96012	**300**	91·44018	**400**	121·92024	**500**	152·40030	**600**	182·88037	**700**	213·36043	**800**	243·84049	**900**	274·32055
1	0·30480	1	30·78486	1	61·26492	1	91·74498	1	122·22504	1	152·70511	1	183·18517	1	213·66523	1	244·14529	1	274·62535
2	0·60960	2	31·08966	2	61·56972	2	92·04978	2	122·52985	2	153·00991	2	183·48997	2	213·97003	2	244·45009	2	274·93015
3	0·91440	3	31·39446	3	61·87452	3	92·35458	3	122·83465	3	153·31471	3	183·79477	3	214·27483	2	244·75489	3	275·23495
4	1·21920	4	31·69926	4	62·17932	4	92·65939	4	123·13945	4	153·61951	4	184·09957	4	214·57963	4	245·05969	4	275·53975
5	1·52400	5	32·00406	5	62·48412	5	92·96419	5	123·44425	5	153·92431	5	184·40437	5	214·88443	5	245·36449	5	275·84455
6	1·82880	6	32·30886	6	62·78893	6	93·26889	6	123·74905	6	154·22911	6	184·70917	6	215·18923	6	245·66929	6	276·14935
7	2·13360	7	32·61367	7	63·09373	7	93·57379	7	124·05385	7	154·53391	7	185·01397	7	214·49403	7	245·97409	7	276·45415
8	2·43840	8	32·91847	8	63·39853	8	93·87859	8	124·35865	8	154·83871	8	185·31877	8	215·79883	8	246·27889	8	276·75895
9	2·74321	9	33·22327	9	63·70333	9	94·18339	9	124·66345	9	155·14351	9	185·62357	9	216·10363	9	246·58369	9	277·06375
10	3·04801	**110**	33·52807	**210**	64·00813	**310**	94·48819	**410**	124·96825	**510**	155·44831	**610**	185·92837	**710**	216·40843	**810**	246·88849	**910**	277·36855
1	3·35281	1	33·83287	1	64·31293	1	94·79299	1	125·27305	1	155·75311	1	186·23317	1	216·71323	1	247·19329	1	277·67336
2	3·65761	2	34·13767	2	64·61773	2	95·09779	2	125·57785	2	156·05791	2	186·53797	2	217·01803	2	247·49810	2	277·97816
3	3·96241	3	34·44247	3	64·92253	3	95·40259	3	125·88265	3	156·36271	3	186·84277	3	217·32283	3	247·80290	3	278·28296
4	4·26721	4	34·74727	4	65·22733	4	95·70739	4	126·18745	4	156·66751	4	187·14757	4	217·62764	4	248·10770	4	278·58776
5	4·57201	5	35·05207	5	65·53213	5	96·01219	5	126·49225	5	156·97231	5	187·45237	5	217·93244	5	248·41250	5	278·89256
6	4·87681	6	35·35687	6	65·83693	6	96·31699	6	126·79705	6	157·27711	6	187·75718	6	218·23724	6	248·71730	6	279·19736
7	5·18161	7	35·66167	7	66·14173	7	96·62179	7	127·10185	7	157·58192	7	188·06198	7	218·54204	7	249·02210	7	279·50216
8	5·48641	8	35·96647	8	66·44653	8	96·92659	8	127·40665	8	157·88672	8	188·36678	8	218·86844	8	249·32690	8	279·80696
9	5·79121	9	36·27127	9	66·75133	9	97·23139	9	127·71146	9	158·19152	9	188·67158	9	219·15164	9	249·63170	9	280·11176
20	6·09601	**120**	36·57607	**220**	67·05613	**320**	97·53620	**420**	128·01626	**520**	158·49638	**620**	188·97638	**720**	219·45644	**820**	249·93650	**920**	280·41656
1	6·40081	1	36·88087	1	67·36093	1	97·84100	1	128·32106	1	158·80112	1	189·28118	1	219·76124	1	250·24130	1	280·72136
2	6·70561	2	37·18567	2	67·66574	2	98·14580	2	128·62586	2	159·10592	2	189·58598	2	220·06604	2	250·54610	2	281·02616
3	7·01041	3	37·49047	3	67·97054	3	98·45060	3	128·93066	3	159·41072	3	189·89078	3	220·37084	3	250·85090	3	281·33096
4	7·31521	4	37·79528	4	68·27534	4	98·75540	4	129·23546	4	159·71552	4	190·19558	4	220·67564	4	251·15570	4	281·63576
5	7·62002	5	38·10008	5	68·58014	5	99·06020	5	129·54026	5	160·02032	5	190·50038	5	220·98044	5	251·46050	5	281·94056
6	7·92482	6	38·40488	6	68·88494	6	99·36500	6	129·84506	6	160·32512	6	190·80518	6	221·28524	6	251·76530	6	282·24536
7	8·22962	7	38·70968	7	69·18974	7	99·66980	7	130·14986	7	160·62992	7	191·10998	7	221·59004	7	252·07010	7	282·55017
8	8·53442	8	39·01448	8	69·49454	8	99·97460	8	130·45466	8	160·93472	8	191·41478	8	221·89484	8	252·37490	8	282·85497
9	8·83922	9	39·31928	9	69·79934	9	100·27940	9	130·75946	9	161·23952	9	191·71958	9	222·19964	9	252·67971	9	283·15977
30	9·14402	**130**	39·62408	**230**	70·10414	**330**	100·58420	**430**	131·06426	**530**	161·54432	**630**	192·02438	**730**	222·50445	**830**	252·98451	**930**	283·46457
1	9·44882	1	39·92888	1	70·40894	1	100·88900	1	131·36906	1	161·84912	1	192·32918	1	222·80925	1	253·28931	1	283·76937
2	9·75362	2	40·23368	2	70·71374	2	101·19380	2	131·67386	2	162·15392	2	192·63399	2	223·11405	2	253·59411	2	284·07417
3	10·05842	3	40·53848	3	71·01854	3	101·49860	3	131·97866	3	162·45872	3	192·93879	3	223·41885	3	253·89891	3	284·37897
4	10·36322	4	40·84328	4	71·32334	4	101·80340	4	132·28346	4	162·76353	4	193·24359	4	223·72365	4	254·20371	4	284·68377
5	10·66802	5	41·14808	5	71·62814	5	102·10820	5	132·58827	5	163·06833	5	193·54839	5	224·02845	5	254·50851	5	284·98857
6	10·97282	6	41·45288	6	71·93294	6	102·41300	6	132·89307	6	163·37313	6	193·85319	6	224·33325	6	254·81331	6	285·29337
7	11·27762	7	41·75768	7	72·23774	7	102·71781	7	133·19787	7	163·67793	7	194·15799	7	224·63805	7	255·11811	7	285·59817
8	11·58242	8	42·06248	8	72·54255	8	103·02261	8	133·50267	8	163·98273	8	194·46279	8	224·94285	8	255·42291	8	285·90297
9	11·88722	9	42·36728	9	72·84735	9	103·32741	9	133·80747	9	164·28753	9	194·76759	9	225·24765	9	255·72771	9	286·20777
40	12·19202	**140**	42·67209	**240**	73·15215	**340**	103·63221	**440**	134·11227	**540**	164·59233	**640**	195·07239	**740**	225·55245	**840**	256·03251	**940**	286·51257
1	12·49682	1	42·97689	1	73·45695	1	103·93701	1	134·41707	1	164·89713	1	195·37719	1	225·85725	1	256·33731	1	286·81737
2	12·80163	2	43·28169	2	73·76175	2	104·24181	2	134·72187	2	165·20193	2	195·68199	2	226·16205	2	256·64211	2	287·12217
3	13·10643	3	43·58649	3	74·06655	3	104·54661	3	135·02667	3	165·50673	3	195·98679	3	226·46685	3	256·94691	3	287·42697
4	13·41123	4	43·89129	4	74·37135	4	104·85141	4	135·33147	4	165·81153	4	196·29159	4	226·77165	4	257·25171	4	287·73178
5	13·71603	5	44·19609	5	74·67615	5	105·15621	5	135·63627	5	166·11633	5	196·59639	5	227·07645	5	257·55652	5	288·03658
6	14·02083	6	44·50089	6	74·98095	6	105·46101	6	135·94107	6	166·42113	6	196·90119	6	227·38125	6	257·86132	6	288·34138
7	14·32563	7	44·80569	7	75·28575	7	105·76581	7	136·24587	7	166·72593	7	197·20599	7	227·68606	7	258·16612	7	288·64618
8	14·63043	8	45·11049	8	75·59055	8	106·07061	8	136·55067	8	167·03073	8	197·51080	8	227·99086	8	258·47092	8	288·95098
9	14·93523	9	45·41529	9	75·89535	9	106·37541	9	136·85547	9	167·33553	9	197·81560	9	228·29566	9	258·77572	9	289·25578

50	15·24003	**150**	45·72009	**250**	76·20015	**350**	106·68021	**450**	137·16027	**550**	167·64034	**650**	198·12040	**750**	228·60046	**850**	259·08052	**950**	289·56058
1	15·54483	1	46·02489	1	76·50495	1	106·98501	1	137·46507	1	167·94514	1	198·42520	1	228·90526	1	259·38532	1	289·86538
2	15·84963	2	46·32969	2	76·80975	2	107·28981	2	137·76988	2	168·24994	2	198·73000	2	229·21006	2	259·69012	2	290·17018
3	16·15443	3	46·63449	3	77·11455	3	107·59462	3	138·07468	3	168·55474	3	199·03480	3	229·51486	3	259·99492	3	290·47498
4	16·45923	4	46·93929	4	77·41935	4	107·89942	4	138·37948	4	168·85954	4	199·33960	4	229·81966	4	260·29972	4	290·77978
5	16·76403	5	47·24409	5	77·72416	5	108·20422	5	138·68428	5	169·16434	5	199·64440	5	230·12446	5	260·60452	5	291·08458
6	17·06883	6	47·54890	6	78·02896	6	108·50902	6	138·98908	6	169·46914	6	199·94920	6	230·42926	6	260·90932	6	291·38938
7	17·37363	7	47·85370	7	78·33376	7	108·81382	7	139·29388	7	169·77394	7	200·25400	7	230·73406	7	261·21412	7	291·69418
8	17·67844	8	48·15850	8	78·63856	8	109·11862	8	139·59868	8	170·07874	8	200·55880	8	231·03886	8	261·51892	8	291·99898
9	17·98324	9	48·46330	9	78·94336	9	109·42342	9	139·90348	9	170·38354	9	200·86360	9	231·34366	9	261·82372	9	292·30378
60	18·28804	**160**	48·76810	**260**	79·24816	**360**	109·72822	**460**	140·20828	**560**	170·68834	**660**	201·16840	**760**	231·64846	**860**	262·12852	**960**	292·60859
1	18·59284	1	49·07290	1	79·55296	1	110·03302	1	140·51308	1	170·99314	1	201·47320	1	231·95326	1	262·43332	1	292·91339
2	18·89764	2	49·37770	2	79·85776	2	110·33782	2	140·81788	2	171·29794	2	201·77800	2	232·25806	2	262·73813	2	293·21819
3	19·20244	3	49·68250	3	80·16256	3	110·64262	3	141·12268	3	171·60274	3	202·08280	3	232·56287	3	263·04293	3	293·52299
4	19·50724	4	49·98730	4	80·46736	4	110·94742	4	141·42748	4	171·90754	4	202·38760	4	232·86767	4	263·34773	4	293·82779
5	19·81204	5	50·29210	5	80·77216	5	111·25222	5	141·73228	5	172·21234	5	202·69241	5	233·17247	5	263·65253	5	294·13259
6	20·11684	6	50·59690	6	81·07696	6	111·55702	6	142·03708	6	172·51714	6	202·99721	6	233·47727	6	263·95733	6	294·43739
7	20·42164	7	50·90170	7	81·38176	7	111·86182	7	142·34188	7	172·82195	7	203·30201	7	233·78207	7	264·26213	7	294·74219
8	20·72644	8	51·20650	8	81·68656	8	112·16662	8	142·64669	8	173·12675	8	203·60681	8	234·08787	8	264·56693	8	295·04699
9	21·03124	9	51·51130	9	81·99136	9	112·47142	9	142·95149	9	173·43155	9	203·91161	9	234·39167	9	264·87173	9	295·35179
70	21·33604	**170**	51·81610	**270**	82·29616	**370**	112·77623	**470**	143·25629	**570**	173·73635	**670**	204·21641	**770**	234·69647	**870**	265·17653	**970**	295·65659
1	21·64084	1	52·12090	1	82·60097	1	113·08103	1	143·56109	1	174·04115	1	204·52121	1	235·00127	1	265·48133	1	295·96139
2	21·94564	2	52·42570	2	82·90577	1	113·38583	2	143·86589	2	174·34595	2	204·82601	2	235·30607	2	256·78613	2	296·26619
3	22·25044	3	52·73051	3	83·21057	3	113·69063	3	144·17069	3	174·65075	3	205·13081	3	235·61087	3	286·09093	3	296·57099
4	22·55525	4	53·03531	4	83·51537	4	113·99543	4	144·47549	4	174·95555	4	205·43561	4	235·91567	4	266·39573	4	296·87579
5	22·86005	5	53·34011	5	83·82017	5	114·30023	5	144·78029	5	175·26035	5	205·74041	5	236·22047	5	266·70053	5	297·18059
6	23·16485	6	53·64491	6	84·12497	6	114·60503	6	145·08509	6	175·56515	6	206·04521	6	236·52527	6	267·00533	6	297·48539
7	23·46965	7	53·94971	7	84·42977	7	114·90983	7	145·38989	7	175·86995	7	206·35001	7	236·83007	7	267·31013	7	297·79020
8	23·77445	8	54·25451	8	84·73457	8	115·21463	8	145·69469	8	176·17475	8	206·65481	8	237·13487	8	267·61494	8	298·09500
9	24·07925	9	54·55931	9	85·03937	9	115·51943	9	145·99949	9	176·47955	9	206·95961	9	237·43967	9	267·91974	9	298·39980
80	24·38405	**180**	54·86411	**280**	85·34417	**380**	115·82423	**480**	146·30429	**580**	176·78435	**680**	207·26441	**780**	237·74448	**880**	268·22454	**980**	298·70460
1	24·68885	1	55·16891	1	85·64897	1	116·12903	1	146·60909	1	177·08915	1	207·56922	1	238·04928	1	268·52934	1	299·00940
2	24·99365	2	55·47371	2	85·95377	2	116·43383	2	146·91389	2	117·39395	2	207·87402	2	238·35408	2	268·83414	2	299·31420
3	25·29845	3	55·77851	3	86·25857	3	116·73863	3	147·21869	3	177·69876	3	208·17882	3	238·65888	3	269·13894	3	299·61900
4	25·60325	4	56·08331	4	86·56337	4	117·04343	4	147·52350	4	178·00356	4	208·48362	4	238·96368	4	269·44374	4	299·92380
5	25·90805	5	56·38811	5	86·86817	5	117·34823	5	147·82830	5	178·30836	5	208·78842	5	239·26848	5	269·74854	5	300·22860
6	26·21285	6	56·69291	6	87·17297	6	117·65304	6	148·13310	6	178·61316	6	209·09322	6	239·57328	6	270·05334	6	300·53340
7	26·51765	7	56·99771	7	87·47777	7	117·95784	7	148·43790	7	178·91796	7	209·39802	7	239·87808	7	270·35814	7	300·83820
8	26·82245	8	57·30251	8	87·78258	8	118·26264	8	148·74270	8	179·22276	8	209·70282	8	240·18288	8	270·66294	8	301·14300
9	27·12725	9	57·60732	9	88·08738	9	118·56744	9	149·04750	9	179·52756	9	210·00762	9	240·48768	9	270·96774	9	301·44780
90	27·43205	**190**	57·91212	**290**	88·39218	**390**	118·87224	**490**	149·35230	**590**	179·83236	**690**	210·31242	**790**	240·79248	**890**	271·27254	**990**	301·75260
1	27·73686	1	58·21692	1	88·69698	1	119·17704	1	149·65710	1	180·13716	1	210·61722	1	241·09728	1	271·57734	1	302·05740
2	28·04166	2	58·52172	2	89·00178	2	119·48184	2	149·96190	2	180·44196	2	210·92202	2	241·40208	2	271·88214	2	302·36220
3	28·34646	3	58·82652	3	89·30658	3	119·78664	3	150·26670	3	180·74676	3	211·22682	3	241·70688	3	272·18694	3	302·66701
4	28·65126	4	59·13132	4	89·61138	4	120·09144	4	150·57150	4	181·05156	4	211·53162	4	242·01168	4	272·49174	4	302·97181
5	28·95606	5	59·43612	5	89·91618	5	120·39624	5	150·87630	5	181·35636	5	211·83642	5	242·31648	5	272·79655	5	303·27661
6	29·26086	6	59·74092	6	90·22098	6	120·70104	6	151·18110	6	181·66116	6	212·14122	6	242·62129	6	273·10135	6	303·58141
7	29·56566	7	60·04572	7	90·52578	7	121·00584	7	151·48590	7	181·96596	7	212·44602	7	242·92609	7	273·40615	7	303·88621
8	29·87046	8	60·35052	8	90·83058	8	121·31064	8	151·79070	8	182·27076	8	212·75083	8	243·23089	8	273·71095	8	304·19101
9	30·17526	9	60·65532	9	91·13538	9	121·61544	9	152·09550	9	182·57557	9	213·05563	9	243·53569	9	274·01575	9	304·49581

1 inch = ·02540 meter.	4 inches = ·10160 meter.	7 inches = ·17780 meter.	10 inches = ·25400 meter.
2 inches = ·05080 meter.	5 inches = ·12700 meter.	8 inches = ·20320 meter.	11 inches = ·27940 meter.
3 inches = ·07620 meter.	6 inches = ·15240 meter.	9 inches = ·22860 meter.	12 inches = ·30480 meter.

CONVERSION TABLES—*Continued.*

Lengths—Meters to feet (from 1 to 1,000 units.)

[Reduction factor: 1 meter = 3·280833333 feet.]

Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.	Meters.	Feet.
0		**100**	328·08333	**200**	656·16667	**300**	984·25000	**400**	1,312·33333	**500**	1,640·41667	**600**	1,198·50000	**700**	2,296·58333	**800**	2,624·66667	**900**	2,952·75000
1	3·28083	1	331·36417	1	659·44750	1	987·53083	1	1,315·61417	1	1,643·69750	1	1,971·78083	1	2,299·86417	1	2,627·86417	1	2,956·03083
2	6·56167	2	334·64500	2	662·72833	2	990·81167	2	1,318·89500	2	1,646·97833	2	1,975·06167	2	2,303·14500	2	2,631·22833	2	2,959·31167
3	9·84250	3	337·82583	3	666·00917	3	994·09250	3	1,322·17583	3	1,650·25917	3	1,978·34250	3	2,306·42583	3	2,634·50917	3	2,962·59250
4	13·12333	4	341·20667	4	669·29000	4	997·37333	4	1,325·45667	4	1,653·54000	4	1,981·62333	4	2,309·70667	4	2,637·79000	4	2,965·87333
5	16·40417	5	344·48750	5	672·57083	5	1,000·65417	5	1,328·73750	5	1,656·82083	5	1,984·90417	5	2,312·98750	5	2,641·07083	5	2,969·15417
6	19·68500	6	347·76833	6	675·85167	6	1,003·93500	6	1,332·01833	6	1,660·10167	6	2,978·18500	6	2,316·26833	6	2,644·35167	6	2,972·43500
7	22·96583	7	351·04917	7	679·13250	7	1,007·21583	7	1,335·29917	7	1,663·38250	7	1,991·46583	7	2,319·54917	7	2,647·63250	7	2,975·71583
8	26·24667	8	354·33000	8	682·41333	8	1,010·49667	8	1,338·58000	8	1,666·66333	8	1,994·74667	8	2,322·83000	8	2,650·91333	8	2,978·99667
9	29·52750	9	357·61083	9	685·69417	9	1,013·77750	9	1,341·86083	9	1,669·94417	9	1,998·02750	9	2,326·11083	9	2,654·19417	9	2,982·27750
10	32·80833	**110**	360·89167	**210**	688·97500	**10**	1·017·05833	**410**	1,345·14167	**510**	1,673·22500	**610**	2,001·30833	**710**	2,329·39167	**810**	2,657·47500	**910**	2,985·55833
1	36·08917	1	364·17250	1	692·25583	1	1,020·33917	1	1,348·42250	1	1,676·50583	1	2,004·58917	1	2,332·67250	1	2,660·75583	1	2,988·83917
2	39·37000	2	367·45333	2	695·53667	2	1,023·62000	2	1,351·70333	2	1,679·78667	2	2,007·87000	2	2,335·95333	2	2,664·03667	2	2,992·12000
3	42·65083	3	370·73417	3	698·81750	3	1,026·90083	3	1,354·98417	3	1,683·06750	3	2,011·15083	3	2,339·23417	3	2,667·31750	3	2,995·40083
4	45·93167	4	374·01500	4	702·09833	4	1,030·18167	4	1,358·26500	4	1,686·34833	4	2,014·43167	4	2,342·51500	4	2,670·59833	4	2,998·68167
5	49·21250	5	377·29583	5	705·37917	5	1,033·46250	5	1,361·54583	5	1,689·62917	5	2,017·71250	6	2,345·79583	5	2,673·87917	5	3,001·96250
6	52·49333	6	380·57667	6	708·66000	6	1,036·74333	6	1,364·82667	6	1,692·91000	6	2,020·99333	6	2,349·07667	6	2,677·16000	6	3,005·24333
7	55·77417	7	383·85750	7	711·94083	7	1,040·02417	7	1,368·10750	7	1,696·19083	7	2,024·27417	7	2,352·35750	7	2,680·44083	7	3,008·52417
8	59·05500	8	387·13833	8	715·22167	8	1,043·30500	8	1,371·38833	8	1,699·47167	8	2,027·55500	8	2,355·63833	8	2,683·72167	8	3,011·80500
9	62·33583	9	390·41917	9	718·50250	9	1,046·58583	9	1,374·66917	9	1,702·75250	9	2,030·83583	9	2,358·91917	9	2,687·00250	9	3,015·08583
20	65·61667	**120**	393·70000	**220**	721·78333	**320**	1,049·86667	**420**	1,377·95000	**520**	1,706·03333	**620**	2,034·11667	**720**	2,362·20000	**820**	2,690·28333	**920**	3,018·36667
1	68·89750	1	396·98083	1	725·06417	1	1,053·14650	1	1,381·23083	1	1,709·31417	1	2,307·39750	1	2,365·48093	1	2·693·56417	1	3,021·64750
2	72·17833	2	400·26167	2	728·34500	2	1,056·42833	2	1,384·51167	2	1,712·59500	2	2,040·67833	2	2,368·76167	2	2,696·84500	2	3,024·92833
3	75·45917	3	403·54250	3	731·62583	3	1,059·70917	3	1,387·79250	3	1,715·87583	3	2,043·95917	3	2,372·04250	3	2,700·12583	3	3,028·20917
4	78·74000	4	406·82333	4	734·90667	4	1,062·99000	4	1,391·07333	4	1,719·15667	4	2,047·24000	4	2,375·32333	4	2,703·40667	4	3,031·49000
5	82·02083	5	410·10417	5	738·18750	5	1,066·27083	5	1,394·35417	5	1,722·43750	5	2,050·52083	5	2,378·60417	5	2,706·68750	5	3·034·77083
6	85·30167	6	413·38500	6	741·46833	6	1,069·55167	6	1,397·63500	6	1,725·71833	6	2,053·80167	6	2,381·88500	6	2,709·96833	6	3·038·05167
7	88·58250	7	416·66583	7	744·74917	7	1,072·83250	7	1,400·91583	7	1,728·99917	7	2,057·08250	7	2,385·16583	7	2,713·24917	7	3,041·33250
8	91·86333	8	419·94667	8	748·03000	8	1,076·11333	8	1,404·19667	8	1,732·28000	8	2,060·36333	8	2,388·44667	8	2,716·53000	8	3,044·61333
9	95·14417	9	423·22750	9	751·31083	9	1,079·39417	9	1,407·47750	9	1,735·56083	9	2,063·64417	9	2,391·72750	9	2,719·81083	9	3,047·89417
30	98·42500	**130**	426·50833	**230**	754·59167	**330**	1,082·67500	**430**	1,410·75833	**530**	1,738·84167	**630**	2,066·92500	**730**	2,395·00833	**830**	2,723·09167	**930**	3,051·17500
1	101·70593	1	429·78917	1	757·87250	1	1,085·95583	1	1,414·03917	1	1,742·12250	1	2,070·20583	1	2,398·28917	1	2,726·37250	1	3,054·45583
2	104·98667	2	433·07000	2	761·15333	2	1,089·23667	2	1,417·32000	2	1,745·40333	2	2,073·48667	2	2,401·57000	2	2,729·65333	2	3,057·73667
3	108·26750	3	436·35083	3	764·43417	3	1,092·51750	3	1,420·60083	3	1,748·68417	3	2,076·76750	3	2,404·85083	3	2,732·93417	3	3,061·01750
4	111·54833	4	439·63167	4	767·71500	4	1,095·79833	4	1,423·88167	4	1,751·96500	4	2,080·04833	4	2,408·13167	4	2,736·21500	4	3,064·29833
5	114·82917	5	442·91250	5	770·99583	5	1,099·07917	5	1,427·16250	5	1,755·24583	5	2,083·32917	5	2,411·41250	5	2,739·49583	5	3,067·57917
6	118·11000	6	446·19333	6	774·27667	6	1,102·36000	6	1,430·44333	6	1,758·52667	6	2,086·61000	6	2,414·69333	6	2,742·77667	6	3,070·86000
7	121·39083	7	449·47141	7	777·55750	7	1,105·64083	7	1,433·72417	7	1,761·80750	7	2,089·89083	7	2,417·97417	7	2,746·05750	7	3,074·14083
8	124·67167	8	452·75500	8	780·83833	8	1,108·92167	8	1,437·00500	8	1,765·08833	8	2,093·17167	8	2,421·25500	8	2,749·33833	8	3,077·42167
9	127·95250	9	456·03583	9	784·11917	9	1,112·20250	9	1,440·28583	9	1,768·36917	9	2,096·45250	9	2,424·53583	9	2,752·61917	9	3,080·70250
40	131·23333	**140**	459·31667	**240**	787·40000	**340**	1,115·48333	**440**	1,443·56667	**540**	1,771·65000	**640**	2,099·73333	**740**	2,427·81667	**840**	2,755·90000	**940**	3,083·98333
1	134·51417	1	462·59750	1	790·68083	1	1,118·76417	1	1,446·84750	1	1,774·93083	1	2,103·01417	1	2,431·09750	1	2,759·18083	1	3,087·26417
2	137·79500	2	465·87833	2	793·96167	2	1,122·04500	2	1,450·12833	2	1,778·21167	2	2,106·29500	2	2,434·37833	2	2,762·46167	2	3,090·54500
3	141·07583	3	469·15917	3	797·24250	3	1,125·32583	3	1,453·40917	3	1,781·49250	3	2,109·57583	3	2,437·65917	3	2,765·74250	3	3,093·82583
4	144·35667	4	472·44000	4	800·52333	4	1,128·60667	4	1,456·69000	4	1,784·77333	4	2,112·85667	4	2,440·94000	4	2,769·02333	4	3,097·10667
5	147·63750	5	475·72083	5	803·80417	5	1,131·88750	5	1,459·97083	5	1,788·05417	5	2,116·13750	5	2,444·22083	5	2,772·30417	5	3,100·38750
6	150·91833	6	479·00167	6	807·08500	6	1,135·16833	6	1,463·25167	6	1,791·33500	6	2,119·41833	6	2,447·50167	6	2,775·58500	6	3,103·66833
7	154·19917	7	482·28250	7	810·36583	7	1,138·44917	7	1,466·53250	7	1,794·61583	7	2,122·69917	7	2,450·78250	7	2,778·86583	7	3,106·94917
8	157·48000	8	485·56333	8	813·64667	8	1,141·73000	8	1,469·81333	8	1,797·89667	8	2,125·98000	8	2,454·06333	8	2,782·14667	8	3,110·23000
9	160·76083	9	488·84417	9	816·92750	9	1,145·01083	9	1,473·09417	9	1,801·17750	9	2,129·26083	9	2,457·34417	9	2,785·42750	9	3,113·51089

50	164·04167	**150**	492·12500	**250**	820·20833	**350**	1,148·29167	**450**	1,476·37500
1	167·32250	1	495·40583	1	823·48917	1	1,151·57250	1	1,479·65583
2	170·60333	2	498·68667	2	826·77000	2	1,154·84333	2	1,482·93667
3	173·88417	3	501·96750	3	830·05083	3	1,158·13417	3	1,486·21750
4	177·16500	4	506·24833	4	833·33167	4	1,161·41500	4	1,489·49833
5	180·44583	5	508·52917	5	836·61250	5	1,164·69583	5	1,492·77917
6	183·72667	6	511·81000	6	839·89333	6	1,167·97667	6	1,496·06000
7	187·00750	7	515·09083	7	843·17417	7	1,171·25750	7	1,499·34083
8	190·28833	8	518·37167	8	846·45500	8	1,174·53833	8	1,502·62167
9	193·56917	9	521·65250	9	849·73583	9	1,177·81917	9	1,505·90250
60	196·85000	**160**	524·93333	**260**	853·01667	**360**	1,181·10000	**460**	1,509·18333
1	200 13083	1	528·21417	1	856·29750	1	1,184·38083	1	1,512·46417
2	203·41167	2	531·49500	2	859·57833	2	1,187·66167	2	1,515·74500
3	206·69250	3	534·77583	3	862·85917	3	1,190·94250	3	1,519·02583
4	209·97333	4	538·05667	4	866·14000	4	1,194·22333	4	1,522·30667
5	213·25417	5	541·33750	5	869·42083	5	1,197·50417	6	1,525·58750
6	216·53500	6	544·61833	6	872·70167	6	1,200·78500	6	1,528·86833
7	219·81583	7	547·89917	7	875·98250	7	1,204·06583	7	1,532·14917
8	223·09667	8	551·18000	8	879·26333	8	1,207·34667	8	1,535·43000
9	226·37750	9	554·46083	9	882·54417	9	1,210·62750	9	1,538·71083
70	229·65833	**170**	557·74167	**270**	885·82500	**370**	1,213·90833	**470**	1,541·99167
1	232·93917	1	561·02250	1	889·10583	1	1,217·18917	1	1,545·27250
2	236·22000	2	564·30333	2	892·38667	2	1,220·47000	2	1,548·55333
3	239·50083	3	567·58417	3	895·66750	3	1,223·75083	3	1,551·83417
4	242·78167	4	570·86500	4	898·94833	4	1,227·03167	4	1,555·11500
5	246·06250	5	574·14583	5	902·22917	5	1,230·31250	5	1,558·39583
6	249·34333	6	577·42667	6	905·51000	6	1,233·59333	6	1,561·67667
7	252·62417	7	580·70750	7	908·79083	7	1,236·87417	7	1,564·95750
8	255·90500	8	583·98833	8	912·07167	8	1,240·15500	8	1,568·23833
9	259·18583	9	587·26917	9	915·35250	9	1,243·43583	9	1,571·51917
80	262·46667	**180**	590·55000	**280**	918·63333	**380**	1,246·71667	**480**	1,574·80000
1	265·74750	1	593·83083	1	921·91417	1	1,249·99750	1	1,578·08083
2	269·02833	2	597·11167	2	925·19500	2	1,253·27833	2	1,581·36167
3	272·30917	3	600·39250	3	928·47583	3	1,256·55917	3	1,584·64250
4	275·59000	4	603·67333	4	931·75667	4	1,259·84000	4	1,587·92333
5	278·87083	5	606·95417	5	935·03750	5	1,263·12083	5	1,591·20417
6	282·15167	6	610·23500	6	938·31833	6	1,266·40167	6	1,594·48500
7	285·43250	7	613·51583	7	941·59917	7	1,269·68250	7	1,597·76583
8	288·71333	8	616·79667	8	944·88000	8	1,272·96333	8	1,601·04667
9	291·99417	9	620·07750	9	948·16083	9	1,276·24417	9	1,604·32750
90	295·27500	**190**	623·35833	**290**	951·44167	**390**	1,279·52500	**490**	1,607·60833
1	298·55583	1	626·63917	1	954·72250	1	1,282·80583	1	1,610·88917
2	301·83667	2	629·92000	2	958·00333	2	1,286·08667	2	1,614·17000
3	305·11750	3	633·20083	3	961·28417	3	1,289·36750	3	1,617·45083
4	308·39833	4	636·48167	4	964·56500	4	1,292·64833	4	1,620·73167
5	311·67917	5	639·76250	5	967·84583	5	1,295·92917	5	1,624·01250
6	314·96000	6	643·04333	6	971·12667	6	1,299·21000	6	1,627·29333
7	318·24083	7	646·32417	7	974·40750	7	1,302·49083	7	1,630·57417
8	321·52167	8	649·60500	9	977·68833	8	1,305·77167	8	1,633·85500
9	324·80250	9	652·88583	9	980·96917	9	1,309·05250	9	1,637·13583

550	1,801·45833	**650**	2,132·54167	**750**	2·460·62500	**850**	2,788·70833	**950**	3,116·79167
1	1,807·73917	1	2,135·82250	1	2,463·90583	1	2,791·98917	1	3,120·07250
2	1,811·02000	2	2,139·10333	2	2,467·18667	2	2,795·27000	2	3,123·35333
3	1,814·30083	3	2,142·38417	3	2,470·46750	3	2,798·55083	3	3,126·63417
4	1,817·58167	4	2,145·66500	4	2,473·74833	4	2,801·83167	4	3,129·91500
5	1,820·86250	5	2,148·94583	5	2,477·02917	5	2,805·11250	5	3,133·19583
6	1,824·14333	6	2,152·22667	6	2,480·31000	6	2,808·39333	6	3,136·47667
7	1,827·42417	7	2,155·50750	7	2,483·59083	7	2,811·67417	7	3,139·75750
8	1,830·70500	8	2,158·78833	8	2,486·78167	8	2,814·95500	8	3,143·03833
9	1,833·98583	9	2,162·06917	9	2,490·15250	9	2,818·23583	9	3,146·31917
560	1·837,26667	**660**	2,165·35000	**760**	2,493·43333	**860**	2,821·51667	**960**	3,149·60000
1	1,840·54750	1	2,168·63083	1	2,496·71417	1	2,824·79750	1	3,152·88083
2	1,843·82833	2	2,171·91167	2	2,499·99500	2	2,828·07833	2	3,156·16167
3	1,847·10917	3	2,175·19250	3	2,503·27583	3	2,831·35917	3	3,159·44250
4	1,850·39000	4	2,178·47333	4	2,506·55667	4	2,834·64000	4	3,162·72333
5	1,853·67083	5	2,181·75417	5	2,509·83750	5	2,837·92083	5	3,166·00417
6	1,856·95167	6	2,185·03500	6	2,513·11833	6	2,841·20167	6	3,169·28500
7	1,860·23250	7	2,188·31583	7	2,516·39917	7	2,844·48250	7	3,172·56583
8	1,863·51333	8	2,191·59667	8	2,519·68000	8	2,847·76333	8	3,175·84667
9	1,806·79417	9	2,194·87750	9	2,522·96083	9	2,851·04417	9	3,179·12750
570	1,870·07500	**670**	2,198·15833	**770**	2,526·24167	**870**	2,854·32500	**970**	3,182·40833
1	1,873·35583	1	2,201·43917	1	2,529·52250	1	2,857·60583	1	3,185·68917
2	1,876·63667	2	2,204·72000	2	2,532·80333	2	2,860·88667	2	3,188·97000
3	1,879·91750	3	2,208·00083	3	2,536·08417	3	2,864·16750	3	3,192·25083
4	1,883·19833	4	2,211·28167	4	2,539·36500	4	2,867·44833	4	3,195·53167
5	1,886·47917	5	2,214·56250	5	2,542·64583	5	2,870·72917	5	3,198·81250
6	1,889·76000	6	2,217·84333	6	2,545·92667	6	2,874·01000	6	3,202·09333
7	1,893·04083	7	2,221·12417	7	2,549·20750	7	2,877·29083	7	3,205·37417
8	1,896·32167	8	2,224·40500	8	2,552·48833	8	2,880·57167	8	3,208·65500
9	1,899·60250	9	2,227·68583	9	2,555·76917	9	2,883·85250	9	3,211·93583
580	1,902·88333	**680**	2,230·96667	**780**	2,559·05000	**880**	2,887·13333	**980**	3,215·21667
1	1,906·16417	1	2,234·24750	1	2,562·33083	1	2,890·41417	1	3,218·49750
2	1,909·44500	2	2,237·52833	2	2,565·61167	2	2,893·69500	2	3,221·77833
3	1,912·72583	3	2,240·80917	3	2,568·89250	3	2,896·97583	3	3,225·05917
4	1,916·00667	4	2,244·09000	4	2,572·17333	4	2,900·25667	4	3,228·34000
5	1,919·28750	5	2,247·37083	5	2,575·45417	5	2,903·53750	5	3,231·62083
6	1,922·56833	6	2,250·65167	6	2,578·73500	6	2,906·81833	6	3,234·90167
7	1,925·84917	7	2,253·93250	7	2,582·01583	7	2,910·09917	7	3,238·18250
8	1,929·13000	8	2,257·21333	8	2,585·29667	8	2,913·38000	8	3,241·46333
9	1,932·41083	9	2,260·49417	9	2,588·57750	9	2,916·66083	9	3,244·74417
590	1,935·69167	**690**	2,263·77500	**790**	2,591·85833	**890**	2,919·94167	**990**	3,248·02500
1	1,938·97250	1	2,267·05583	1	2,595·13917	1	2,923·22250	1	3,251·30583
2	1,942·25333	2	2,270·33667	2	2,598·42000	2	2,926·50333	2	3,254·58667
3	1,945·53417	3	2,273·61750	3	2,601·70083	3	2,929·78417	3	2,257·67503
4	1,948·81500	4	2,276·89833	4	2,604·98167	4	2,933·06500	4	3,261·14833
5	1,952·09583	5	2,280·17917	5	2,608·26250	5	2,936·34583	5	3,264·42917
6	1,955·37667	6	2,283·46000	6	2,611·54333	6	2,939·62667	6	3,267·71000
7	1,958·65750	7	2,286·74088	7	2,614·82417	7	2,942·90750	7	3,270·99083
8	1,961·93833	8	2,290·02167	8	2,618·10500	8	2,946·1		3 ,274·27167
9	1,965·21917	9	2,293·30250	9	2,621·38583	9	2,949·46917	9	3,277·55250

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS ALONG THE 141st MERIDIAN FROM THE ARCTIC OCEAN TO MOUNT ST. ELIAS.

Based on Yukon Datum.

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To Station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Demarcation, 1912	9·6	32	69 40 43·896	1360·3	291 34 16·6	111 53 28·2	Ocean	14257·3	4·154037
			141 10 39·467	425·1	322 05 55·2	142 17 09·9	Tundra	12671·9	4·102843
					329 39 05·1	149 57 57·2	Bug	25995·8	4·414903
					3 39 30·9	183 37 14·3	Mosquito	24869·0	4·395658
Demarcation Point,[1] Landward end, 1912.	......	....	69 40 41·58	1288·5	357 58 15	178 00 10	Borealis	37771·1	4·57716
			141 12 25·82	278·1	0 59 38	180 59 01	Mosquito	24750·8	4·39359
Polar, 1912	8·5	28	69 39 36·751	1138·9	289 47 07·5	109 59 55·6	Ocean	9399·1	3·973088
			141 03 50·524	544·7	302 39 27·2	122 43 03·3	Monument No. 1	2953·8	3·470377
					336 54 13·8	157 06 42·5	Bug	22148·2	4·345339
					115 19 46·5	295 13 23·0	Demarcation	4873·2	3·687813
Ocean, 1912	7·0	23	69 37 53·552	1659·5	0 44 00·2	180 43 41·2	Bug	17192·1	4·235330
			140 50 11·220	121·1	49 19 43·7	229 11 47·0	Tundra	7252·5	3·860490
Ice, 1912	7·3	24	69 35 52·482	1626·4	43 57 56·8	223 39 22·8	Bug	18623·0	4·270049
			140 30 42·395	458·3	106 41 59·9	286 23 44·3	Ocean	13172·9	4·119681
Wreck,[1] 1912	9·4	31	69 35 38·216	1184·3	42 50 05·9	222 32 02·3	Hot	18501·6	4·267210
			140 10 57·013	616·6	92 07 47·0	271 49 16·0	Ice	12825·1	4·108060
Herschel Island,[1] Highest Point, 1912.	......	....	69 35 34·65	1073·8	90 39 28	269 38 31	Wreck	42200·7	4·62532
			139 05 54·67	591·3	91 14 15	269 54 47	Ice	55016·1	4·74049
Tundra, 1912	28·4	93	69 35 20·823	645·3	336 54 23·6	157 02 01·1	Bug	13536·6	4·131511
			140 58 39·779	430·3	32 29 44·0	212 16 13·2	Mosquito	17533·7	4·243874
Mount Conibear,[1] 1912	......	....	69 29 33·23	1029·8	85 09 42	264 07 53	Mosquito	43253·4	4·63602
			140 07 05·06	55·0	119 18 12	298 37 49	Ocean	32013·3	4·50533
Bug, 1912	606·9	1991	69 28 38·814	1202·8	350 57 21·5	171 00 13·6	Backhouse	12782·4	4·106614
			140 50 31·458	342·0	40 25 26·9	220 06 50·9	Borealis	20117·8	4·303580
					81 06 46·0	260 45 38·2	Mosquito	14913·4	4·173576
Hot, 1912	587·7	1928	69 28 19·331	599·0	92 46 07·4	272 27 06·9	Bug	13256·7	4·122437
			140 30 13·637	148·3	144 03 19·3	323 44 37·2	Ocean	22023·2	4·342881
					178 43 53·8	358 43 26·8	Ice	14046·1	4·147557
Mosquito, 1912	737·2	2419	69 27 23·004	712·9	301 17 40·3	121 41 39·7	Backhouse	19668·3	4·293767
			141 13 05·271	57·4	352 15 03·3	172 17 34·6	Borealis	13120·2	4·117940
Backhouse, 1912	1103·6	3621	69 21 51·425	1593·6	7 37 19·6	187 34 55·1	Aurora	12793·7	4·106996
			140 47 27·628	302·0	56 26 54·9	236 21 11·5	Pass	4817·8	3·682850
					79 54 41·1	259 33 13·5	Borealis	15293·2	4·184498
Pass, 1912	1279·9	4199	69 20 25·390	786·8	346 52 32·0	166 55 50·8	Aurora	10282·6	4·012105
			140 53 34·560	378·2	89 49 14·2	269 33 30·1	Borealis	11041·6	4·043033
Borealis, 1912	1713·0	5620	69 20 23·459	727·0	306 27 45·2	126 46 47·8	Aurora	16688·9	4·222427
			141 10 23·604	258·3	333 04 59·8	153 21 39·6	Empire	26097·1	4·416593
					346 06 40·8	166 11 55·5	Grizzly	15434·1	4·188481
					359 00 12·3	179 00 44·1	Republic	21584·1	4·334133
Aurora, 1912	1448·0	4751	69 15 02·195	68·0	7 11 02·8	187 08 40·5	Empire	13448·2	4·128665
			140 50 02·066	22·7	62 47 18·4	242 33 30·9	Grizzly	10957·9	4·039727
Whale Mountain,[1] 1912	......	....	69 14 13·52	419·0	285 36 59	105 54 39	Grizzly	12964·3	4·11275
			141 23 41·11	452·0	317 43 51	137 56 48	Republic	13648·7	4·13509
Grizzly Ridge, Northwest Peak, 1912.	1968·4	6458	69 13 04·20	130·2	6 01 20	186 00 08	Republic	8013·1	3·903801
			141 08 33·46	368·3	174 56 24	354 54 40	Borealis	13665·4	4·135621
					253 11 56	73 29 15	Aurora	12756·2	4·105722
					298 50 48	118 54 19	Grizzly	2845·0	3·454077
Grizzly, 1912	2001·2	6566	69 12 19·862	615·5	315 42 30·9	135 53 55·8	Empire	11594·7	4·064259
			141 04 47·135	519·0	26 51 46·4	206 47 03·7	Republic	7390·4	3·868666
Grizzly Ridge,[1] Topographical Cairn, 1912.	1966·5	6452	69 11 55·51	1720·2	314 54 40	135 05 20	Empire	10689·1	4·02894
			141 03 59·47	655·0	33 30 47	213 25 20	Republic	7001·5	3·84519
Grizzly Ridge, Southeast Peak, 1912.	2032·1	6667	69 11 40·307	1249·1	16 10 47·5	196 01·12·1	Reaburn	24587·4	4·390713
			141 04 00·330	3·6	35 41 59·6	215 36 33·2	Republic	6608·2	3·820082
					313 01 46·8	133 12 28·0	Empire	10368·7	4·015726
High Peak, 1911	......	....	69 11 18·75	581	353 32 23	173 38 42	Turner	40507	4·607527
			141 03 54·15	597	358 10 50	178 12 52	Riggs	46147	4·664145

1 No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Double Peak,[1] 1912	2037·0	6683	69 10 25·28	783·4	204 32 24	25 08 21	Polar	59808·1	4·77676
			141 42 14·71	162·2	211 03 37	31 30 53	Mosquito	36903·7	4·56707
Mount Greenough,	2200·6	7220	69 09 45·205	1400·8	208 05 56·1	28 31 03·4	Mosquito	37231·5	4·570910
West Peak, 1912.			141 39 56·492	623·2	258 04 41·9	78 37 33·6	Grizzly	23736·9	4·375424
					274 55 51·4	95 24 00·0	Republic	20022·8	4·301525
					276 01 56·5	96 46 12·5	Empire	31575·4	4·499349
Mount Greenough (Elephant	2195·2	7202	69 08 59·123	1832·2	205 31 40·2	25 55 06·5	Mosquito	37969·6	4·579436
Mt., 1911),			141 38 08·718	96·2	253 59 51·6	74 31 02·4	Grizzly	22926·7	4·360342
East Peak, 1912.					270 55 26·3	91 21 54·1	Republic	18761·3	4·273263
					273 36 32·0	94 19 07·1	Empire	30270·0	4·481012
					319 22 50·3	139 45 08·1	Reaburn	24473·6	4·388698
Republic, 1912	1773·0	5817	69 08 47·029	1457·4	336 47 26·1	156 58 55·3	Tub	20836·8	4·318831
			141 09 49·603	547·6	9 13 52·4	189 09·43·3	Reaburn	18491·4	4·266969
Highest Peak near (west of)	1888·3	6195	69 08 37·86	1173·2	25 09 10	204 57 22	Reaburn	19835·9	4·297453
line in ridge south of coast			141 01 38·32	423·1	93 03 44	272 56 05	Republic	5431·7	3·734938
line, 1912.					163 11 13	343 08 17	Grizzly	7187·5	3·856573
					283 20 53	103 29 21	Empire	6177·5	3·790813
Empire, 1912	1655·2	5430	69 07 51·596	1598·9	10 44 22·0	190 39 44·3	Tub	17755·2	4·249326
			140 52 34·289	378·8	41 17 07·6	220 56 51·6	Reaburn	21949·1	4·341416
					98 40 39·7	278 24 32·3	Republic	11562·7	4·063059
Reaburn, 1911–12	1530·1	5020	68 58 57·957	1795·8	326 16 56·6	146 32 56·7	Turner	20764·7	4·317325
			141 14 16·287	181·1	7 51 03·0	187 47 20·2	Siwash	19598·3	4·292218
Tub, 1911–12	1440·0	4725	68 58 28·572	885·3	359 02 45·3	179 03 08·0	Turner	16390·2	4·214585
			140 57 31·627	351·9	37 02 57·0	216 43 37·0	Siwash	23137·2	4·364311
					94 47 15·2	274 31 37·4	Reaburn	11214·1	4·049763
Sharp Cone, 1911	......	....	68 52 54·72	1695	308 51 21	130 00 55	Coral	65374	4·815404
			142 28 17·52	196	311 38 23	133 02 13	Lynx	82563	4·916788
Turner, 1911	1400·3	4594	68 49 39·697	1230·0	342 54 11·6	162 57 31·5	Incog	8197·7	3·913690
			140 57 07·263	81·4	27 52 07·8	207 47 50·1	Riggs	6638·7	3·822080
					37 45 43·8	217 31 55·7	Albion	16333·2	4·213070
Siwash, 1911	1229·3	4033	68 48 31·361	971·7	261 21 31·6	81 41 13·8	Turner	14364·2	4·157282
			141 18 15·076	169·0	288 31 00·5	108 46 24·8	Riggs	11739·4	4·069645
					338 26 01·2	158 31 54·9	Albion	11625·1	4·065397
Riggs, 1911	1376·8	4517	68 46 30·237	936·9	289 33 39·4	109 41 16·9	Incog	5853·5	3·767417
			141 01 43·648	490·0	44 20 02·3	224 10 32·0	Albion	9859·4	3·993852
Incog, 1911	949·7	3116	68 45 26·791	830·1	4 49 00·8	184 47 32·4	Shark	12758·9	4·105813
			140 53 32·788	368·4	47 58 57·8	227 39 24·9	Silver	19139·0	4·281919
					67 48 34·6	247 31 26·9	Albion	13410·4	4·127441
Albion, 1911	1159·7	3805	68 42 42·334	1311·7	303 42 04·0	123 57 42·9	Shark	13683·2	4·136189
			141 11 55·573	625·9	12 48 38·8	192 46 13·4	Silver	7952·6	3·900510
Firth, 1911	941·7	3090	68 41 33·592	1040·8	201 05 08·2	21 08 59·3	Incog	7746·1	3·889082
			140 57 40·790	459·7	342 30 21·3	162 32 43·9	Shark	5753·7	3·759948
					32 28 47·6	212 23 23·4	Firth River South Base	7326·1	3·864871
					63 52 38·6	243 36 57·1	Silver	12717·0	4·104383
					102 35 03·6	282 21 47·2	Albion	9861·6	3·993947
Wave Mountain, 1911	......	....	68 41 14·25	442	292 38 15	113 42 12	Jim	50736	4·705320
			142 07 00·45	5	298 15 07	119 04 50	Coral	41323	4·616197
Firth River,	525·6	1725	68 39 21·117	654·3	283 57 29·0	104 05 05·8	Shark	5709·4	3·756591
North Base, 1911.			141 03 18·238	205·9	78 46 49·9	258 36 22·7	Silver	7754·8	3·889568
					136 58 38·6	316 50 36·6	Albion	8537·6	3·931335
Shark, 1911	873·2	2865	68 38 36·472	1130·1	8 12 09·8	188 09 11·8	Jim	15229·9	4·182698
			140 55 07·649	86·4	40 12 33·6	219 55 21·4	Coral	19514·8	4·290364
					89 33 11·8	269 15 07·7	Silver	13148·0	4·118861
Silver, 1911	1009·1	3311	68 38 32·049	993·0	323 27 22·6	143 42 28·2	Jim	18563·2	4·268653
			141 14 31·692	358·0	357 34 25·9	177 35 17·3	Coral	14811·0	4·170583
Firth River	522·6	1715	68 38 14·042	435·1	94 20 54·7	274 10 37·5	Silver	7506·4	3·875429
South Base, 1911.			141 03 29·023	327·9	145 34 02·3	325 26 10·3	Albion	10087·1	4·003767
					183 21 09·1	3 21 19·1	Firth River, North Base	2081·9	3·318463
					262 56 19·0	83 04 05·7	Shark	5705·9	3·756326
Pepper,[1] 1911	......	....	68 34 04·308	133·5	313 28 36·7	133 38 09·6	Jim	9639·0	3·984031
			141 08 34·485	390·9	27 49 58·2	207 45 17·1	Coral	7349·6	3·866264

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
High Dome,[1] 1911	......	....	68 33 35·37 142 18 02·55	1096 29	275 25 20 289 15 12	96 39 32 110 29 25	Jim Lynx	54593 57917	4·737139 4·762808
Coral, 1911	839·7	2755	68 30 34·476 141 13 36·509	1068·2 414·8	270 39 07·4 323 13 07·7 1 57 27·7	90 53 21·2 143 27 23·4 181 56 58·8	Jim Lynx Wee	10426·9 17556·4 10340·1	4·018154 4·244435 4·014523
Jim, 1911	823·4	2701	68 30 29·950 140 58 18·891	928·0 214·7	359 53 02·8 46 46 34·0	179 53 05·1 226 31 51·6	Lynx Wee	13943·0 14850·9	4·144356 4·171753
Cone Mountain,[1] 1911	......	....	68 29 21·06 141 44 22·64	653 257	311 29 09 332 19 05	131 58 18 152 47 33	Yankee Pasture	28776·2 45726·0	4·459033 4·660163
Wee, 1911	396·9	1302	68 25 00·957 141 14 07·471	30·0 85·2	288 55 36·3 309 37 48·2 356 05 21·2	109 10 20·6 129 45 37·6 176 06 22·8	Lynx Watt Yankee	11486·9 7492·0 11120·4	4·060202 3·874596 4·046119
Northwest Range, 1911	......	....	68 25 20·00 142 02 57·64	620 658	257 13 43 288 26 54 313 56 19	78 13 51 109 13 19 134 42 03	Jim Yankee Pasture	45187 36192 47391	4·655014 4·558612 4·675696
Lynx, 1911	1044·4	3427	68 22 59·957 140 58 16·422	1857·8 187·7	339 54 39·9 54 09 08·5 78 34 23·3	159 59 02·4 233 55 26·1 258 27 28·5	Doodle Yankee Watt	9428·8 12508·2 5203·3	3·974456 4·097195 3·716277
Watt, 1911	996·0	3268	68 22 26·521 141 05 42·636	821·8 487·3	313 03 42·4 38 33 45·6	133 14 59·6 218 26 57·9	Doodle Yankee	11434·7 8062·7	4·058227 3·906482
Yankee, 1911	574·8	1886	68 19 02·889 141 13 01·278	89·5 14·6	276 17 45·5 2 29 25·5 316 10 04·4	96 35 50·1 182 28 46·8 136 25 57·9	Doodle Billie Wad	13464·6 11033·0 17066·2	4·129195 4·042692 4·232136
Doodle, 1911	470·9	1545	68 18 14·097 140 53 33·947	436·8 389·2	8 31 01·3 55 44 59·9	188 28 50·6 235 26 16·9	Wad Billie	10946·8 16831·6	4·039288 4·226126
Potato Hill, 1911	......	....	68 16 50·56 141 21 21·45	1567 246	234 22 40 343 02 08	54 30 25 163 09 13	Yankee Pasture	7051 18109	3·848223 4·257890
Billie, 1911	578·8	1899	68 13 07·140 141 13 42·937	221·2 494·2	275 58 13·3 321 16 52·8 0 04 45·3	96 14 45·2 141 31 10·7 180 04 44·2	Wad Spud Pasture	12365·9 17091·4 10403·8	4·092224 4·232778 4·017190
Wad, 1911	311·2	1021	68 12 24·673 140 55 54·756	764·5 630·5	7 52 39·9 53 45 24·2	187 50 26·2 233 28 51·5	Spud Pasture	12155·8 15321·3	4·084782 4·185296
Pasture, 1911	805·7	2643	68 07 31·360 141 13 44·182	971·7 510·5	285 18 50·3 333 26 08·4 358 12 11·4	105 33 09·0 153 33 03·3 178 12 54·3	Spud Tip Cherry	11099·1 11600·6 17166·0	4·045288 4·064479 4·234669
Spud, 1911	469·5	1540	68 05 56·031 140 58 18·780	1736·1 217·3	349 41 53·7 36 46 51·4	169 45 36·0 216 39 27·8	Trap Tip	15605·9 9266·1	4·193289 3·966898
Cut-in,[1] 1911	869·7	2853	68 04 57·256 141 07 16·409	1774·1 190·0	253 36 57·0 136 50 36·2 352 59 34·2	73 45 15·8 316 44 36·4 173 00 29·3	Spud Pasture Tip	6482·5 6550·6 5648·5	3·811744 3·816284 3·751936
Tip, 1911	877·8	2880	68 01 56·306 141 06 17·012	1744·6 197·4	313 26 48·7 34 33 00·3	133 37 54·4 214 26 48·5	Trap Cherry	11509·5 8222·5	4·061056 3·915002
Cherry, 1911	946·4	3105	67 58 17·591 141 12 57·908	545·0 673·6	315 41 47·6 357 06 18·3	135 57 20·8 177 07 17·9	Old Crow Comb	16850·6 14889·1	4·226615 4·172868
Trap, 1911	386·6	1269	67 57 40·414 140 54 18·956	1252·1 220·5	6 48 56·5 42 01 44·2 95 12 01·4	186 47 12·9 221 45 27·0 274 54 44·2	Old Crow Comb Cherry	11011·4 18428·9 13069·2	4·041842 4·265499 4·116250
Dome-shaped Mountain,[1] 1911.	......	....	67 52 15·56 140 28 50·73	482 593	87 36 51 119 39 23	267 11 32 299 15 47	Old Crow Trap	19182·3 20464·5	4·282900 4·311002
Old Crow, 1911	595·6	1954	67 51 47·512 140 56 10·779	1472·0 125·9	353 28 44·4 38 22 39·8 75 56 46·9	173 31 24·5 218 12 45·4 255 42 13·7	Doc Tiny Comb	17917·4 12126·6 11370·4	4·253275 4·083740 4·055775
Comb, 1911	989·4	3246	67 50 17·641 141 11 53·630	546·5 627·4	318 46 41·5 9 18 47·0 332 19 30·1	139 03 54·4 189 15 19·1 152 24 08·8	Doc Barren Tiny	19922·5 16333·8 7600·0	4·299343 4·213088 3·880813
Tiny, 1911	823·4	2702	67 46 40·327 141 06 52·676	1249·4 617·8	310 46 18·7 33 24 16·4	130 58 52·8 213 16 10·0	Doc Barren	12659·7 11235·7	4·102424 4·050602
Pin,[1] 1911	1031·5	3384	67 42 46·192 141 01 51·121	1431·1 601·3	279 37 23·9 77 44 36·9	99 45 18·8 257 31 51·6	Doc Barren	6125·5 9962·4	3·787141 3·998366

[1]No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Doc, 1911	962·3	3157	67 42 12·917	400·2	0 28 27·1	180 28 19·0	Gun	12450·8	4·095197
			140 53 17·838	209·9	37 13 48·7	216 59 07·1	Orphan	18644·3	4·270547
Barren, 1911	968·4	3177	67 41 37·347	1157·0	265 49 53·1	86 10 33·2	Doc	15812·4	4·198997
			141 15 38·189	449·5	305 40 27·9	126 00 59·4	Gun	19378·9	4·287329
					341 35 40·4	161 41 38·3	Orphan	14504·9	4·161516
Rock,[1] 1911	957·9	3143	67 41 13·821	428·2	344 18 03·6	164 21 57·1	Gun	11029·2	4·042543
			140 57 38·995	459·1	17 05 44·1	196 59 10·5	Sun	17154·0	4·234366
Rapid, 1911	683·4	2242	67 37 57·195	1772·0	291 49 02·9	112 03 42·8	Gun	12117·8	4·083424
			141 09 18·169	214·4	317 45 37·9	137 54 14·0	P_1 of the Boundary	9826·3	3·992388
					342 32 40·6	162 36·53·5	Sun	10804·6	4·033608
Old Crow Mountain,[1] 1910	1269·1	4164	67 36 55·71	1726·0	51 08 58	230 23 53	Rampart	44885	4·65210
			140 07 55·42	654·5	53 57 51	233 09 19	Canalaska Mountain	46513	4·66757
East End Castle Ridge,[1] 1910	......	....	67 35 50·19	1554·9	38 23 37	218 10 48	Cone	15906	4·20155
			140 52 46·50	549·6	359 08 16	179 08 31	Nassau	13145	4·11876
Gun, 1911	989·6	3247	67 35 31·057	962·2	356 55 39·4	176 56 31·8	Nassau	12568·4	4·099282
			140 53 26·554	314·0	38 22 19·8	218 10 08·1	Cone	15147·0	4·180326
					54 18 58·5	234 08 31·8	Sun	9890·5	3·995218
Orphan, 1911	720·0	2362	67 34 12·991	402·5	257·39 48·3	77 54 21·5	Gun	11430·7	4·058074
			141 09 11·144	131·8	316 47 08·1	136 51 14·6	Sun	4611·7	3·663857
					349 09 24·4	169 11 45·6	Cone	9644·8	3·984294
Castle Peak,[1] 1910	......	....	67 34 00·33	10·2	25 40 28	205 34 48	Cone	10072	4·00310
			140 00 30·89	365·5	329 35 06	149 42 31	Nassau	11287	4·05257
West End Castle Ridge [1]	......	....	67 32 24·46	757·8	12 27 33	192 25 48	Cone	6258	3·79641
			141 04 44·67	529·1	307 44 12	127 55 31	Nassau	11037	4·04285
Sun, 1911	753·3	2471	67 32 24·447	757·4	307 44 14·8	127 55 33·7	Nassau	11036·3	4·042822
			141 04 44·618	528·5	12 27 53·7	192 26 08·6	Cone	6257·5	3·796404
"b"	......	....	67 30 50·63	1568·6	349 57 43	169 58 14	Monument No. 48	2277·8	3·35752
			141 00 33·44	396·6	53 33 09	233 27 32	Cone	5387·0	3·73135
					134 20 26	314 16 34	Sun	4160·9	3·61919
Cone, 1910	732·6	2404	67 29 07·218	223·6	332 53 05·4	153 02 14·4	Rampart	15572·5	4·192359
			141 06 38·355	455·6	3 45 47·2	183 44 15·0	Chasm	18199·1	4·260049
Peak East of Cone,[1] 1910	......	....	67 28 51·45	1594·0	320 37 53	140 40 56	Wan 2	3722	3·57075
			141 02 18·81	223·4	345 19 00	165 21 50	Fire Hill	8671	3·93808
Nassau, 1910	740·6	2430	67 28 45·959	1423·9	12 55 25·3	192 51 30·8	Rampart	13553·4	4·132048
			140 52 29·842	354·5	24 35 28·4	204 28 07·5	Canalaska Mountain	13690·9	4·136433
					32 58 34·3	212 43 58·7	Chasm	20833·7	4·318767
					93 50 53·8	273 37 50·0	Cone	10099·0	4·004277
June, 1911	706·4	2318	67 27 36·120	1119·0	117 30 03·0	297 23 00·3	Cone	6124·1	3·787045
			140 59 00·917	10·9	244 59 00·2	65 05 01·4	Nassau	5126·1	3·709791
Wan 2, 1910	677·8	2224	67 27 18·542	574·4	1 44 35·9	181 44 22·9	Fire Hill	5513·1	3·741398
			140 59 00·265	3·2	6 04 46·5	186 03 26·2	Canalaska Mountain	9801·9	3·991312
					12 42 17·3	192 40 14·6	Flat 2	7205·0	3·857633
					24 17 12·8	204 08 37·9	Chasm	16220·4	4·210062
					46 54 22·0	226 49 25·4	Sunset 2	5236·7	3·719055
					121 47 48·7	301 40 45·7	Cone	6400·5	3·806212
					351 10 55·6	171 13 01·6	Rampart	10653·2	4·027479
Porcupine, 1911	658·7	2161	67 25 39·424	1221·4	173 45 21·0	353 44 26·2	Cone	6476·2	3·811319
			141 05 39·039	464·7	232 35 30·6	52 41 38·3	June	5958·2	3·775118
					238 16 24·6	58 28 33·5	Nassau	11021·1	4·042223
Sunset 2, 1910	619·5	2032	67 25 22·974	711·8	10 29 27·0	190 25 20·2	Junction 2	17604·7	4·245629
			141 04 21·440	255·3	14 10 25·8	194 06 47·3	Chasm	11563·3	4·063082
					166 49 44·2	346 47 37·8	Cone	7135·5	3·853425
					233 17 30·1	53 28 27·3	Nassau	10543·3	4·022975
					321 41 57·6	141 49 00·1	Rampart	8814·7	3·945209
					335 36 52·3	155 40 28·5	Canalaska Mountain	6769·0	3·830525
Turner's Astronomic Station, 1910.	250·3	821	67 25 00·924	28·6	5 39 18·7	185 38 36·7	Canalaska Mountain	5510·2	3·741169
			140 59 41·755	497·3	21 30 43·7	201 29 19·3	Flat 2	2972·3	3·473096
					61 17 02·4	241 16 14·8	Turner's North Monument	699·8	2·844987
					345 19 19·5	165 19 44·8	Fire Hill	1289·1	3·110278
Rampart Storehouse Flagstaff,[1] 1910.	......	....	67 24 58·76	1820·4	20 14 19	200 13 02	Flat 2	2875·9	3·45877
			140 59 49·73	592·3	340 20 08	160 20 40	Fire Hill	1253·1	3·09798

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Turner's North Monument, 1910.	378·1	1241	67 24 50·068	1551·2	11 04 42·8	191 04 06·0	Flat 2	2475·3	3·393622
			141 00 33·284	396·4	193 31 09·2	13 32 35·1	Wan 2	4731·2	3·674972
					218 08 05·6	38 15 32·1	Nassau	9299·1	3·968442
					314 04 12·4	134 05 25·3	Fire Hill	1309·1	3·116982
					335 06 00·9	155 09 32·8	Rampart	6507·1	3·813389
					359 11 56·8	179 12 02·4	Canalaska Mountain.	5147·7	3·711609
Fire Hill, 1910	380·3	1248	67 24 20·672	640·4	11 36 25·7	191 35 18·4	Canalaska Mountain.	4324·7	3·635959
			140 59 14·341	170·9	43 01 21·6	222 59 31·9	Flat 2	2076·5	3·317330
					117 51 34·9	297 46 51·4	Sunset 2	4135·8	3·616555
					149 18 24·5	329 11 34·5	Cone	10329·8	4·014091
					210 17 49·4	30 24 03·0	Nassau	9524·0	3·978817
					340 12 00·3	160 14 19·3	Rampart	5306·0	3·724770
Flat 2, 1910	403·0	1322	67 23 31·659	980·0	146 59 05·2	326 56 11·4	Sunset 2	4113·8	3·614248
			141 01 13·180	157·1	159 37 40·1	339 32 39·8	Cone	11092·6	4·045032
					212 32 04·3	32 40 07·6	Nassau	11558·5	4·062901
					317 11 51·1	137 15 53·7	Rampart	4733·1	3·675143
					348 35 56·9	168 36 39·3	Canalaska Mountain.	2772·6	3·442892
Porcupine River East Base, 1911.	481·5	1580	67 22 44·319	1373·0	68 10 35·5	248 06 45·9	Porcupine River, West Base	3197·1	3·504756
			140 59 28·844	344·1	140 55 51·2	320 50 09·4	Porcupine	6992·1	3·844605
					182 06 11·7	2 06 37·5	June	9046·3	3·956473
					203 56 33·8	24 03 00·7	Nassau	12263·8	4·088627
Porcupine River West Base, 1911.	561·4	1842	67 22 05·903	182·9	167 40 07·4	347 38 15·3	Porcupine	6771·7	3·830696
			141 03 37·552	448·1	197 49 00·4	17 53 15·8	June	10747·9	4·031324
					212 35·27·0	32 45 43·6	Nassau	14724·5	4·168039
Canalaska Mountain, 1910	688·9	2260	67 22 03·928	121·7	285 48 21·3	105 51 47·6	Rampart	2772·6	3·442881
			141 00 27·254	325·1	48 10 16·1	228 03 01·4	Chasm	7557·6	3·878384
					161 25 48·2	341 20 05·6	Cone	13838·0	4·141074
Rampart, 1910	709·5	2328	67 21 39·509	1224·0	332 21 27·7	152 27 22·9	Lake	9937·7	3·997288
			140 56 43·775	522·4	39 56 55·6	219 45 46·6	Junction 2	13533·6	4·131413
					62 44 56·8	242 34 15·9	Chasm	9340·2	3·970354
Chasm, 1910	593·4	1947	67 19 21·046	652·0	289 08 19·8	109 24 55·6	Lake	13684·5	4·136229
			141 08 18·255	218·3	319 35 40·5	139 57 49·2	Kite	26785·0	4·427892
					3 26 53·4	183 26 25·1	Junction 2	6110·6	3·786084
Lake, 1910	615·9	2021	67 16 55·219	1710·7	344 42 15·4	164 47 48·8	Kite	16515·9	4·217901
			140 50 18·806	225·3	14 03 03·9	193 59 13·1	Tit	12410·7	4·093795
					34 27 49·1	214 11 19·5	Arch 2	22882·5	4·359503
Junction 2, 1910	594·9	1952	67 16 04·161	128·9	263 04 30·5	83 21 34·4	Lake	13393·1	4·126882
			141 08 48·924	586·1	315 16 06·3	135 29 19·0	Tit	14694·9	4·167166
					358 32 35·2	178·33 08·9	Arch 2	17321·1	4·238576
N. A., 1912	......	....	67 12 12·852	398·2	296 14 35·1	116 23 05·7	Tit	7429·1	3·870936
			141 03 43·142	518·4	17 44 49·1	197 40 40·9	Arch 2	10654·6	4·027537
Tit, 1910	686·9	2253	67 10 26·549	822·5	297 46 13·5	117 55 37·6	Kite	8334·3	3·920871
			140 54 29·269	352·1	55 26 32·5	235 13 54·0	Arch 2	12055·0	4·081168
Kite, 1910	695·0	2280	67 08 20·878	646·8	12 16 08·7	192 08 39·3	Salmon	27961·5	4·446561
			140 44 17·176	206·9	23 35 08·8	203 26 19·1	Battle	17423·2	4·241127
					47 08 33·5	226 44 13·5	Lone	26229·5	4·418790
					80 27 55·5	260 05 53·2	Arch 2	17552·9	4·244348
No. 20,[1] 1910	831·2	2727	67 07 06·990	216·6	75 32 55·0	255 29 35·6	Arch 2	2695·7	3·430678
			141 04 35·976	433·9	169 40 40·1	349 36 46·9	Junction 2	16917·1	4·228325
					229 41 23·9	49 50 43·0	Tit	9571·7	3·980991
Arch 2, 1910	......	....	67 06 45·234	1401·3	321 15 57·6	141 29 09·6	Battle	16657·2	4·221602
			141 08 12·411	149·8	6 56 54·6	186 54 36·3	Lone	15055·7	4·177701
Battle, 1910	920·4	3020	66 59 45·162	1399·1	354 40 21·2	174 41 41·3	Salmon	11401·8	4·056972
			140 53 52·410	635·4	33 04 09·2	212 50 54·6	Storm	19297·1	4·285491
					81 09 49·8	260 54 20·0	Lone	12398·4	4·093367
Lone, 1910	656·0	2152	66 58 42·793	1325·7	305 06 38·5	125 23 28·0	Salmon	16322·3	4·212782
			141 10 42·594	516·7	352·51 36·8	172 53 51·6	Storm	14370·2	4·157462
N. B., 1912	......	....	66 56 41·880	1297·3	112 13 05·0	292 01 26·3	Lone	9947·3	3·997703
			140 58 03·292	40·0	208 09 41·7	28 13 32·6	Battle	6442·3	3·809038
N. C., 1912	......	....	66 54 32·390	1003·4	144 00 49·7	323 53 42·0	Lone	9594·0	3·982000
			141 02 57·766	702·6	214 16 35·1	34 24 56·9	Battle	11735·5	4·069502
					221 42 02·6	41 46 33·5	N. B.	5375·9	3·730450

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Salmon, 1910	1303·1	4275	66 53 38·697	1198·8	344 21 30·4	164 26 24·8	Mesa	14526·7	4·162166
			140 52 25·423	309·4	34 42 49·2	214 29 29·2	Fort	18701·3	4·271871
Trout,[1] 1910	1130·0	3707	66 52 16·763	519·3	55 25 56·9	235 21 45·3	Storm	4051·1	3·607572
			141 03 42·464	517·2	252 47 57·5	72 58 20·2	Salmon	8625·2	3·935771
Storm, 1910	1115·3	3659	66 51 02·501	77·5	247 12 01·3	67 26 35·6	Salmon	12550·0	4·098645
			141 08 16·091	196·2	300 22 04·7	120 41 32·9	Mesa	18017·4	4·255692
					354 40 09·5	174 41 23·5	Fort	10600·1	4·025312
Mesa, 1910	976·1	3202	66 46 07·046	218·3	10 28 58·5	190 25 58·8	Trouble	13218·9	4·121194
			140 47 05·231	64·0	51 59 30·1	231 37 45·1	White	22166·9	4·345704
					84 39 16·8	264 21 03·0	Fort	14632·1	4·165308
Fort, 1910	1044·7	3428	66 45 21·797	675·2	313 25 28·0	133 40 41·6	Trouble	16832·3	4·226143
			141 06 55·628	680·8	342 57 34·9	163 10 07·2	Arctic	34643·0	4·539615
					12 57 51·5	192 54 19·9	White	12623·7	4·101185
N. D., 1912	......	....	66 43 29·530	914·8	8 53 40·5	188 51 37·6	L_1 of the Boundary		
			140 57 46·189	566·0			(Monument No. 68)	10645·6	4·027169
					171 44 01·7	351 41 58·7	M_1 of the Boundary	11358·3	4·055315
					238 02 39·2	58 12 28·1	Mesa	9240·7	3·965704
Wart, 1910	1034·6	3394	66 42 40·422	1252·2	41 38 02·1	221 29 57·6	White	9762·6	3·989566
			141 01 58·397	716·0	239 33 01·5	59 46 42·1	Mesa	12673·3	4·102890
					307 31 54·8	127 42 35·3	Trouble	10809·4	4·033801
Rover,[1] 1910	1047·6	3437	66 42 02·799	86·7	62 45 19·0	242 30 32·2	White	13353·7	4·125601
			140 54 40·246	493·7	216 19 04·5	36 26 02·6	Mesa	9397·5	3·973013
Trouble, 1910	904·5	2967	66 39 07·418	229·8	5 44 53·0	185 42 12·4	Arctic	21651·2	4·335481
			140 50 20·923	257·1	47 17 02·5	226 56 12·6	Circle	22913·6	4·360093
White, 1910	980·0	3215	66 38 44·634	1382·6	267 09 36·9	87 28 21·6	Trouble	15074·8	4·178251
			141 10 46·003	565·5	327 59 33·9	148 15 37·2	Arctic	24537·0	4·389822
					6 29 27·0	186 27 21·2	Circle	14984·5	4·175642
Black River, 1910	958·9	3146	66 37 21·247	658·2	43 01 37·8	222 47 26·7	Circle	16801·2	4·225339
			140 57 35·495	436·8	238 20 05·9	58 26 44·8	Trouble	6275·1	3·797618
					350 00 46·8	170 04 44·8	Arctic	18533·2	4·267950
Control,[1] 1910	1073·4	3522	66 36 32·409	1003·9	20 03 50·9	199 58 58·4	Circle	11487·3	4·060218
			141 07 44·196	544·1	249 21 08·1	69 37 05·8	Trouble	13702·0	4·136784
Circle, 1910	870·7	2857	66 30 43·997	1362·9	291 53 49·2	112 11 57·7	Arctic	15846·0	4·199919
			141 13 03·059	37·8	323 43 29·8	144 00 14·9	Curve	23060·5	4·362869
					354 01 51·8	174 04 06·6	Igloo	17584·5	4·245131
Arctic, 1910	1273·7	4179	66 27 31·972	990·4	5 04 28·8	185 03 05·9	Curve	12725·6	4·104678
			140 53 15·997	198·1	48 19 57·6	228 04 04·5	Igloo	17315·6	4·238438
Topo,[1] 1910	1010·4	3315	66 26 27·185	842·1	42 39 10·0	222 28 23·8	Igloo	12945·1	4·112104
			140 58 50·809	629·7	344 05 33·5	164 09 17·4	Curve	11092·2	4·045016
Igloo, 1910	660·7	2168	66 21 19·391	600·7	325 30 48·1	145 41 45·6	Fishing	15846·9	4·199945
			141 10 36·032	448·1	4 15 16·1	184 13 55·0	Low	14929·1	4·174033
Curve, 1910	1022·9	3356	66 20 42·765	1324·7	13 36 59·8	193 33 27·9	Fishing	12285·5	4·089393
			140 54 46·466	578·3	43 24 18·7	223 08 28·1	Low	18889·8	4·276227
					95 36 25·8	275 21 56·0	Igloo	11866·7	4·074329
Prow,[1] 1910	987·2	3239	66 18 30·427	942·6	37 00 44·4	216 51 52·0	Low	12078·6	4·082017
			141 02 23·070	287·4	340 15 49·2	160 19 15·3	Fishing	8330·3	3·920660
Fishing, 1910	1153·7	3785	66 14 17·255	534·5	357 09 02·4	177 09 58·4	Stripe	15477·8	4·189709
			140 58 37·938	474·1	28 30 11·9	208 18 02·8	Tom	21007·2	4·322369
					79 54 54·7	259 42 36·4	Low	10244·3	4·010483
Low, 1910	634·6	2082	66 13 18·762	581·2	321 19 51·9	141 33 05·8	Stripe	17451·9	4·241842
			141 12 04·611	57·6	359 35 04·9	179 35 13·7	Tom	16667·2	4·221863
N.E., 1912	......	....	66 08 10·422	322·8	6 54 03·2	186 52 22·0	Blue	11616·5	4·065075
			141 03 29·457	369·5	41 48 41·7	221 40 59·5	Tom	9537·3	3·979425
					197 46 14·5	17 50 41·3	Fishing	11934·8	4·076816
					312 43 04·4	132 48 27·0	Stripe	6032·4	3·780488
Stripe, 1910	1210·7	3972	66 05 58·197	1802·9	353 10 45·4	173 13 40·0	Kandik	20359·3	4·308763
			140 57 36·697	461·0	74 28 19·8	254 15 15·2	Tom	11204·0	4·049373
Arch, 1910	807·1	2648	66 05 19·683	609·7	65 34 09·1	245 29 17·3	Tom	4410·3	3·644466
			141 06 35·746	449·3	164 30 56·8	344 25 56·0	Low	15401·9	4·187575
					259 56 35·2	80 04 48·0	Stripe	6878·2	3·837473

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Tom, 1910	855·9	2808	66 04 20·704 141 11 55·006	641·3 691·8	322 16 34·4 11 34 26·7	142 32 33·1 191 31 08·4	Kandik Bench	21701·8 13671·6	4·336496 4·135818
Blue, 1910	1073·5	3522	66 01 58·101 141 05 20·260	1799·9 255·2	327 01 26·9 40 45 57·9 131 41 11·3 218 02 35·8	147 11 24·9 220 36 39·0 311 35 10·5 38 09 39·5	Kandik Bench Tom Stripe	15219·1 11840·0 6648·1 9450·8	4·182389 4·073351 3·822699 3·975467
Bench, 1910	737·1	2418	65 57 08·266 141 15 32·075	256·0 405·3	283 11 34·3 317 10 25·6 351 28 50·8	103 30 50·8 137 33 39·3 171 31 44·7	Kandik Seal Fire	16459·4 28597·5 16340·4	4·216413 4·456328 4·213264
Kandik, 1910	1066·2	3498	65 55 05·539 140 54 25·607	171·6 324·1	349 06 08·5 47 57 51·4	169 10 06·4 227 41 29·5	Seal Fire	17552·9 18409·9	4·244348 4·265052
Cut-in, 1910	1131·7	3713	65 53 15·792 140 55 00·204	489·1 2·6	55 59 23·1 114 57 11·5 187 20 16·4	235 43 32·9 294 38 26·8 7 20 48·0	Fire Bench Kandik	15964·9 17169·2 3427·5	4·203166 4·234749 3·534980
Fire, 1910	7534·0	2474	65 48 26·512 141 12 21·589	821·2 274·3	285 50 30·8 311 39 06·5 350 19 28·0	106 10 49·9 132 02 12·0 170 22 35·0	Seal Scratch Change	17687·0 26005·7 15590·2	4·247653 4·415068 4·192852
Seal, 1910	1269·0	4163	65 45 49·010 140 50 04·919	1518·0 62·6	349 21 36·1 54 07 34·9	169 24 23·1 233 50 23·5	Scratch Change	12687·4 17841·2	4·103371 4·251425
Diablo, 1910	1329·9	4363	65 44 25·037 140 53 27·597	775·5 351·6	56 27 49·8 117 32 36·4 224 45 18·8 333 25 44·7	236 13 43·2 297 15 22·3 44 48 23·6 153 31 36·4	Change Fire Seal Scratch	14237·6 16252·8 3664·4 11029·9	4·153437 4·210929 3·564001 4·042572
Trimmed, 1910	797·8	2618	65 42 41·293 141 01 37·621	1279·0 479·6	50 12 06·9 142 36 08·3 300 38 34·7 357 51 07·2	230 05 26·9 322 26 21·1 120 51 52·8 177 51 40·0	Change Fire Scratch Union	7298·0 13474·3 13016·1 12323·0	3·863203 4·129507 4·114482 4·090716
Change, 1910	905·7	2972	65 40 10·303 141 08 56·499	319·1 721·9	276 33 02·2 321 26 15·0 343 44 41·0	96 53 00·1 141 33 27·6 163 48 49·2	Scratch Union Halley	16919·8 9759·5 12490·6	4·228396 3·989427 4·096582
Scratch, 1910	1075·7	3529	65 39 06·409 140 47 01·688	198·5 21·6	348 20 47·1 2 32 34·4 62 20 26·5	168 23 17·1 182 31 29·6 242 07 41·5	Comet Lost Union	10459·9 20686·7 12146·6	4·019529 4·315692 4·084455
Union, 1910	1294·5	4247	65 36 03·719 141 01 01·565	115·2 20·1	289 28 33·8 30 48 24·9	109 43 48·5 210 45 20·6	Comet Halley	13670·6 5070·0	4·135787 3·705005
Halley, 1910	1082·4	3551	65 33 43·091 141 04 23·965	1334·7 307·5	310 21 36·7 353 08 58·3	130 36 20·4 173 10 34·0	Lost Yellow	16407·6 11358·2	4·215046 4·055308
Comet, 1910	1096·1	3596	65 33 35·640 140 44 17·007	1103·9 218·2	16 15 20·5 52 11 06·9 91 00 23·5	196 11 45·8 231 54 24·3 270 42 04·7	Lost Yellow Halley	10853·8 17961·0 15486·3	4·035580 4·254331 4·189947
Lost, 1910	1279·5	4198	65 27 59·174 140 48 12·969	1832·8 167·0	15 19 53·0 41 13 56·3 86 54 00·1	195 14 58·6 221 00 15·2 266 40 52·5	Lime Casca Yellow	15848·3 17719·3 11166·7	4·199984 4·248447 4·047923
Yellow, 1910	816·7	2680	65 27 38·989 141 02 38·768	1207·6 499·3	334 24 56·5 2 09 40·1	154 33 09·4 182 09 06·3	Lime Casca	16246·8 12732·8	4·210767 4·104924
N. G.,[1] 1912	......	....	65 26 37·553 140 56 23·592	1163·0 304·0	28 51 50 111 32 12	208 48 56 291 26 31	N. F. Yellow	5125·5 5194·5	3·70974 3·71554
N. F., 1912	......	....	65 24 12·590 140 59 35·295	389·9 455·6	24 15 55·3 159 43 03·1 231 19 46·0 330 41 08·2	204 12 34·8 339 40 16·2 51 30 06·7 150 46 34·3	Casca Yellow Lost Lime	6943·0 6816·4 11252·7 9479·6	3·841549 3·833553 4·051256 3·976792
Peak, northwest of F_1 Ridge, 1909.	......	....	65 22 04·61 141 04 54·26	142·8 701·4	325 29 16 11 47 04	145 38 14 191 44 33	View Northeast Nation	13575·9 10507·4	4·132770 4·021497
F_1 Ridge, 1909	......	....	65 21 35·73 140 59 29·63	1106·7 383·1	341 19 53 2 15 44 34 06 26	161 23 57 182 15 16 213 59 01	View Northeast E_1 of the Boundary (Monument No. 99) Nation	10872·4 9979·5 11335·5	4·036327 3·999107 4·054441
Dark peak, northeast of View Northeast, 1909.	......	....	65 21 12·73 140 47 14·02	394·3 181·3	32 20 14 61 29 02	202 12 09 241 10 28	View Northeast Nation	11340·7 18091·7	4·054639 4·257479
Casca, 1910	487·5	4880	65 20 48·183 141 03 15·888	1492·4 205·5	323 58 36·0 23 22 22·0	144 06 05·3 203 18 22·3	View Northeast Nation	10908·7 8625·6	4·037773 3·935789

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Peak, south of west of F_1	......	....	65 20 47·96	1486·7	323 58 32	144 06 01	View Northeast.......	10900·3	4·037439
Ridge, 1909.			141 03 15·52	200·8	16 40 16	196 35 35	Mush...............	14027·4	4·146978
					23 25 12	203 21 12	Nation..............	8621·1	3·935562
Reddish peak, 4 miles north	......	....	65 20 18·48	572·4	9 09 54	189 08 24	View Northeast.......	8011·8	3·903728
of View Northeast, 1909.			140 53 23·02	297·9	57 52 02	237 39 03	Nation..............	13121·0	4·117967
High Rocky Peak, 1909.....	......	....	65 20 11·15	345·4	18 34 35	198 31 34	View Northeast.......	8103·8	3·908691
			140 51 42·39	548·6	61 28 53	241 14 23	Nation..............	14130·8	4·150168
Lime, 1910................	1417·6	4651	65 19 45·599	1412·3	9 03 24·5	189 02 07·6	View Northeast......	6978·1	3·843737
			140 53 36·713	475·3	61 24 01·0	241 11 15·1	Nation.............	12453·0	4·095274
					104 34 31·6	284 25 45·2	Casca..............	7740·6	3·888775
Craggy Peak, northeast of E_1	......	....	65 17 42·38	1312·6	352 20 05	172 20 34	View Northeast......	3102·7	3·491745
1909.			140 55 33·28	431·3	51 36 01	231 31 58	E_1 of the Boundary..		
							(Monument No. 99.	4414·9	3·644919
					77 08 42	256 57 42	Nation.............	9663·9	3·985153
Nation, 1909..............	1299·9	4269	65 16 32·477	1005·9	275 11 20·7	95 22 49·5	View Northeast......	9879·0	3·994711
			141 07 39·722	515·2	304 38 28·7	124 50 37·3[1]	Grub..............	12678·3	4·103060
					6 06 14·0	186 05 32·7	Mush..............	5559·2	3·745010
E_1 Mountain Summit, 1909.	......	....	65 16 28·06	869·1	280 29 07	100 33 59	View Northeast......	4232·6	3·626604
			141 00 22·18	287·7	326 12 16	146 17 47	Grub..............	8525·2	3·930706
					49 22 32	229 15 14	Mush..............	8269·6	3·917486
					91 26 07	271 19 29	Nation.............	5676·6	3·754090
View Northeast, 1909.......	1703·4	5588	65 16 03·100	96·0	354 49 55·4	174 50 35·3	Grub..............	6341·0	3·802160
			140 55 01·381	17·9	10 39 14·7	190 36 40·6	Back..............	11955·4	4·077564
					66 14 03·4	246 01 53·4	Mush..............	11412·8	4·057392
					94 55 02·8	274 50 31·5	E_1 of the Boundary		
							(Monument No. 99)	3888·0	3·589731
View Southwest, 1909.......	......	....	65 15 37·82	1171·4	241 13 35	61 15 14	View Northeast.....	1627·6	3·211547
			140 56 51·35	666·4	340 06 51	160 09 10	Grub..............	5882·3	3·769546
					4 03 28	184 02 34	Back..............	10994·5	4·041174
					16 19 11	196 16 17	Slide..............	8847·6	3·946827
					27 24 45	207 17 57	Pack..............	12699·0	4·103770
					67 02 00	246 51 30	Mush..............	9792·3	3·990886
					101 27 42	281 17 53	Nation.............	8580·3	3·933504
					114 29 31	294 26 39	E_1 of the Boundary..		
							(Monument No. 99)	2689·2	3·429628
Mountain, Southwest of E_1	......	....	65 15 24·54	760·1	258 30 11	78 37 04	View Northeast......	6022·0	3·779740
of the Boundary, 1909.			141 02 36·24	470·5	308 15 29	128 23 02	Grub..............	8258·7	3·916912
					52 58 36	232 53 20	Mush..............	5679·7	3·754324
					118 09 33	298 04 57	Nation.............	4464·5	3·649776
Shed Mountain, 1909.......	......	....	65 15 05·895	182·6	296 39 07·6	116 49 37·9	Grub..............	10098·2	4·004245
			141 05 51·621	670·1	35 02 47·1	215 00 27·6	Mush..............	3475·6	3·541024
					152 24 03·1	332 22 24·9	Nation.............	3026·3	3·480918
Mush, 1909...............	1142·8	3749	65 13 34·003	1053·2	278 39 02·6	98 51 52·3	Grub..............	11149·0	4·047236
			141 08 25·214	327·7	305 23 49·3	125 31 25·7	Slide..............	8028·2	3·904619
					310 45 50·9	130 55 26·5	Back..............	10905·6	4·037649
					336 47 00·8	156 50 43·1	Pack..............	8098·3	3·908392
Jay, 1909.................	......	....	65 13 04·017	124·4	5 39 49·6	185 39 04·6	Pack..............	6547·4	3·816067
			141 03 30·551	397·2	153 25 00·3	333 21 13·8	Nation.............	7221·7	3·858638
					204 55 14·6	24 58 25·7	E_1 of the Boundary		
							(Monument No. 99)	6482·1	3·811714
					229 56 38·0	50 04 20·3	View Northeast......	8630·3	3·936028
					276 01 59·2	96 10 21·3	Grub..............	7231·2	3·859208
					323 59 19·4	144 02 28·3	Slide..............	4608·2	3·663527
					324 30 17·6	144 35 25·7	Back..............	7615·5	3·881700
Grub, 1909................	1035·1	3396	65 12 39·196	1214·0	27 07 01·9	207 03 48·0	Back..............	6104·5	3·785653
			140 54 17·450	226·9	56 37 47·4	236 32 34·3	Slide..............	5375·2	3·730392
Highest pinnacle west of	......	....	65 12 32·51	1006·9	267 07 58	87 12 51	Grub..............	4201·3	3·623380
Grub, 1909.			141 59 40·18	522·4	5 59 21	185 59 01	Slide..............	2767·9	3·442158
					33 22 15	213 18 01	Pack..............	6630·5	3·821545
					105 39 37	285 31 40	Mush..............	7085·3	3·850356
Reddish peak, east-southeast	......	....	65 12 30·57	946·8	96 49 12	276 29 36	Mush..............	16947·2	4·229097
of E_1 of the Boundary,			140 46 50·20	652 7	114 56 30	294 37 35	Nation.............	17872·6	4·252187
1909.					124 04 40	303 52 43	E_1 of the Boundary		
							(Monument No. 99)	12369·5	4·092353
					135 57 30	315 50 04	View Northeast......	9166·5	3·962204

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
East, 1909	963·8	3162	65 12 01·945	60·2	30 40 31·9	210 39 17·1	Slide	2099·9	3·322197
			140 58 40·055	521·0	71 40 08·0	251 38 57·9	Talus	1056·7	3·023967
					200 47 42·2	20 51 00·7	View Northeast	7991·0	3·902600
					251 17 56·9	71 21 55·3	Grub	3604·6	3·556852
					172 25 36·0	352 24 23·3	E1 of the Boundary (Monument No. 99)	7868·6	3·895898
Talus, 1909	960·5	3151	65 11 51·209	1586·1	115 47 55·6	295 40 14·4	Mush	7332·4	3·865244
			140 59 57·169	743·7	145 27 55·7	325 20 55·7	Nation	10582·3	4·024582
					206 11 04·4	26 15 33·0	View Northeast	8696·5	3·939346
West, 1909	1044·1	3425	65 11 37·218	1152·8	250 26 23·7	70 32 42·0	Grub	5748·4	3·759547
			141 01 14·068	183·0	122 53 09·8	302 46 38·4	Mush	6671·4	3·824217
					151 20 03·7	331 14 13·5	Nation	10427·0	4·018160
					210 24 26·7	30 30 05·1	View Northeast	9552·9	3·980133
					246 34 16·3	66 35 26·1	Talus	1090·2	3·037500
					249 03 40·2	69 06 00·1	East	2144·8	3·331394
Slide, 1909	1335·8	4382	65 11 03·625	112·3	325 20 53·4	145 22 52·6	Back	3007·8	3·478255
			141 00 02·372	30·9	50 19 53·4	230 15 59·4	Pack	4362·5	3·639738
					180 11 00·9	0 11 03·1	E_1 of the Boundary (Monument No. 99)	9606·1	3·982548
Back, 1909	1575·6	5169	65 09 43·720	1354·1	330 46 21·9	150 51 01·7	Barney	8247·4	3·916319
			140 57 51·073	665 3	35 58 34·7	215 51 00·8	Hi-yu	11127·0	4·046378
Pack, 1909	1259·4	4132	65 09 33·649	1042·2	266 25 46·3	86 31 39·4	Back	5077·8	3·705674
			141 04 20·154	262·5	9 29 00·0	189 27 19·1	Hi-yu	8820·1	3·945474
Sharp Peak, east of Back, 1909.	......	....	65 09 28·48	882·1	104 54 37	284 52 33	Back	1458·7	3·163967
			140 55 34·83	453·7	144 25 52	324 14 54	Nation	16162·7	4·208515
					164 40 41	344 36 41	E_1 of the Boundary (Monument No. 99)	13017·6	4·114532
					182 02 01	2 02 32	View Northeast	12229·9	4·087422
					189 39 57	9 41 08	Grub	5992·1	3·777580
Game, 1909	1373·8	4507	65 07 28·062	869·2	308 20 46·4	128 25 09·6	Barney	4829·5	3·683900
			140 57 32·741	427·1	54 40 21·2	234 32 30·8	Hi-yu	8305·4	3·919361
					126 16 13·5	306 10 03·9	Pack	6582·8	3·818410
					176 44 49·9	356 44 33·3	Back	4208·3	3·624105
Barney, 1909	1256·6	4123	65 05 51·243	1587·2	0 33 39·3	180 33 32·5	Castle	10135·5	4·005847
			140 52 42·656	556·8	54 10 20·8	234 03 18·5	Squaw	7511·0	3·875700
					80 22 10·8	260 09 57·3	Hi-yu	10717·0	4·030075
Hi-yu, 1909	1476·7	4845	65 04 52·749	1633·8	299 58 54·8	120 04 05·9	Squaw	5178·4	3·714194
			141 06 11·383	148·7	351 20 02·3	171 21 07·4	Red	6242·3	3·795346
Skook, 1909	1549·2	5083	65 04 05·571	172·6	9 19 59·2	189 19 05·5	Red	4773·1	3·678802
			141 04 00·418	5·5	27 12 48·1	207 06 24·4	Crow	1214·1	3·084244
					130 30 17·5	310 28 18·7	Hi-yu	2250·4	3·352257
					178 33 01·7	358 32 43·8	Pack	10164·4	4·007080
					204 39 50·0	24 45 25·1	Back	11528·6	4·061778
					307 57 22·9	128 07 30·4	Castle	11136·0	4·046730
					358 19 02·2	178 19 28·3	Chief	12937·4	4·111848
Squaw, 1909	1438·8	4720	65 03 29·086	900·9	313 39 05·1	133 46 00·4	Castle	8295·6	3·91884
			141 00 28·366	370·9	44 46 39·7	224 42 33·8	Red	5040·4	3·70246
Red, 1909	901·8	2959	65 01 33·493	1037·4	351 59 44·1	172 01 03·9	Chief	8302·5	3·919210
			141 04 59·541	779·5	38 06 55·2	218 01 25·2	Crow	7738·1	3·888637
Cone-shaped Peak, 1909	......	....	65 00 48·31	1496·3	278 15 29	98 21 26	Castle	5211·4	3·716958
			140 59 23·88	312·7	2 10 48	182 10 20	Hug	10856·8	4·035703
					25 28 51	205 25 07	Chief	7555·8	3·878281
					62 59 38	242 49 04	Crow	10303·4	4·012980
					107 41 59	287 36 55	Red	4612·9	3·663978
Pinnacle, 1909	830·5	2725	65 00 44·186	1368·6	152 16 16·5	332 11 29·0	Skook	7048·1	3·848071
			140 59 49·432	647·5	0 24 42·4	180 24 37·1	Hug	10721·4	4·030253
					23 32 03·0	203 28 41·8	Chief	7300·6	3·863359
					110 30 48·2	290 34 07·1	Red	4338·7	3·637358
Castle, 1909	1127·9	3701	65 00 24·002	743·4	28 58 33·2	208 52 08·0	Hug	11534·7	4·062005
			140 52 50·229	658·0	54 15 42·9	234 06 01·8	Chief	10371·5	4·015840
					102 47 23·2	282 36 22·1	Red	9791·2	3·990835
Crow, 1909	859·8	2821	64 58 16·794	520·1	289 41 18·5	109 48 08·2	Chief	6304·4	3·799647
			141 11 03·622	47·5	304 57 46·0	125 07 51·6	Hug	10720·6	4·030220
					3 48 38·3	183 48 08·7	Strata	6469·0	3·810835
Chief, 1909	1248·0	4094	64 57 08·023	248·5	324 46 31·0	144 49 46·8	Hug	4927·2	3·692602
			141 03 31·477	413·3	55 53 10·8	235 45 51·6	Strata	7699·2	3·886447

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Peak, east of Hug, 1909	......	....	64 55 48·34	1497·0	358 33 54	178 34 08	Blow	8151·0	3·911209
			140 57 19·93	262·0	152 39 59	232 37 39	Hug	2568·7	3·409711
Hug, 1909	1295·1	4249	64 54 58·017	1796·7	341 08 18·3	161 10 53·0	Blow	6963·0	3·842795
			140 59 55·293	726·9	55 14 34·7	235 04 19·1	Bush	10900·3	4·037439
Strata, 1909	578·9	1899	64 54 48·382	1498·3	268 03 26·2	88 14 01·1	Hug	9221·0	3·964777
			141 11 36·323	477·5	298 37 32·0	118 50 41·5	Blow	13086·5	4·116824
					357 18 07·6	177 18 26·8	Bush	5935·8	3·773477
Peak, east of Blow, 1909	......	....	64 52 04·61	142·8	79 01 40	260 52 53	Blow	7756·6	3·889672
			140 47 22·91	301·7	118 34 25	298 23 04	Hug	11262·7	4·051642
Asp, 1909	820·6	2692	64 51 58·440	1809·8	23 48 47·2	203 40 59·8	Nut	16936·1	4·228814
			141 02 26·084	343·5	47 54 25·5	227 45 31·2	Eagle Peak	10501·1	4·021236
					84 36 27·5	264 28 28·5	Bush	7000·0	3·845099
					149 55 34·9	329 47 45·9	Crow	13549·6	4·131927
					174 53 02·5	354 52 03·2	Chief	9626·6	3·983471
					199 36 56·1	19 39 12·6	Hug	5905·1	3·771225
					283 35 59·7	103 40 50·8	Blow	4360·0	3·639485
					323 12 11·0	143 16 56·2	Lone	6941·0	3·841425
Bush, 1909	786·1	2579	64 51 36·936	1143·9	271 44 41·2	91 57 31·3	Blow	11212·7	4·049711
			141 11 15·113	199·1	293 38 11·5	113 50 55·6	Lone	12157·9	4·084857
					7 13 10·4	187 12 15·0	Eagle Peak	6434·4	3·808505
Blow, 1909	1083·7	3555	64 51 25·237	781·6	1 05 39·3	181 05 33·4	Lone	4533·6	3·656445
			140 57 04·436	58·4	63 31 11·3	243 17 26·0	Eagle Peak	13449·7	4·128711
Peak, east end of Lone Ridge, 1909.	......	....	64 49 00·46	14·2	16 17 00	196 14 34	Hog	7582·2	3·879793
			140 55 16·29	214·9	51 30 12	231 15 55	Nut	16007·0	4·204310
					88 09 49	268 08 05	Lone	1514·3	3·180210
					162 22 24	342 20 46	Blow	4705·1	3·672573
Lone, 1909	1066·9	3501	64 48 58·878	1823·4	4 48 47·3	184 48 05·7	Hog	7255·4	3·860661
			140 57 10·996	145·0	47 58 35·7	227 46 03·4	Nut	14819·9	4·170845
					83 00 49·8	262 47 10·5	Eagle Peak	12041·4	4·080678
Eagle Peak, 1909	686·8	2253	64 48 10·821	335·1	296 42 52·0	116 55 49·4	Hog	12724·2	4·104632
			141 12 16·367	216·1	353 24 39·8	173 25 46·5	Nut	8508·7	3·929865
Birch, 1909	644·8	2115	64 47 15·030	465·5	39 19 14·3	219 12 58·2	Nut	8686·3	3·938834
			141 04 06·845	90·4	105 01 35·8	284 54 12·9	Eagle Peak	6691·1	3·825498
					145 11 51·6	325 05 24·0	Bush	9884·7	3·994964
					215 40 02·0	35 46 24·3	Blow	9544·5	3·979755
					239 35 04·6	59 41 20·8	Lone	6362·6	3·803638
					309 20 35·2	129 26 09·7	Hug	6324·8	3·801050
					313 59 28·1	134 03 11·4	A1 of the Boundary	4536·7	3·656744
Peak, between the forks of Eagle Creek, 1909.	......	....	64 46 29·50	913·6	78 30 50	258 01 35	Nut	26140·0	4·417306
			140 38 47·58	628·9	80 25 28	260 08 03	Hog	15417·9	4·188026
					96 59 56	276 29 34	Eagle Peak	26717·3	4·426792
					107 45 20	287 28 37	Lone	15287·4	4·184334
					122 28 00	302 11 22	Blow	17127·7	4·233700
Eldridge[1] (U.S.G.S.), 1907	......	....	64 45 26·47	819·7	314 08 27	134 49 27	Fortymile Dome	50770·0	4·705607
			141 47 28·43	376·0	321 45 13	142 22 54	Uncle Sam	54232·2	4·734257
Hog, 1909	967·3	3174	64 45 05·431	168·2	0 12 43·6	180 12 42·0	Pete	6173·6	3·790537
			140 57 57·023	754·3	47 33 20·3	227 25 18·2	George	9576·3	3·981198
Peak, east end of Hog Ridge, 1909.	......	....	64 44 46·74	1447·5	79 43 54	259 30 39	Nut	11835·2	4·073174
			140 56 22·93	303·2	114 57 31	294 56 06	Hog	1372·7	3·137588
					175 21 24	355 20 40	Lone	7834·6	3·894019
Nut, 1909	846·7	2778	64 43 37·890	1173·4	255 17 02·0	75 28 52·5	Hog	10743·0	4·031126
			141 11 02·616	34·6	288 20 35·5	108 32 24·3	Pete	10945·2	4·039222
					318 19 03·4	138 22 51·7	George	5031·9	3·701734
Yukon, 1907	821·5	2695	64 42 17·199	532·6	287 13 13·2	107 17 52·0	Knoll	4278·8	3·631320
			141 04 17·390	230·4	308 14 04·7	128 17 57·4	Crossing	4345·4	3·638034
					310 53 13·3	131 00 33·0	Loop	8540·3	3·931473
Pete, 1909	733·6	2407	64 41 46·091	1427·4	342 50 35·6	162 52 13·0	Loop	4849·1	3·685662
			140 57 58·747	778·6	50 30 33·8	230 23 23·7	Plateau	8185·6	3·913051
George, 1909	917·2	3009	64 41 36·484	1129·9	267 30 52·0	87 38 52·4	Pete	7049·8	3·848174
			141 06 50·162	664·9	297 00 24·6	117 10 02·3	Loop	9522·8	3·978764
					351 27 27·9	171 28 18·1	Plateau	4969·8	3·696335
Knoll, 1907	647·1	2123	64 41 36·208	1121·3	25 25 06·7	205 24 20·6	Crossing	1574·1	3·197022
			140 59 09·052	120·0					

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Yukon River, West Base, 1907.	274·4	900	64 41 01·927	59·7	137 51 20·4	317 48 56·4	Yukon	3145·0	3·497623
			141 01 38·113	505·4	241 44 04·3	61 46 19·1	Knoll	2243·3	3·350882
					285 27 31·1	105 28 59·8	Crossing	1349·9	3·130309
Boundary, Lat., Long., and Az. Station, 1906.	......	....	64 40 51·420	1592·4					
			141 00 00·405	5·4					
Bald of the Boundary, 1907.	......	....	64 40 51·420	1592·4	90 00 00·0	270 00 00·0	Boundary Astro. Sta.	5·37	0·729974
			141 00 00·000	0·0					
Crossing, 1907	268·0	879	64 40 50·300	1557·7	180 00 00·0	0 00 00·0	Bald	34·7	1·540329
			141 00 00·000	0·0					
Yukon River, East Base, 1907	283·8	931·2	64 40 49·017	1518·0	105 29 09·7	285 27 31·2	Yukon River, West Base	1498·7	3·175728
			140 59 49·185	652·3	127 33 51·9	307 29 49·4	Yukon	4483·0	3·651568
					200 00 00·3	20 00 35·6	Knoll	1555·3	3·191826
Loop, 1907	739·8	2427	64 39 16·471	510·1	133 45 02·0	313 41 35·0	Crossing	4204·3	3·623694
			140 56 10·984	145·8	151 23 49·6	331 21 03·7	Knoll	4930·2	3·692866
Plateau, 1907	930·4	3052	64 38 57·789	1789·7	191 46 31·3	11 47 59·1	Yukon	6308·7	3·799940
			141 05 54·560	724·3	227 34 58·5	47 41 05·1	Knoll	7280·6	3·862169
					265 39 20·5	85 48 07·9	Loop	7768·6	3·890343
Trail, 1907	1001·9	3287	64 37 34·260	1060·9	27 25 07·8	207 21 07·3	Slope	7699·0	3·886437
			141 01 38·088	506·2	127 14 42·7	307 10 50·9	Plateau	4277·4	3·631177
					233 52 46·8	53 57 42·4	Loop	5375·1	3·730389
					325 10 54·8	145 17 12·5	Table	9755·2	3·989237
					349 48 19·6	169 49 48·3	E of the Boundary (Monument No. 115)	7381·6	3·868153
U. S. G. S. Cairn, 1907	1222·0	4009	64 35 40·790	1263·2	191 36 27·6	11 37 52·9	Plateau	6228·6	3·794392
			141 07 28·955	385·2	232 57 54·6	53 03 11·6	Trail	5840·4	3·766445
					317 51 33·5	137 55 54·1	Path	6326·8	3·801184
					341 15 12·4	161 16 28·9	Slope	3508·0	3·545060
Slope, 1907	1235·0	4052	64 33 53·518	1657·4	180 47 11·1	0 47 19·9	Plateau	9424·0	3·974234
			141 06 04·302	57·3	218 11 22·0	38 20 18·0	Loop	12738·3	4·105110
Table, 1907	1059·8	3477	64 33 15·493	479·8	97 26 50·7	277 16 32·7	Slope	9190·7	3·963348
			140 54 40·009	533·0	139 50 37·6	319 40 28·2	Plateau	13887·3	4·142618
					173 50 05·9	353 48 43·7	Loop	11244·5	4·050942
Path, 1907	1088·0	3570	64 33 09·230	285·2	2 09 32·1	182 09 10·6	Liberty	8480·5	3·928424
			141 02 10·352	138·0	113 47 37·3	293 44 06·0	Slope	3405·1	3·532128
					268 05 10·7	88 11 57·4	Table	6003·2	3·778381
					311 58 14·4	132 05 34·0	Woody	9938·4	3·997315
Smoke, 1913	1007·0	3304	64 33 07·198	222·9	30 03 10·3	209 57 41·7	Liberty	9714·3	3·987412
			140 56 30·144	401·7	90 49 49·5	270 44 42·2	Path	4533·3	3·656414
					100 41 41·6	280 33 03·1	Slope	7781·6	3·891069
					118 33 13·2	298 23 18·2	U. S. G. S. Cairn	9977·9	3·999038
					260 03 23·2	80 05 02·7	Table	1489·7	3·173093
Woody, 1907	937·3	3075	64 29 34·311	1062·6	76 47 46·6	256 39 05·6	Liberty	7922·4	3·898854
			140 52 56·981	760·9	127 29 58·0	307 18 07·1	Slope	13216·3	4·121109
					168 40 03·9	348 38 35·9	Table	6986·3	3·844245
Liberty, 1907	1080·2	3544	64 28 35·564	1101·4	164 08 36·2	344 05 25·5	Slope	10237·5	4·010196
			141 02 34·263	457·8	216 03 55·7	36 11 03·8	Table	10732·6	4·030706
Fortymile Dome, U. S. G. S., 1907.	1276·9	4189	64 26 17·579	544·4	174 48 50·2	354 48 24·0	Liberty	4290·8	3·632540
			141 02 05·234	70·0	230 11 27·8	50 19 42·5	Woody	9529·9	3·979088
Bare, 1907	1065·8	3497	64 25 40·410	1251·5	103 16 44·3	283 11 14·4	Fortymile Dome	5028·4	3·701428
			140 55 59·453	795·8	135 49 25·4	315 43 29·2	Liberty	7569·5	3·879068
					198 35 20·2	18 38 04·9	Woody	7643·3	3·883283
Uncle Sam, 1907	961·3	3154	64 22 25·057	776·0	202 12 48·3	22 16 06·6	Fortymile Dome	7779·7	3·890961
			141 00 45·080	604·3	232 17 28·7	52 26 16·8	Bare	9907·4	3·995959
John Bull, 1907	917·6	3011	64 22 05·715	177·0	94 24 23·8	274 15 32·3	Uncle Sam	7928·4	3·899185
			140 55 55·618	746·0	147 38 16·3	327 32 43·0	Fortymile Dome	9238·8	3·965615
					151 35 23·4	331 31 43·1	F of the Boundary (Monument No. 118)	6876·1	3·837345
					179 33 28·0	359 33 24·5	Bare	6649·0	3·822754
River, 1907	910·0	2986	64 17 53·122	1645·1	174 07 20·3	354 06 22·0	Uncle Sam	8466·0	3·927676
			141 04 40·414	543·5	221 57 17·7	42 05 10·7	John Bull	10529·4	4·022404
Moose, 1907	978·8	3211	64 15 52·853	1636·8	112 15 53·2	292 05 41·5	River	9865·8	3·994132
			140 53 21·473	289·1	140 39 00·3	320 27 50·1	Uncle Sam	15727·6	4·196663
					169 50 54·7	349 48 35·8	John Bull	11731·2	4·069341

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Canyon, 1907	864·5	2836	64 12 10·489	324·2	186 14 13·3	6 15 31·0	River	10674·6	4·028353
			141 06 06·654	89·8	236 10 21·8	56 21 50·9	Moose	12401·8	4·093483
Little Baldy, 1913	1147·0	3763	64 12 08·410	260·4	16 33 41·4	196 29 04·7	Walker	14624·0	4·165066
			140 57 45·333	611·8	84 37 51·2	264 17 52·2	Steel Creek Dome	18061·1	4·256744
					342 42 53·0	162 47 11·8	Gold	13116·3	4·117812
Baldy. 1907	1148·0	3767	64 12 06·816	211·0	91 00 27·2	270 52 49·2	Canyon	6866·1	3·836708
			140 57 37·911	511 6	152 05 49·3	331 59 28·8	River	12141·0	4·084256
					206 14 55·0	26 18 46·0	Moose	7806·8	3·892472
Steel Creek Dome, U. S. G. S. 1907.	1223·9	4015[2]	64 11 12·149	376·2	224 44 10·2	44 57 55·8	River	17515·1	4·243412
			141 19 57·139	771·5	247 47 58·5	63 11 55·4	Moose	23204·1	4·365564
					254 23 55·9	84 49 02·5	Baldy	18156·3	4·259027
					296 00 37·6	116 24 54·8	Gold	24414·5	4·387648
Baby, 1907	945·1	3101	64 06 31·589	978·3	193 05 31·6	13 08 14·4	Canyon	10775·3	4·032429
			141 09 07·533	102·0	221 50 10·1	42 00 30·7	Baldy	13952·1	4·144640
Marmot, 1907	1251·8	4107	64 06 16·089	498·2	47 44 04·3	226 41 40·6	G of the Boundary (Monument No. 126)	2971·9	3·473034
			140 57 20·297	274·9	92 57 27·4	272 45 51·2	Baby	9588·6	3·981756
					147 06 28·1	326 53 34·4	Canyon	13079·0	4·116576
					162 35 20·0	342 33 56·3	R6 of the Boundary	7218·2	3·858430
					178 44 45·4	358 44 30·6	Baldy	10863·7	4·035978
					294 23 56·0	114 27 52·3	Gold	3907·0	3·591840
Gold, 1907	1376·1	4515	64 05 23·907	740·4	99 11 12·1	278 55 39·7	Baby	13302·1	4·123919
			140 52 57·691	781·6	139 49 23·1	319 37 33·1	Canyon	16502·1	4·217538
					163 08 32·5	343 04 20·3	Baldy	13039·7	4·115267
Walker, 1907	1257	4124[2]	64 04 35·672	1104·7	125 18 47·9	305 13 10·9	Baby	6217·1	3·793588
			141 02 52·846	716·4	259 26 01·8	79 34 57·1	Gold	8202·8	3·913963
					350 25 17·2	170 26 40·0	Ptarmigan	7516·4	3·876010
Minnesota, 1907	1305·6	4284	64 01 46·144	1428·9	154 35 30·8	334 30 51·8	Baby	9789·1	3·990742
			141 03 57·327	778·4	232 54 43·6	53 04 36·7	Gold	11203·8	4·049364
					315 27 40·4	135 30 01·0	Ptarmigan	3032·3	3·481777
Miller, 1907	1435·9	4711[2]	64 01 12·709	393·6	66 36 24·6	246 33 32·5	Ptarmigan	2835·1	3·452563
			140 58 09·302	126·3	137 58 10·3	317 48 18·4	Baby	13311·4	4·124223
					208 28 55·9	28 33 36·1	Gold	8853·3	3·947103
Ptarmigan, 1907	1425·6	4677	64 00 36·325	1124·9	150 08 25·8	330 01 26·1	Baby	12692·9	4·103561
			141 01 20·799	282·6	217 24 30·1	37 32 02·5	Gold	11220·9	4·050026
Witherspoon North Base (U.S.G.S.),[1] 1907.	1245·2	4085[2]	63 57 58·69	1817·5	173 28 41	353 26 40	Baby	15986·8	4·203761
			141 06 53·42	727·0	222 46 38	42 51 37	Ptarmigan	6654·8	3·823134
Bedrock, 1907	1310·4	4299	63 58 05·252	162·6	86 32 59·6	266 20 21·6	Witherspoon	11504·1	4·060852
			140 58 22·936	312·1	152 41 01·5	332 38 21·7	Ptarmigan	5266·4	3·721516
					197 58 11·0	18 03 03·5	Gold	14283·6	4·154839
Witherspoon, 1907	1238·3	4063	63 57 42·214	1307·1	189 20 09·8	9 23 08·8	Baby	16614·3	4·220483
			141 12 26·595	362·0	227 50 44·0	48 08 14·9	Gold	21363·2	4·329666
					239 08 40·7	59 18 39·1	Ptarmigan	10538·2	4·022766
Moss, 1907	1324·1	4344[2]	63 56 43·072	1333·7	352 42 51·8	172 43 23·0	Sixtymile River, East Base	3739·0	3·572753
			141 03 33·235	452·6	27 10 33·7	207 08 18·3	Sixtymile River, West Base	4501·9	3·653392
					104 13 16·0	284 05 16·8	Witherspoon	7489·2	3·874436
					337 22 35·9	157 27 30·9	Crag	11670·9	4·067106
Bagley (U.S.G.S.),[1] 1907	......	....	63 55 27·67	857·0	251 15 50	71 23 21	Witherspoon	7209·3	3·857895
			141 20 48·18	656·3	286 12 41	106 25 55	Sixtymile River, West Base	12556·4	4·098866
Reilly, 1913	993·3	3259	63 54 45·496	1408·8	35 47 03·8	215 38 29·2	Divide	13412·3	4·127502
			141 00 00·219	3·0	71 44 34·0	251 33 15·4	Lode	10862·5	4·035929
					332 43 31·5	152 44 04·9	Sixty	1102·4	3·042333
					347 31 33·0	167 33 16·7	Crag	7307·3	3·863756
Sixtymile River, East Base, 1907.	1047·9	3438	63 54 43·303	1340·9	330 23 39·4	150 28 03·1	Crag	8125·5	3·909852
			141 02 58·460	797·1	346 36 41·4	166 39 21·5	I of the Boundary (Monument No. 133).	10543·4	4·022979
					26 32 39·1	206 26 44·5	Divide	12092·2	4·082506

[1] No check on this position. [2] Top of cairn.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ″		*Meters.*	
Sixtymile River, West Base, 1907.	972·2	3190	63 54 33·720	1044·1	263 19 17·7	83 20 04·3	Sixtymile River, East Base	2547·5	3·406120
			141 06 04·011	54·7	315 55 10·3	136 02 20·6	Crag	9415·4	3·973841
					333 25 46·6	153 31 13·3	I of the Boundary (Monument No. 133)	11132·9	4·046608
					15 13 43·8	195 10 35·8	Divide	10907·2	4·037713
					138 17 01·1	318 11 17·4	Witherspoon	7825·5	3·893512
Sixty, 1913	867·9	2847	63 54 13·854	429·0	77 23 12·3	257 11 20·4	Lode	11088·8	4·044886
			140 59 23·182	316·2	107 16 57·5	287 13 44·2	Sixtymile River, East Base	3074·2	3·487735
					350 07 06·4	170 08 16·8	Crag	6247·8	3·795730
Lode, 1907	1266·6	4155	63 52 55·053	1704·8	180 49 12·3	0 49 20·7	Witherspoon	8893·3	3·949061
			141 12 35·945	490·6	230 19 42·4	50 32 28·4	Bedrock	15080·7	4·178421
					240 12 29·9	60 18 21·9	Sixtymile River, West Base	6158·6	3·789484
					246 52 46·7	67 01 25·3	Sixtymile River, East Base	8561·9	3·932572
					287 13 51·2	107 26 53·3	Crag	12465·7	4·095717
					300 36 17·6	120 43 22·4	Spur	7512·0	3·875755
					341 30 37·9	161 33 21·8	Divide	7875·7	3·896287
Crag, 1907	1541·7	5058	63 50 55·077	1705·4	137 06 43·5	316 53 49·5	Witherspoon	17237·3	4·236470
			140 58 04·724	64·6	178 56 03·0	358 55 46·6	Bedrock	13323·2	4·124610
Spur, 1907	1353·8	4442	63 50 51·334	1589·6	153 37 32·1	333 30 35·6	Witherspoon	14208·8	4·152558
			141 04 42·856	585·8	170 52 14·0	350 51 01·1	Sixtymile River West Base	6975·0	3·843545
					191 12 31·0	11 14 04·7	Sixtymile River, East Base	7323·2	3·864700
					210 02 19·9	21 08 01·0	Bedrock	14401·2	4·158398
					268 43 47·5	88 49 44·8	Crag	5442·3	3·735782
					308 26 56·3	128 31 06·0	I of the Boundary (Monument No. 133)	4940·8	3·693797
Divide, 1907	1561·8	5124	63 48 53·817	1666·4	171 48 08·3	351 45 32·8	Witherspoon	16532·3	4·218333
			141 09 33·406	457·0	208 05 51·2	28 15 53·2	Bedrock	19372·3	4·287181
					248 10 32·0	68 20 50·1	Crag	10138·3	4·005964
Odell, 1908	1180·6	3873	63 46 27·756	859·4	84 02 08·8	263 49 37·5	Fred	11543·8	4·062348
			140 55 10·410	142·6	111 03 08·8	290 50 14·5	Divide	12652·5	4·102175
					163 56 48·6	343 54 12·2	Crag	8614·7	3·935238
Charlie, 1913	894·2	2934	63 46 25·494	789·4	81 21 36·6	261 13 15·0	Fred	7598·2	3·880708
			141 00 00·009	0·1	120 23 55·5	300 15 21·0	Divide	9096·0	3·958850
					180 01 04·9	00 01 04·9	Monument No. 134	391·9	2·593165
Fred, 1908	1404·3	4607	63 45 48·345	1497·0	176 32 12·9	356 31 50·1	Divide	5753·8	3·759955
			141 09 08·004	109·7	223 37 19·7	43 47 14·9	Crag	13138·9	4·118558
Bill, 1908	1338·1	4390	63 44 54·976	1702·3	6 26 50·6	186 26 24·6	Interior	3540·0	3·549007
			141 01 07·695	105·5	41 49 26·3	221 41 19·6	Round	11194·4	4·049008
					104 08 48·9	284 01 38·0	Fred	6789·8	3·831854
					239 33 36·7	59 38 57·1	Odell	5678·3	3·754215
Interior, 1908	1221·0	4006	63 43 01·377	42·6	129 55 03·5	309 48 18·7	Fred	8066·8	3·906701
			141 01 36·647	503·2	219 36 34·4	39 42 20·8	Odell	8301·0	3·919128
Ladue, 1908	927·8	3044	63 40 45·476	1408·1	87 57 42·8	267 39 55·5	Round	16384·7	4·214438
			140 50 19·790	272·1	114 25 56·2	294 15 49·4	Interior	10207·3	4·008910
					121 20 12·4	301 03 20·8	Fred	18106·2	4·257827
					159 24 45·7	339 20 25·1	Odell	11324·7	4·054025
Round, 1908	1193·2	3915	63 40 25·290	783·1	184 53 59·6	4 54 55·6	Fred	10040·4	4·001751
			141 10 10·569	145·3	235 32 45·9	55 40 26·6	Interior	8557·2	3·932333
Junction, 1908	795·5	2610	63 36 13·438	416·1	128 22 20·7	308 11 37·6	Round	12587·6	4·099943
			140 58 12·904	177·9	217 39 07·6	37 46 11·5	Ladue	10648·0	4·027268
					276 31 43·6	96 37 10·1	Ridge	5058·8	3·704044
Timber, 1908	977·3	3206	63 36 04·642	143·7	175 52 06·2	355 51 28·2	Round	8092·1	3·908062
			141 09 28·171	388·3	241 02 40·8	61 19 49·7	Ladue	18043·7	4·256326
Ridge, 1908	1002·4	3289	63 35 54·734	1694·8	91 21 19·1	271 05 47·7	Timber	14338·7	4·156509
			140 52 08·372	115·4	119 28 50·4	299 12 40·8	Round	17094·6	4·232859
					189 24 51·9	9 26 29·2	Ladue	9126·1	3·960287
Edward, 1910	1243·1	4078	63 34 29·181	903·6	40 29 13·4	220 18 20·8	K of the Boundary	15553·5	4·191827
			140 47 50·882	702·1	57 35 15·7	237 17 07·0	Summit	19947·5	4·299887
					126 45 05·3	306 41 14·7	Ridge	4430·8	3·646481
					355 04 01·6	175 05 01·5	Point	10773·6	4·032362

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Victoria, 1910	......	....	63 31 35·554	1100·9	7 31 14·4	187 30 28·7	Point	5403·9	3·732709
			140 45 52·887	731·0	61 12 39·4	241 00 01·3	K of the Boundary	13387·5	4·126698
					73 58 23·2	253 38 29·0	Summit	19220·7	4·283768
					147 11 20·7	327 05 44·5	Ridge	9553·9	3·980181
Point, 1908	1077·7	3536	63 28 42·533	1317·0	90 09 04·3	269 49 56·1	Summit	17766·3	4·249598
			140 46 43·971	608·8	126 09 43·7	305 49 22·4	Timber	23294·5	4·367254
					161 31 27·3	341 26 36·9	Ridge	14113·6	4·149638
Summit, 1908	1273·7	4179	63 28 42·450	1314·4	175 20 13·4	355 19 00·9	Timber	13738·0	4·137924
			141 08 07·160	99·1	224 34 58·1	44 49 16·6	Ridge	18832·3	4·274904
Fra-wa-pe, 1908	1100·1	3609	63 18 46·319	1434·2	88 50 17·0	268 33 30·0	Oh-ti	15700·0	4·195899
			140 46 40·777	567·8	136 06 02·5	315 46 52·3	Summit	25686·0	4·409697
					179 51 45·9	359 51 43·0	Point	18461·3	4·266262
Oh-ti, 1908	1090·0	3576	63 18 34·800	1077·6	173 18 50·3	353 16 27·9	Summit	18945·0	4·277494
			141 05 27·851	387·9	219 31 51·1	39 48 36·1	Point	24447·4	4·388232
Howard, 1910	......	....	63 16 47·373	1466·9	345 24 50·0	165 27 29·1	Brown	9891·6	3·995266
			140 59 04·530	63·1	7 11 38·5	187 10 49·0	Monument No. 148	6187·1	3·791488
					82 26 09·6	262 24 32·7	Hyacinthe	1528·2	3·184183
Hyacinthe, 1910	......	....	63 16 40·865	1265·3	336 49 42·5	156 53 58·6	Brown	10191·9	4·008255
			141 00 53·185	741·5	352 52 03·3	172 52 50·8	Monument No. 148	5983·2	3·776933
Bump, 1908	897·4	2944	63 14 07·047	218·2	210 09 35·7	30 14 44·8	Oh-ti	9592·8	3·981945
			141 11 13·910	194·2	246 59 17·2	67 21 13·0	Fra-wa-pe	22287·5	4·348062
Brown, 1908	1096·3	3597	63 11 38·178	1182·2	110 05 19·2	289 51 49·0	Bump	13492·6	4·130090
			140 56 06·380	89·2	148 47 44·5	328 39 23·1	Oh-ti	15093·2	4·178780
					210 41 51·8	30 50 16·9	Fra-wa-pe	15428·3	4·188316
Black, 1908	1039·0	3409[1]	63 10 13·909	430·7	72 26 03·6	252 15 15·0	Missou	9693·7	3·986489
			140 47 26·972	377·4	109 49 06·8	289 41 23·3	Brown	7720·0	3·887620
					135 55 10·6	315 39 05·5	Oh-ti	21638·8	4·335232
					182 19 19·0	2 20 00·2	Fra-wa-pe	15879·1	4·200826
Missou, 1908	1241·8	4074	63 08 38·912	1204·9	133 32 03·8	313 20 39·1	Bump	14776·5	4·169572
			140 58 26·707	374·1	199 28 00·2	19 30 05·4	Brown	5887·8	3·769956
Moosehorn, 1908	1305·4	4283	63 04 03·278	101·5	87 50 04·8	267 36 01·3	Flat	13298·8	4·123814
			140 56 44·439	624·2	147 01 55·0	326 48 59·3	Bump	22309·8	4·348496
					170 28 20·3	350 26 49·1	Missou	8654·1	3·937223
					182 09 49·4	2 10 23·4	Brown	14095·2	4·149070
Flat, 1908	1031·0	3383	63 03 46·171	1429·7	183 11 12·3	3 12 20·7	Bump	19254·1	4·284524
			141 12 30·566	429·3	232 27 04·9	52 39 37·5	Missou	14908·3	4·173428
Sauerkraut, 1908	818·7	2686·0	62 58 15·385	476·3	187 11 54·5	7 13 16·6	Flat	10323·6	4·013831
			141 14 02·664	37·5	233 27 40·7	53 43 05·9	Moosehorn	18147·3	4·258813
Wienerwurst, 1908	914·4	3000	62 54 45·923	1421·8	113 59 09·5	293 43 43·6	Sauerkraut	16034·6	4·205058
			140 56 42·948	606·4	141 32 07·3	321 18 03·1	Flat	21398·1	4·330376
					179 55 49·6	359 55 48·3	Moosehorn	17257·0	4·236966
Sawback, 1908	......	....	62 48 53·439	1654·5	49 48 59·4	229 42 10·8	Mick	8532·0	3·931050
			140 54 42·657	604·3	79 54 22·6	259 48 20·2	Scottie	5863·7	3·768169
					92 52 49·5	272 48 07·2	O of the Boundary	4500·7	3·653278
Scottie, 1908	1123·9	3687	62 48 20·084	621·8	85 47 30·9	265 36 11·3	Tanana	10858·7	4·035776
			141 01 30·063	426·0	150 06 35·0	329 55 25·0	Sauerkraut	21279·4	4·327960
					198 44 22·0	18 48 37·5	Wienerwurst	12617·6	4·100977
Tanana, 1908	886·0	2907	62 47 53·772	1664·8	180 28 50·9	0 29 01·1	Sauerkraut	19247·0	4·284362
			141 14 14·127	200·2	229 14 05·8	49 29 41·2	Wienerwurst	19594·7	4·292138
Mick, 1908	1048·4	3440	62 45 55·426	1716·0	327 27 38·7	147 30 11·4	Starvation	4536·6	3·656733
			141 02 22·034	312·7	8 57 55·6	188 54 31·1	Airs	21095·6	4·324192
					42 32 21·8	222 24 29·8	Mirror	11172·7	4·048160
					110 01 51·9	289 51 18·6	Tanana	10742·6	4·031111
					189 20 13·5	9 20 59·7	Scottie	4539·0	3·656964
Starvation, 1908	1062·7	3486	62 43 51·872	1606·0	120 57 13·2	300 44 07·3	Tanana	14607·7	4·164583
			140 59 30·260	429·8	168 26 49·8	348 25 03·3	Scottie	8476·4	3·928209
					177 28 38·0	357 28 11·5	O of the Boundary	9569·3	3·980881
Rupe, 1909	1114·3	3656	62 43 49·900	1544·9	70 10 05·5	249 57 34·9	Mirror	12770·6	4·106213
			140 57 08·535	121·2	91 45 14·9	271 43 08·9	Starvation	2014·2	3·304113
					156 06 43·0	336 02 50·4	Scottie	9151·2	3·961480

[1] Target.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longiude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Mirror, 1909	785·4	2577	62 41 29·258	905·8	167 50 12·4	347 47 31·5	Tanana	12179·5	4·085628
			141 11 13·071	185·9	212 58 53·6	33 07 31·9	Scottie	15175·7	4·181148
					245 04 10·6	66 14 35·2	Starvation	10922·8	4·038335
Flag No. 8, 1909	863·6	2833	62 35 00·323	10·0	45 07 50·4	225 05 19·6	Airs	3421·3	3·534186
			141 03 22·456	320·4	296 27 13·7	116 37 29·1	Dave	11065·8	4·043983
					321 47 08·7	141 50 08·2	R of the Boundary	4675·1	3·669787
Airs, 1909	1032·4	3387	62 34 42·335	1310·64	161 14 41·7	341 10 14·5	Mirror	13308·0	4·124114
			141 06 12·267	175·27	198 32 57·6	18 38 54·7	Starvation	17951·6	4·254104
Flaa No. 7, 1909	874·2	2868	62 34 16·877	522·5	101 13 33·7	281 09 26·1	Airs	4060·9	3·608623
			141 01 33·311	475·7	185 36 28·1	5 38 17·4	Starvation	17888·3	4·252570
					281 42 57·4	101 51 35·9	Dave	8525·1	3·930699
					289 28 43·6	109 30 05·3	R of the Boundary	1414·1	3·150488
					328 40 03·9	148 51 42·1	Snag	21746·0	4·337379
Dave, 1909	965·4	3167	62 33 20·625	638·6	101 42 06·8	281 29 20·7	Airs	12585·9	4·099884
			140 51 49·154	702·4	132 29 52·0	312 12 38·5	Mirror	22455·2	4·351317
					161 28 35·9	341 21 46·4	Starvation	20618·5	4·314258
Flag No. 6, 1909	846·6	2778	62 32 33·751	1044·9	13 10 42·9	193 08 48·4	S of the Boundary	8102·0	3·908591
			140 57 51·097	730·5	119 08 04·1	299 00 39·4	Airs	8192·7	3·913428
					254 17 06·9	74 22 28·1	Dave	5372·9	3·730211
Snider, 1909	882·2	2894	62 28 52·865	1636·7	50 02 37·3	229 55 26·7	Wellesley	9092·8	3·958699
			141 01 03·225	117·8	158 08 31·8	338 04 02·0	Airs	11660·8	4·066729
					185 49 15·9	5 50 16·3	R of the Boundary	9609·5	3·982699
					223 54 29·1	44 02 45·1	Dave	11519·8	4·061446
					307 58 16·4	128 09 32·1	Snag	13887·3	4·142618
Wellesley, 1909	1335·5	4382	62 25 44·017	1362·8	188 50 43·4	8 53 24·5	Airs	16868·0	4·227064
			141 09 13·917	199·8	226 29 40·9	45 45 07·6	Dave	20583·5	4·313520
Hill southwest of Wellesley, 1909.	1514·1	4968	62 25 39·84	1233	203 40 36	23 55 04	Starvation	36953·8	4·567659
			141 16 54·90	788	208 37 51	28 47 21	Airs	19150·1	4·282170
					251 10 39	71 25 39	S of the Boundary	15365·1	4·186536
Snag, 1909	796·7	2614	62 24 16·304	504·8	170 13 31·9	350 10 31·7	Dave	17101·7	4·233040
			140 48 25·977	373·1	98 46 20·9	278 27 54·8	Wellesley	18120·6	4·258173
					141 53 55·5	321 38 09·8	Airs	24674·5	4·392248
Flag No. 5,[1] 1909	803·0	2635	62 23 55·84	1729	105 21 29	285 09 40	Wellesley	11961·6	4·077789
			140 55 54·13	778	264 19 27	84 25 04	Snag	6468·2	3·810786
Laura,[1] 1909	1106·0	3629[2]	62 19 03·08	95	13 39 18	193 35 27	Baultoff	16011·9	4·204444
			141 05 21·49	310	307 22 28	127 36 01	Niggerhead	16692·4	4·222520
Chisana,[1] peak west of, 1909	1598·9	5246	62 18 58·82	1821	230 20 25	50 57 08	Airs	46065·9	4·663380
			141 47 35·96	518	248 57 34	69 31 33	Wellesley	35395·2	4·548944
Chisana,[1] peak east of, 1909.	1988·7	6525	62 16 44·64	1382	224 00 47	44 34 17	Airs	46612·8	4·668505
			141 44 00·50	7	240 39 25	61 10 13	Wellesley	34350·5	4·535933
Mount Allen,[1] 1909	......	....	62 15 03·18	98	327 31 52	148 14 50	Holmes	80157·3	4·903943
			142 12 52·96	765	340 27 23	160 45 36	Lime	54214·9	4·734119
Niggerhead, 1909	1454·9	4773	62 13 34·946	1081·9	184 01 40·3	4 03 05·5	Snag	19905·4	4·298971
			140 50 03·328	48·1	143 51 46·4	323 34 47·4	Wellesley	27999·1	4·447144
Needle Peak,[1] 1909	2312·1	7586	62 11 13·50	418	217 08 11	37 29 13	Wellesley	33884·9	4·530006
			141 32 59·42	860	237 30 22	58 09 49	Snag	45522·6	4·658227
Baultoff, 1909	2030·4	6661	62 10 40·434	1251·8	180 50 46·7	0 51 12·2	Wellesley	27977·3	4·446806
			141 09 42·712	618·0	215 55 26·8	36 14 17·1	Snag	31253·4	4·494897
					252 16 33·5	72 33 56·8	Niggerhead	17888·2	4·252567
Ella, 1909	1174·2	3852[2]	62 09 52·384	1621·8	11 05 43·0	191 04 54·1	T of the Boundary	4151·8	3·618238
			140 59 04·876	70·6	99 13 54·6	279 04·30·5	Baultoff	9351·1	3·970861
					228 35 37·8	48 43 36·8	Niggerhead	10431·5	4·018346
					324 01 18·0	144 07 16·5	Ed	10017·8	4·000771
Ed, 1909	1557·8	5111	62 05 30·359	939·9	122 32 20·2	302 16 57·8	Baultoff	17909·8	4·253091
			140 52 19·329	280·4	187 27 41·3	7 29 41·6	Niggerhead	15130·8	4·179862
Joe, 1909	2210·8	7253	62 03 27·939	865·0	185 03 44·7	5 04 57·1	Baultoff	13442·0	4·128463
			141 11 04·680	68·0	224 02 41·9	44 21 17·1	Niggerhead	26212·3	4·418505
					256 48 13·6	77 04 47·9	Ed	16773·8	4·224631
Beaver, 1909	1973·7	6476	62 03 24·157	747·9	90 42 21·1	270 31 16·1	Joe	10936·7	4·038888
			140 58 31·934	464·1	234 07 11·8	54 12 41·0	Ed	6673·5	3·824355

[1] No check on this position. [2] Top of cairn.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Bear Mountain,[1] 1909	......	....	62 02 49·38	1529	331 55 27	152 16 54	Black Eagle	45582·2	4·658795
			141 56 44·13	641	352 06 39	172 10 36	Lime	28691·5	4·457753
Lava, 1909	1826·6	5993[2]	62 01 50·089	1550·8	1 51 59·9	181 51 21·5	Sheep	19515·7	4·290384
			141 04 41·550	604·2	33 59 53·1	213 52 52·8	Wi-ki	12418·5	4·094068
					118 35 33·6	298 29 55·1	Joe	6339·2	3·802037
					241 29 38·1	61 35 04·6	Beaver	6110·8	3·786101
					292 15 56·8	112 28 18·0	Hump	13209·2	4·120876
					342 55 16·9	163 01 26·2	Rabbit	20845·3	4·319009
Hump, 1909	1922·3	6307	61 59 07·708	238·6	114 31 20·5	294 13 20·9	Joe	19522·3	4·290531
			140 50 42·119	613·3	139 20 12·5	319 13 17·6	Beaver	10475·2	4·020162
					173 12 32·6	353 11 06·7	Ed	11930·1	4·076644
Wi-ki, 1909	2331·9	7651	61 56 17·291	535·2	185 47 05·4	5 48 27·5	Joe	13400·4	4·127119
			141 12 37·649	549·1	222 52 06·1	43 04 32·8	Beaver	18060·8	4·256736
					254 27 12·2	74 46 33·3	Hump	19885·0	4·298525
Ted,[1] 1909	1656·4	5435[2]	61 55 32·46	1005	96 01 56	275 48 26	Wi-ki	13458·2	4·128987
			140 57 20·03	292	220 59 17	41 05 09	Hump	8834·5	3·946181
Wi-ki Ridge, west mesa,[1] 1909	......	....	61 54 58·21	1802	317 07 09	137 20 34	Cache	19653·4	4·293438
			141 19 13·87	202	347 57 15	168 04 14	Cub	33556·2	4·525773
Wi-ki Ridge, east mesa,[1] 1909	......	....	61 54 55·90	1730	318 36 24	138 49 04	Cache	19105·6	4·281161
			141 18 23·35	341	349 10 50	169 17 04	Cub	33340·0	4·522965
Peak west of Wi-ki,[2] 1909	......	....	61 54 45·79	1417	327 52 14	148 01 04	Cache	16569·5	4·219310
			141 14 02·67	39	355 44 19	175 46 44	Cub	32529·2	4·512273
Wi-ki Ridge, east peak,[1] 1909	......	....	61 54 20·45	633	306 12 59	126 31 04	Cache	22360·5	4·349482
			141 24 32·26	471	339 42 45	159 54 24	Cub	33728·3	4·527994
Wi-ki Ridge, west peak,[1] 1909	......	....	61 54 10·14	314	305 10 14	125 28 34	Cache	22379·6	4·349852
			141 24 49·57	724	339 06 49	159 18 44	Cub	33518·4	4·525283
Sheep, 1909	1877·8	6161	61 51 20·020	619·7	145 34 47·2	325 28 25·5	Wi-ki	11163·1	4·047783
			141 05 25·017	365·8	221 33 30·1	41 46 29·1	Hump	19381·3	4·287384
					273 33 08·6	93 39 56·0	Rabbit	6770·7	3·830634
Rabbit, 1909	1987·4	6520	61 51 06·253	193·6	126 29 43·3	306 16 34·2	Wi-ki	16231·6	4·210361
			140 57 42·993	628·9	189 57 27·1	10 02 12·8	Ed	27163·2	4·433981
					202 20 45·0	22 26 56·3	Hump	16120·7	4·207384
Slide, 1909	1996·4	6550	61 50 19·340	598·7	121 12 50·4	301 09 43·3	Sheep	3627·5	3·559604
			141 01 52·883	773·9	248 18 12·3	68 21 52·6	Rabbit	3933·7	3·594796
Center, 1909	2064·8	6774	61 48 32·073	992·8	148 21 30·5	328 19 27·2	Slide	3901·2	3·591199
			140 59 33·017	483·6	198 37 50·5	18 39 27·5	Rabbit	5037·3	3·702198
Cache, 1909	1447·1	4748	61 47 12·157	376·3	155 58 01·9	335 50 26·7	Wi-ki	18486·7	4·266860
			141 04 01·447	21·2	170 57 01·0	350 55 47·3	Sheep	7770·1	3·890424
					197 59 04·0	18 00 57·4	Slide	6092·8	3·784820
					237 47 47·0	57 51 43·6	Center	4646·4	3·667119
Flat Top, 1909	1991·4	6534	61 47 05·329	165·0	174 50 27·7	354 49 47·2	Rabbit	7488·7	3·874406
			140 56 56·954	834·9	91 59 51·3	271 53 37·3	Cache	6225·7	3·794188
					139 36 10·3	319 33 52·8	Center	3527·0	3·547411
Silence,[1] 1909	1306·5	4287[3]	61 44 59·48	1842	288 51 04	108 54 45	White River, East Base	3889·3	3·589872
			141 02 56·58	830	320 02 24	140 03 46	White River, West Base	2125·8	3·327522
Harris, 1913	1340·7	4399	61 44 32·206	997·0	43 31 40·3	223 16 05·0	Dalton	22757·8	4·357131
			140 43 58·338	856·3	74 46 17·4	254 33 37·3	Kletsan	13142·4	4·118673
					357 34 31·8	177 35 01·8	Jenerk	11875·3	4·074644
White River, East Base, 1909	876·2	2875	61 44 18·818	582·5	139 15 14·2	319 10 36·2	Cache	7086·9	3·850457
			140 58 45·858	673·3	197 12 21·7	17 13 57·6	Flap Top	5396·5	3·732113
White River, West, Base, 1909	891·5	2925	61 44 06·832	211·5	158 02 18·1	337 59 59·1	Cache	6186·8	3·791464
			141 01 23·590	346·4	215 15 41·5	35 19 36·4	Flat Top	6770·0	3·830590
					260 52 39·2	80 54 58·1	White River, East Base	2345·2	3·370180
Little Boundary, 1909	1406·0	4613	61 42 45·724	1415·6	81 36 56·0	261 35 43·2	Kletsan	1227·2	3·088926
			140 56 58·747	863·1	122 52 27·1	302 48 33·9	White River, West Base	4629·8	3·665559
					151 23 05·9	331 21 31·6	White River, East Base	3283·2	3·516303

[1] No check on this position. [2] Top of cairn. [3] Lower target.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Kletsan, 1909	1431·9	4698	61 42 39·937	1236·3	135 10 07·8	315 07 27·4	White River, West Base	3794·5	3·579157
			140 58 21·377	314·1	149 24 24·6	329 19 25·1	Cache	9794·0	3·990958
					173 18 13·7	353 17 52·1	White River, East Base	3082·1	3·488842
					188 33 56·2	8 35 10·5	Flat Top	8308·5	3·919525
Traver, 1909	1102·0	3616	61 42 11·712	362·6	263 59 38·6	84 08 02·2	Kletsan	8448·8	3·926794
			141 07 53·231	782·3	170 59 45·1	350 55 34·4	Wi-ki	26505·8	4·423341
					200 03 45·0	20 07 09·2	Cache	9903·4	3·995785
					226 34 53·6	46 44 31·6	Flat Top	13244·0	4·122019
					238 02 39·5	58 08 22·7	White River, West Base	6742·4	3·828813
					243 51 22·8	63 59 24·9	White River, East Base	8951·3	3·951887
Signal on Boundary,[1] 1909	......	....	61 39 13·05	404	129 37 22	309 30 41	Traver	8682·8	3·938660
			141 00 18·17	267	194 59 57	15 01 39	Kletsan	6630·9	3·821571
Blank Peak,[1] 1909	2769·6	9087	61 38 50·85	1574	126 36 40	306 28 51	Bend	9755·0	3·989228
			141 34 57·80	851	159 32 31	339 26 37	Solo	16866·6	4·227027
West Flag,[1] 1909	1276·2	4187	61 38 37·46	1160	145 21 17	325 16 42	Traver	8065·8	3·906649
			141 02 41·24	607	206 57 15	27 01 04	Kletsan	8423·5	3·925494
East Flag,[1] 1909	1243·4	4080	61 38 34·14	1057	130 12 28	310 04 30	Traver	10447·7	4·019019
			140 58 50·33	741	183 12 01	3 12 26	Kletsan	7621·0	3·882013
Jenerk, 1913	1450·0	4757	61 38 08·935	276·6	74 01 01·0	253 44 56·2	Dalton	16827·0	4·226006
			140 43 24·231	356·9	122 33 04·6	302 19 54·9	Kletsan	15638·7	4·194200
Scoria, 1909	1327·8	4356	61 37 55·855	1729·0	125 27 07·4	305 15 59·7	Traver	13686·4	4·136290
			140 55 14·641	215·7	162 40 26·9	342 37 42·5	Kletsan	9213·3	3·964414
Cub, 1909	1756·3	5762	61 37 17·874	553·3	198 21 28·0	18 24 28·8	Traver	9585·3	3·981604
			141 11 18·638	274·7	199 11 54·8	19 18 19·7	Cache	19486·6	4·289737
					228 49 32·9	49 00 57·0	Kletsan	15172·5	4·181057
					265 08 59·6	85 23 07·8	Scoria	14251·4	4·153858
Dalton, 1909	2017·8	6620	61 35 38·037	1177·5	155 49 59·4	335 44 31·8	Traver	13362·1	4·125875
			141 01 41·021	605·1	174 31 42·6	354 29 38·9	Cache	21586·4	4·334181
					192 39 27·4	12 42 23·1	Kletsan	13387·0	4·126684
					233 06 56·8	53 12 36·8	Scoria	7115·9	3·852232
Dark,[1] 1913	1800·2	5906	61 33 22·01	681·3	107 04 38	286 49 51	Monument No. 187A	15567·5	4·192218
			140 43 10·95	161·7	115 48 38	295 33 50	Monument No. 187	16517·6	4·217947
Natazhat,[1] 5th peak west of, 1909.	3097·7	10163	61 32 32·30	1000	152 44 31	332 38 50	Holmes	12460·5	4·095534
			141 17 43·30	640	174 04 55	354 02 45	Ping Pong	21138·5	4·325074
Natazhat,[1] 4th peak west of 1909.	3140·7	10304	61 32 15·16	469	148 41 07	328 34 05	Holmes	13589·4	4·133201
			141 16 11·22	166	170 41 46	350 38 15	Ping Pong	21844·8	4·339349
Natazhat,[1] 3rd peak west of, 1909.	3287·0	10784	61 31 37·91	1174	147 51 04	327 43 05	Holmes	15076·9	4·178312
			141 15 06·04	89	168 49 14	348 44 45	Ping Pong	23151·2	4·364573
Natazhat,[1] 2nd peak west of, 1909.	3602·4	11819	61 31 24·39	755	141 43 12	321 32 50	Holmes	16802·7	4·225378
			141 12 23·98	354	163 27 51	343 21 00	Ping Pong	24132·3	4·382598
Natazhat, black rock between peaks, 1909.	4052·0	13294	61 31 18·950	586·6	155 46 22·6	335 41 24·1	Cub	12187·9	4·085927
			141 05 39·239	580·2	174 26 02·1	354 24 04·2	Traver	20303·2	4·307565
					196 58 01·8	17 04 27·0	Kletsan	22046·3	4·343336
					220 56 00·8	41 00 59·0	Z of the Boundary	7641·6	3·883186
Cloud, 1913	3740·0	12270	61 31 17·51	542·0	199 48 17	19 55 53	Kletsan	22462·2	4·35145
			141 06 59·34	877·2	210·11 45	30·16 25	Dalton	9334·7	3·97010
					219 25 12	39 45 27	Harris	31922·8	4·50410
Natazhat, West Peak, 1913	4096·8	13441	61 31 17·13	530·3	205 41 11	25 45 02	Dalton	8964·7	3·95253
			141 06 04·47	66·1	218 16 40	38 36 06	Harris	31422·9	4·49725
					237 24 52	57 44 48	Jenerk	23778·0	4·37618
Mount Lambart, 1909	3269·0	10725	61 31 16·956	524·9	140 44 31·7	320 25 25·3	Ping Pong	30234·3	4·480500
			140 58 28·752	425·1	160 40 03·9	340 37 14·8	Dalton	8566·1	3·932784
					166 59 45·8	346 58 25·6	Z of the Boundary	5984·8	3·777051
Natazhat, East Peak, 1913	4095·0	13435	61 31 16·24	502·7	202 02 49	22 05 05	Dalton	8745·4	3·94178
			141 05 23·59	348·7	217 22 51	37 41 43	Harris	31074·0	4·49240
					236 33 57	56 53 17	Jenerk	23286·3	4·36710
Natazhat,[1] 1st peak west of, 1909.	3750·4	12305	61 31 11·30	350	137 59 32	317 47 20	Holmes	18304·5	4·262557
			141 10 18·99	281	159 42 41	339 34 00	Ping Pong	25100·9	4·399689

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Mount Riggs, 1913	3591·5	11783	61 30 40·08	1240·7	181 42 58	1 43 16	Dalton	9227·5	3·96508
			141 01 59·76	883·7	211 36 21	31 52 14	Harris	30288·5	4·48128
					229 42 04	49 58 26	Jenerk	21543·2	4·33331
					272 10 08	92 24 29	Klutlan	14494·0	4·16119
					336 47 56	156 52 10	Crag	10846·9	4·03530
					337 50 12	157 51 57	Bald	4705·5	3·67261
Klutlan, 1913	2629·9	8628	61 30 21·385	662·0	98 42 09·7	278 30·54·6	Lambart, Mt	11488·0	4·060245
			140 45 40·527	599·4	187 53 47·1	7 55 47·0	Jenerk	14612·5	4·164725
					124 45 35·9	304 31 31·5	Dalton	17243·4	4·236624
Mount Brooke,[1] 1913	3289·1	10791	61 29 38·63	1195·8	262 38 01	82 48 17	Klutlan	10443·2	4·01883
			140 57 20·76	307·2	43 49 06	223 46 46	Bald	3402·8	3·53183
Crag, 1913	2792·6	9162	61 25 17·931	555·1	174 08 55·3	354 07·47·6	Lambart, Mt	11171·6	4·048114
			140 57 11·627	172·4	227 22 21·1	47 32 28·2	Klutlan	13892·7	4·142788
Gable,[1] 1913	4765·2	10791	61 25 06·55	202·8	230 05 24	50 44 33	Kletsan	51172·8	4·70904
			141 42 52·86	784·1	234 53 26	55 45 14	Harris	63418·2	4·80221
Bo, 1913	2739·2	8987	61 24 45·577	1410·8	97 31 05·4	277 23 32·3	Crag	7718·8	3·887549
			140 48 35·645	528·8	193 59 24·8	14 01 58·6	Klutlan	10713·8	4·029945
					144 07 59·2	323 59 18·2	Lambart, Mt	14963·0	4·175020
West Curtain Peak,[1] 1913	2730·6	8959	61 24 38·95	1205·4	148 11 38	328 05 07	Klutlan	12480·8	4·09624
			140 38 15·79	234·3	169 43 53	349 39 22	Jenerk	25485·0	4·40628
Middle Curtain Peak, 1913	3056·2	10027	61 24 16·48	510·1	109 44 34	289 23 41	Bald	22440·7	4·35104
			140 36 13·40	198·8	143 25 30	323 17 18	Klutlan	14077·8	4·14854
					166 10 07	346 03 50	Jenerk	26544·6	4·42398
Mount Constantine,[2] 1913	3137·3	10294	61 24 29·0	898·7	92 25 48·9	272 13 22·8	Bo	12616·2	4·100929
			140 34 26·0	385·5	94 36 19·3	274 16 20·1	Crag	20319·4	4·307911
Mount Strickland,[1] 1913	4211·7	13818	61 14 29·29	906·6	47 05 45	226 33 04	Eck	46024	4·66298
			140 45 14·74	220·0	48 48 13	228 09 40	Bud	52903	4·72348
Mount Wood, 1913	4841·6	15885	61 13 56·17	1738·7	135 45 59	315 20 11	Bald	37425·1	4·57317
			140 30 36·67	547·1	155 24 29	335 00 08	Kletsan	58778·0	4·76922
					156 20 48	336 07 35	Klutlan	33322·5	4·52274
					168 18 22	348 06 41	Harris	58060·8	4·76388
Mount Steele,[1] 1913	5073·1	16644	61 05 32·57	1008·2	152 28 59	332 05 13	Klutlan	52057·9	4·71649
			140 18 34·43	516·0	162 51 08	342 28 50	Harris	75868·9	4·88006
Ping Pong, 1909	1333·2	4374	61 43 51·491	1593·9	285 48 07·4	105 58 57·7	Traver	11280·0	4·052308
			141 20 11·728	172·3	312 55 33·0	133 11 50·5	Dalton	22372·3	4·349710
					327 10 16·9	147 18 06·1	Cub	14490·2	4·161073
					19 29 07·5	199 25 37·0	Holmes	10555·9	4·023494
					246 18 17·4	66 32 32·1	Cache	15531·0	4·191198
					268 13 11·0	88 29 44·5	White River, W. Base	16571·0	4·219349
Holmes Creek,[1] 1st peak west of, 1909.	......	....	61 35 38·56	1194	164 19 19	344 17 50	Holmes	5511·7	3·741283
			141 22 29·69	438	187 33 43	7 35 45	Ping Pong	15393·9	4·187348
Holmes Creek,[1] 2nd peak west of, 1909.	2579·2	8462	61 35 37·42	1158	176 24 10	356 23 50	Holmes	5352·1	3·728522
			141 23 48·03	708	191 43 49	11 47 00	Ping Pong	15622·3	4·193746
Holmes, 1909	1741·1	5712	61 38 29·971	927·8	227 33 24·3	47 51 09·2	Cache	24021·0	4·380591
			141 24 10·830	159·6	244 21 58·9	64 36 19·4	Traver	15936·2	4·202385
					281 00 22·3	101 11 41·7	Cub	11592·1	4·064162
Burnt Hill, 1909	1332·4	4043	61 46 06·155	190·5	297 07 42·8	117 15 49·8	Ping Pong	9121·2	3·960053
			141 29 24·565	360·2	341 52 48·2	161 57 24·4	Holmes	14855·5	4·171887
					16 04 06·5	196 01 27·3	Black Eagle	9602·2	3·982371
					264 35 09·4	84 57 31·3	Cache	22424·7	4·350726
					290 47 21·3	111 06 18·6	Traver	20300·4	4·307504
Black Eagle, 1909	1645·4	5398	61 41 08·057	249·4	244 46 03·1	64 56 49·0	Ping Pong	11907·8	4·075831
			141 32 25·299	372·0	290 45 34·4	111 04 09·1	Cub	19961·1	4·300185
					303 51 43·2	123 58 58·4	Holmes	8769·1	3·942954
Mount Sulzer, 1913	3330·1	10926	61 37 28·95	896·2	253 48 40	74 22 21	Kletsan	35123·0	4·54559
			141 36 37·04	545·8	253 51 44	74 38 05	Harris	48265·1	4·68363
					268 06 08	88 52 58	Jenerk	47051·4	4·67257
Solo, 1909	1478·6	4851	61 47 21·175	655·5	282 03 51·9	102 14 40·0	Burnt Hill	11030·1	4·042579
			141 41 40·039	586·8	288 47 51·3	109 06 46·3	Ping Pong	19983·1	4·300662
					324 44 42·1	144 52 50·8	Black Eagle	14132·9	4·150230
					10 52 11·2	190 50 16·3	Bend	10170·9	4·007358
					270 12 24·1	90 45 34·3	Cache	33104·6	4·519888
Whitey, 1909	3130·5	10271	61 35 26·18	810	159 25 21	339 19 48	End	15842·0	4·199809
			141 43 57·43	847	180 28 44	0 28 50	Bend	12145·0	4·084398
					185 11 53	5 13 54	Solo	22225·5	4·346852

[1] No check on this position.

[2] See bottom of page 164.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Bend, 1909	1929·7	6331	61 41 58·500	1810·9	238 48 17·5	59 01 00·2	Burnt Hill	14846.9	4·171637
			141 43 50·527	742·6	278 43 37·4	98 53 40·7	Black Eagle	10194·6	4·008370
Mount Bona, 1913	5005·2	16421	61 23 03·16	97·8	228 18 51	48 59 55	Kletsan	55144·6	4·74150
			141 45 04·22	62·7	233 09 08	54 02 51	Harris	67240·2	4·82763
					255 09 37	76 01 47	Klutlan	54526·6	4·73661
Moraine Creek, end of first ridge north of, 1909	2052·5	6734	61 39 50·155	1552·6	146 47 24·1	326 43 02·8	End	7957·7	3·900789
			141 45 19·782	291·1	192 59 15·6	13 02 29·0	Solo	14330·1	4·156249
					198 16 20·6	18 17 39·2	Bend	4184·3	3·621626
Peak No. 3, 1909	2873·9	9429	61 35 39·846	1233·4	166 02 07·0	345 58 32·3	End	14844·5	4·171564
			141 46 12·631	186·3	190 06 11·4	10 08 16·4	Bend	11907·0	4·075801
					190 25 32·3	10 29 32·2	Solo	22077·4	4·343949
Peak No. 1, 1909	2531·8	8307	61 37 14·796	458·0	69 35 39·5	249 32 34·0	Skolai	3316·0	3·520619
			141 47 54·860	808·5	196 18 30·3	16 24 00·3	Solo	19562·8	4·291432
					202 14 12·6	22 17 47·6	Bend	9490·1	3·977270
Glacier, northeast end of, 1909	1251·4	4106	61 41 20·652	639·3	153 59 08·7	333 57 15·9	End	4288·8	3·632338
			141 48 08·463	124·4	207 00 55·1	27 06 37·2	Solo	12532·8	4·098049
					252 47 53·6	72 51 40·7	Bend	3968·9	3·598666
Peak No. 5,[1] 1909	2528·3	8295	61 36 13·37	414	114 50 40	294 49 04	Skolai	1771·6	3·248373
			141 49 36·63	540	177 29 22	357 28 47	End	13379·0	4·126425
End, 1909	1929·1	6329	61 43 25·142	778·3	167 07 21·5	347 05 36·8	Lime	7816·5	3·893011
			141 50 16·536	242·8	225 58 48·9	46 06 23·8	Solo	10526·8	4·022296
					295 15 44·5	115 21 24·4	Bend	6273·9	3·797535
Skolai, 1909	1829·5	6002	61 36 37·401	1157·8	184 36 03·2	4 37 04·1	End	12663·1	4·102540
			141 51 25·695	378·8	203 17 25·5	23 26 01·1	Solo	21708·7	4·336633
					213 55 34·5	34 02 15·1	Bend	11987·3	4·078720
Russell (U.S.G.S, "Y")1912	2292·8	7522	61 41 30·181	934·3	201 47 19·3	21 48 44·6	End	3832·9	3·583528
			141 51 53·403	785·1	219 34 18·5	39 43 18·7	Solo	14111·3	4·149566
					262 54 02·9	83 01 08·1	Bend	7152·5	3·854458
					357 25 10·6	177 25 35·0	Skolai	9072·5	3·957729
U.S.G.S. "Z" east peak, 1909	2444·3	8019	61 42 26·542	821·6	223 05 36·1	43 07 17·9	End	2484·7	3·395281
			141 52 12·116	178·1	225 24 22·3	45 33 39·0	Solo	13009·0	4·114245
					247 47 25·2	68 28 38·5	Sheep	44341·5	4·646810
					257 52 26·1	78 34 52·2	Cache	43335·3	4·636842
					259 32 10·9	80 20 50·7	Flat Top	49414·1	4·693851
					276 39 17·3	96 46 38·9	Bend	7422·7	3·870564
U.S.G.S "Z" west peak, 1909	2460·8	8073	61 42 25·129	777·9	225 58 00·4	46 07 30·8	Solo	13203·9	4·120703
			141 52 27·742	407·7	226 02 23·9	46 04 19·4	End	2677·1	3·427668
					247 50 45·8	68 32 12·8	Sheep	44570·4	4·649047
					257 52 38·3	78 35 18·1	Cache	43568·9	4·639177
					276 07 33·3	96 15 08·7	Bend	7646·1	3·883438
Lime, 1909	2156·3	7074	61 47 31·274	968·1	271 50 43·0	92 00 02·9	Solo	9316·8	3·969268
			141 52 15·406	225·8	303 53 47·1	124 18 30·4	Holmes	29886·8	4·475479
					304 01 53·7	124 19 21·9	Black Eagle	21117·9	4·324650
					324 12 37·7	144 20 02·4	Bend	12689·8	4·103454
Glacier,[1] point on, 1909	......	....	61 37 50·39	1560	234 14 27	54 25 07	Bend	13171·5	4·119636
			141 55 57·70	850	229 22 35	119 26 34	Skolai	4601·2	3·662873
U.S. G.S. "X," 1909	2635·7	8647	61 38 54·312	1681·3	242 39 52·4	63 05 56·6	Burnt Hill	29327·4	4·467273
			141 59 00·965	14·2	243 32 23·6	64 19 36·4	Sheep	52533·2	4·720434
					246 49 42·5	67 03 03·9	Bend	14556·5	4·163058
					251 57 30·2	72 45 55·7	Cache	50861·1	4·706386
					262 07 17·7	83 00 41·5	Kletsan	53984·9	4·732272
Beaver Peak, 1909	2709·4	8889	61 50 12·488	386·6	286 44 13·1	107 09 18·7	Burnt Hill	26162·5	4·417680
			141 57 52·897	774·1	290 17 52·6	110 32 10·1	Solo	15202·3	4·181909
					320 57 46·4	141 10 08·6	Bend	19659·1	4·293564
Glacier,[1] west end of, 1909	......	....	61 37 26·34	815	236 03 05	56 15 37	Bend	15127·6	4·179771
			141 58 04·27	63	284 24 43	104 30 34	Skolai	6066·4	3·782931
Peak No. 6,[1] 1909	3147·0	10325	61 31 19·18	594	207 14 31	27 29 52	Solo	33533·4	4·525477
			141 59 07·37	109	214 37 18	34 44 04	Skolai	11978·5	4·078402
Peak No. 7, 1909	2700·5	8860	61 34 52·828	1635·3	213 49 57·0	34 05 31·1	Solo	27930·8	4·446084
			141 59 21·101	311·4	226 00 35·8	46 14 14·7	Bend	19011·8	4·279023
					245 09 32·2	65 16 30·4	Skolai	7722·5	3·887760
Ice, 1912	......	....	61 37 07·752	240·0	215 41 12·4	35 47 01·9	Russell	10008·1	4·000352
			141 58 30·497	449·4	278 28 55·6	98 35 09·3	Skolai	6331·3	3·801495

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Glacier, 1912	2606·9	8553	61 39 53·591	1658·9	250 08 29·2	70 16 46·5	Russell	8831·6	3·946041
			142 01 18·372	270·3	334 15 58·9	154 18 26·6	Ice	5698·0	3·755721
					2 43 34·9	182 43 17·3	Pass	6209·5	3·793060
Skolai Peak,[1] 1912	2631·2	8633	61 38 54·22	1678·4	89 33 17	269 23 55	Gofer	9394·2	3·97286
			141 59 00·96	14·1	232 26 27	52 32 43	Russell	7929·8	3·89926
Pass, 1912	1772·0	5814	61 36 33·226	1028·5	223 03 44·8	43 12 19·6	Russell	12596·8	4·100260
			142 01 38·408	566·0	248 52 34·7	68 55 20·0	Ice	2968·8	3·472574
					269 06 19·6	89 15 18·6	Skolai	9033·2	3·955842
Rock in Skolai Pass,[1] 1909	......	....	61 35 47·07	1457	235 53 37	56 10 37	Bend	20580·8	4·313462
			142 03 09·87	146	261 22 45	81 33 04	Skolai	10499·0	4·021146
Bluff,[1] 1912	......	....	61 38 05·13	158·8	135 46 50	315 40 28	Coal	9158·4	3·96182
			142 07 59·90	882·3	175 12 56	355 12 10	Frederika	9250·6	3·96617
Peak " H," 1913	......	....	61 53 39·42	1220·3	282 01 24	103 17 06	Harris	77321·8	4·88830
			142 09 50·93	743·9	287 28 20	108 31 21	Kletsan	66072·4	4·82002
					290 06 10	111 22 20	Jenerk	81344·8	4·91033
					299 37 24	120 51 31	Klutlan	85925·3	4·93412
Southwest Lime Peak,[1] 1909	2940·7	9648	61 50 57·40	1777	306 48 26	127 10 37	Bend	27725·5	4·442879
			142 09 00·77	11	310 12 52	130 29 24	End	21622·9	4·334913
Peak " X ",[1,2] 1913	3066·1	10059	61 52 23·58	730·0	288 32 51	109 48 57	Jenerk	80517·4	4·90589
			142 10 47·25	690·6	298 15 44	119 29 47	Klutlan	84742·1	4·92810
Frederika, 1912	2426·5	7961	61 43 02·914	90·2	311 13 30·4	131 20 10·1	Glacier	8883·4	3·948577
			142 08·52·418	770·0	5 01 58·6	185 01 17·6	Gofer	7814·7	3·892913
Peak " B ",[1] 1912	2752·0	9029	61 36 37·84	1171·4	118 20 38	298 00 07	Goat	23355·0	4·36838
			142 06 27·29	402·3	169 51 37	349 49 30	Frederika	12110·5	4·08316
Peak " C ",[1] 1912	2667·7	8752	61 36 03·19	98·7	125 41 59	305 25 07	Goat	20805·6	4·31818
			142 10 36·32	535·6	186 41 58	6 43 30	Frederika	13082·8	4·11670
Peak " D ", 1912	2717·2	8915	61 37 45·26	1401·1	130 51 04	310 40 43	Goat	13691·1	4·13644
			142 18 01·37	20·2	219 19 39	39 27 42	Frederika	12724·8	4·10465
					254 27 38	74 35 00	Gofer	7677·5	3·88522
Gofer, 1912	1547·0	5075	61 38 51·443	1592·4	255 18 22·0	75 25 42·6	Glacier	7615·7	3·881708
			142 09 38·981	573·9	301 05 12·3	121 12 15·2	Pass	8272·5	3·917638
Frederika Mountain,[1] 1912	3148·4	10329	61 46 17·69	547·6	64 00 14	243 46 07	Goat	15729·7	4·19672
			142 13 43·98	644·9	345 21 48	165 25 24	Gofer	14275·7	4·15460
Peak " F ",[1,2] 1913	3155·9	10354	61 46 59·69	1847·8	272 41 09	93 59 29	Harris	78393·7	4·89428
			142 12 53·66	786·6	276 26 14	97 31 53	Kletsan	66125·5	4·82037
Peak " G ",[1,2] 1913	3237·8	10623	61 50 07·38	228·5	276 51 20	98 10 10	Harris	79355·7	4·89958
			142 13 26·42	386·7	285 00 10	106 19 28	Jenerk	82370·2	4·91577
Coal, 1912	2217·7	7276	61 41 36·968	1144·4	244 35 28·1	64 41 04·4	Frederika	6211·4	3·793192
			142 15 14·344	210·9	316 02 28·3	136 07 23·5	Gofer	7113·4	3·852078
Rohn, 1912	2096·0	6877	61 44 04·316	133·6	279 57 03·1	100 07 47·0	Frederika	10902·7	4·037534
			142 21 03·426	50·3	311 36 24·7	131 41 32·1	Coal	6863·6	3·836554
					2 39 38·9	182 39 15·1	Fulcrum	8573·1	3·933136
Foothill, 1912	2108·6	6918	61 38 06·846	211·9	98 48 37·6	278 38 58·4	Sentinel	9807·0	3·991535
			142 21 04·065	59·9	171 10 19·5	351 09 56·3	Fulcrum	2532·1	3·403488
Fulcrum, 1912	1800·4	5907	61 39 27·674	856·7	234 04 18·8	54 09 49·9	Coal	6828·7	3·834340
			142 21 30·466	448·6	239 02 17·0	59 13 24·4	Frederika	12986·3	4·113486
					276 01 30·8	96 11 57·0	Gofer	10533·7	4·022581
Chimney Mountain,[1] 1912	2259·0	7411	61 43 05·55	171·8	5 53 13	185 53 07	Goat	980·5	2·99146
			142 29 39·31	577·5	256 26 03	76 33 38	Rohn	7791·7	3·89163
Regal Mountain, 1912	4209·5	13811	61 44 37·43	1158·7	271 55 35	92 22 51	Rohn	27277·8	4·43581
			142 52 00·28	4·1	285 41 10	106 18 28	Gofer	38863·3	4·58954
					280 52 06	101 11 41	Goat	19961·8	4·30020
Goat, 1912	1678·4	5506	61 42 34·040	1053·7	249 56 07·4	70 03 47·8	Rohn	8170·7	3·912258
			142 29 46·155	678·0	308 17 52·2	128 25 08·6	Fulcrum	9296·5	3·968319
Sentinel, 1912	1847·3	6061	61 38 54·930	1700·4	196 25 55·2	16 27 55·0	Goat	7072·3	3·849560
			142 32 02·304	33·9	225 14 45·0	45 24 25·1	Rohn	13622·4	4·134253
					263 42 11·9	83 51 28·0	Fulcrum	9356·3	3·971102
Point on Sentinel Ridge,[1] 1912.	1889·5	6199	61 37 08·12	251·4	182 14 44	2 15 07	Goat	10097·2	4·00420
			142 30 13·08	92·8	212 02 34	32 10 38	Rohn	15210·7	4·18215

[1] No check on this position. [2] These peaks are on the eastern edge of the Wrangel Mountains.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Nizina, 1912	2293·8	7525	61 36 44·828	1387·7	210 49 20·4	30 51 44·1	Sentinel	4690·8	3·671249
			142 34 45·550	671·3	246 36 47·8	66 48 27·5	Fulcrum	12750·0	4·105511
					258 03 11·8	78 15 14·6	Foothill	12367·8	4·092293
Nikolai, 1912	2264·7	7430	61 30 34·499	1067·9	198 49 32·6	18 53 25·8	Nizina	12114·1	4·083291
			142 39 10·750	159·0	228 44 39·2	49 00 34·9	Foothill	21291·2	4·328200
					281 54 47·4	102 04 03·0	Chitistone	9560·5	3·980480
Nikolai Peak,[1] 1912	......	....	61 30 35·28	1092·1	212 26 43	32 42 38	Rohn	29720·8	4·47306
			142 39 09·43	139·5	225 45 26	46 06 28	Coal	29450·3	4·46909
Chitistone, 1912	2082·9	6834	61 29 30·337	939·1	158 05 51·2	338 00 28·5	Nizina	14500·9	4·161395
			142 28 38·579	570·7	202 42 40·2	22 49 19·9	Foothill	17340·0	4·239048
Boulder, 1912	2062·6	6767	61 24 57·006	1764·6	144 15 11·7	324 07 44·6	Nikolai	12882·3	4·109993
			142 30 41·869	621·0	192 10 02·6	12 11 50·9	Chitistone	8656·0	3·937316
East Sourdough, 1912	1822·5	5979	61 24 48·221	1492·7	185 56 46·1	5 57 52·4	Nikolai	10777·3	4·032511
			142 40 26·243	389·3	230 07 20·3	50 17 42·0	Chitistone	13645·4	4·134987
					268 07 54·9	88 16 28·1	Boulder	8673·0	3·938167
Sourdough Peak, 1912	......	....	61 24 43·04	1332·3	300 47 35	120 58 45	Williams	13202·3	4·12065
			142 44 01·67	24·8	316 46 23	136 55 32	Geolog	13592·8	4·13331
Mount Blackburn,[1] 1912	5036·3	16523	61 43 48·61	1504·8	320 44 56	141 26 08	Chititu	66259·8	4·82125
			143 24 05·18	76·1	322 46 30	143 31 37	Bulb	76102·7	4·88140
Nizina River, Northeast Base, 1912.	479·7	1574	61 23 46·960	1453·7	246 15 24·7	66 20 16·9	Boulder	5393·9	3·731901
			142 36 14·717	218·4	318 52 02·7	138 56 22·5	Williams	6689·4	3·825385
					74 11 15·2	254 08 50·0	Nizina River, Southwest Base.	2552·3	3·406927
					116 57 54·1	296 54 13·3	East Sourdough	4186·5	3·621846
Nizina River, Southwest Base, 1912.	458·7	1505	61 23 24·466	757·4	153 46 18·5	333 45 02·9	East Sourdough	2890·5	3·460973
			142 39 00·131	1·9	248 45 42·7	68 53 00·1	Boulder	7929·6	3·899249
					302 18 42·2	122 25 27·2	Williams	8115·7	3·909328
					53 14 30·7	233 10·27·7	Young Creek	5133·1	3·710377
Grove,[1] 1912	601·7	1974	61 21 54·58	1689·5	87 55 39	267 47 57	Young Creek	7828·2	3·89366
			142 34 50·40	748·8	346 44 23	166 45 28	Geolog	4830·5	3·68399
Young Creek, 1912	468·3	1537	61 21 45·152	1397·7	206 31 08·3	26 33 55·7	East Sourdough	6334·5	3·801715
			142 43 36·899	548·3	242 36 19·5	62 47 39·9	Boulder	12948·5	4·112220
					276 30 57·7	96 41 45·6	Williams	11044·3	4·043139
Williams, 1912	1910·8	6269	61 21 04·106	127·1	130 32 17·3	310·24 16·6	East Sourdough	10688·3	4·028910
			142 31 18·686	277·7	184 19 55·5	4 20 27·8	Boulder	7230·1	3·859145
May Creek, 1912	592·0	1942	61 19 10·590	327·8	158 49 14·3	338 47 24·8	Young Creek	5131·5	3·710247
			142 41 32·127	478·0	248 51 36·5	69 00 34·8	Williams	9776·2	3·990172
					279 40 09·5	99 50 34·4	Rex	10756·4	4·031667
Geolog, 1912	1412·1	4633	61 19 22·686	702·2	27 32 29·2	207 29 19·5	Chititu	6971·2	3·843306
			142 33 35·929	534·6	87 01 58·8	266 55 01·0	May Creek	7095·0	3·850950
					116 20 30·0	296 11 42·6	Young Creek	9964·4	3·998450
					213 00 39·3	33 02 39·7	Williams	3744·5	3·573398
Rex, 1912	2227·4	7308	61 18 11·706	362·4	118 03 28·5	297 51 14·0	Young Creek	14094·0	4·149033
			142 29 39·851	593·3	164 36 33·0	344 35 06·3	Williams	5535·4	3·743150
Calamity, 1912	2348·0	7703	61 16 32·088	993·3	109 51 07·3	289 37 41·8	May Creek	14526·4	4·162158
			142 26 13·854	206·4	135 10 14·2	315 07 13·5	Rex	4349·9	3·638480
Virginia,[1] 1912	1589·7	5216	61 15 59·44	1839·9	90 57 52	270 51 08	Chititu	6858·7	3·83624
			142 29 32·08	478·2	150 02 15	329 58 41	Geolog	7264·1	3·86118
Chititu, 1912	1458·9	4787	61 16 02·953	91·4	146 21 08·0	326 17 20·0	May Creek	6979·8	3·843841
			142 37 12·207	181·9	239 20 26·8	59 27 03·5	Rex	7828·5	3·893678
					264 40 03·4	84 49 40·7	Calamity	9852·1	3·993530
Brigham, 1912	1722·8	5652	61 14 09·189	284·5	49 09 12·9	229 01 04·7	Eaton	11009·9	4·041783
			142 15·04·685	69·9	113 59 31·2	293 49 44·5	Calamity	10913·5	4·037966
Patty, 1912	1882·0	6175	61 11 12·639	391·2	137 20 03·1	317 11 55·4	Chititu	12234·5	4·087585
			142 27 55·872	834·9	188 44 20·5	8 45 49·9	Calamity	10004·8	4·000208
Bulb, 1912	1713·4	5621	61 11 01·258	39·0	156 51 38·8	336 47 44·0	Chititu	10158·2	4·006817
			142 32 44·369	663·1	209 35 36·9	29 41 19·2	Calamity	11782·4	4·071235
					265 17 35·6	85 21 48·3	Patty	4325·3	3·636020

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Eaton, 1912	1724·4	5657	61 10 16·241	502·8	100 34 13·6	280 26 53·3	Bulb	7639·8	3·883082
			142 24 21·801	325·9	118 38 40·8	298 35 33·2	Patty	3644·7	3·561665
					171 50 00·9	351 48 22·7	Calamity	11753·6	4·070172
Head, 1912	1685·7	5530	61 10 04·739	146·7	92 58 03·8	272 51 13·5	Eaton	7011·6	3·845817
			142 16 33·410	499·5	144 13 14·6	324 04 45·9	Calamity	14792·5	4·170041
					189 55 20·4	9 56 38·1	Brigham	7681·9	3·885469
Bar, 1912	394·6	1295	61 06 11·401	352·9	149 33 04·8	329 28 43·8	Eaton	8794·5	3·944210
			142 19 23·680	354·8	199 24 47·5	19 27 16·6	Head	7659·1	3·884176
					272 21 31·2	92 24 57·8	Delta	3539·0	3·548876
Delta, 1912	410·4	1347	61 06 06·638	205·5	134 05 23·5	313 57 35·7	Eaton	11117·3	4·045998
			142 15 27·671	414·6	172 24 14·7	352 23 17·1	Head	7435·5	3·871311
Young,[1] 1912	1009·7	3313	61 09 05·10	155·1	16 43 12	196 41 35	Delta	5767·4	3·76098
			142 13 36·92	554·9	44 02 11	223 57 07	Bar	7473·6	3·87353
Streak, 1912	1637·0	5371	61 10 23·428	725·2	45 02 02·9	224 54 18·2	Delta	11235·1	4·050576
			142 06 37·103	554·6	86 21 34·9	266 12 52·5	Head	8933·4	3·951017
Gibraltar, 1912	636·2	2087	61 06 21·782	674·3	86 43 24·4	266 35 35·3	Delta	8041·0	3·905312
			142 06 31·845	477·1	127 32 46·6	307 23 59·7	Head	11343·7	4·054756
					179 23 53·0	359 23 48·4	Streak	7480·3	3·873919
Delay, 1912	2223·9	7296	61 09 53·468	1655·1	41 25 00·7	221 19 23·0	Gibraltar	8731·3	3·941081
			142 00 06·268	93·7	99 03 56·9	278 58 14·5	Streak	5916·3	3·772052
Till, 1912	491·4	1612	61 05 11·16	345·4	186 35 30	6 36 30	Delay	8796·9	3·94433
			142 01 13·81	207·0	218 58 22	39 03 17	Finis	8008·5	3·90355
					240 54 57	60 55 54	Island	1107·3	3·04427
					284 50 37	104 57 04	Terminus	6864·5	3·83661
Island, 1912	494·2	1621	61 05 28·543	883·6	106 05 02·5	285 59 27·5	Gibraltar	5965·1	3·775616
			142 00 09·238	138·4	147 35 23·1	327 29 43·4	Streak	10817·7	4·034133
					180 18 36·8	0 18 39·4	Delay	8200·6	3·913844
Finis, 1912	1520·8	4989	61 08 32·183	996·2	35 39 45·5	215 35 47·3	Island	6993·6	3·844698
			141 55 37·185	556·4	122 02 36·5	301 58 40·8	Delay	4746·6	3·676385
Terminus, 1912	536·5	1760	61 04 14·143	437·8	112 10 03·8	292 04 33·0	Island	6115·4	3·786427
			141 53 51·358	770·2	151 55 13·7	331 49 45·4	Delay	11909·6	4·075899
					168 47 12·5	348 45 39·8	Finis	8143·1	3·910790
Mar, 1912	747·0	2451	61 04 47·658	1475·2	74 13 14	254 09 40	Terminus	3807·9	3·580683
			141 49 47·018	705·0	135 40 09	315 31 07	Delay	13250·3	4·122225
					143 00 09	322 55 02	Finis	8706·8	3·939859
Knob,[1] 1913	664·6	2181	61 03 22·64	700·8	327 18 17	147 21 25	Chop	5953·5	3·77477
			141 47 31·33	470·1	105 40 18	285 34 45	Terminus	5919·3	3·77227
Knob,[1] 1912	......	....	61 00 15·36	475·4	105 59 49	285 34 25	Terminus	27169·4	4·43408
			141 24 49·84	749·0	119 15 37	298 48 40	Finis	31684·7	4·50085
Dome, 1912	2238·0	7343	60 55 58·83	1821·0	128 46 08	308 24 41	Island	28271·6	4·45135
			141 35 38·46	579·3	133 09 33	312 53 37	Terminus	22469·3	4·35159
					139 43 34	319 22 09	Delay	33950·8	4·53085
					142 29 13	322 11 44	Finis	29455·1	4·46916
Middle, 1912	2328·5	7639	60 55 06·43	199·0	127 10 00	306 45 11	Island	32026·5	4·50551
			141 31 46·37	698·8	130 33 46	310 14 28	Terminus	26156·5	4·41758
					137 18 13	316 53 25	Delay	37482·6	4·57383
					139 25 48	319 04 56	Finis	32918·5	4·51744
Chop, 1913	612·9	2011	61 00 40·726	1260·7	126 36 10·3	306 27 30·5	Terminus	11097·8	4·045235
			141 43 57·299	860·9	144 21 53·0	324 11 40·3	Finis	17974·7	4·254662
Nibs, 1913	1309·6	4297	61 05 12·289	380·4	357 09 33·4	177 09 57·7	Chop	8416·1	3·925112
			141 44 25·059	375·6	78 06 02·3	257 57 46·6	Terminus	8679·3	3·938486
					121 39 37·6	301 29 49·2	Finis	11815·6	4·072456
Don, 1913	768·3	2521	60 58 58·965	1825·0	136 08 19·1	316 05 22·8	Chop	4370·4	3·640519
			141 40 35·749	537·5	163 26 13·6	343 22 53·0	Nibs	12057·6	4·081261
Chitina River, West Base, 1913.	592·0	1942	61 01 49·970	1546·8	60 27 52·1	240 24 12·1	Chop	4343·8	3·637867
			141 39 45·767	687·3	146 14 52·4	326 10 48·0	Nibs	7535·0	3·877081
					185 29 12·9	5 29 26·2	Only	2378·1	3·376231
					282 58 54·1	103 05 20·6	Shelf	6809·6	3·833122
					320 39 13·5	140 48 23·3	Bud	14937·0	4·174262
					8 04 56·5	188 04 12·8	Don	5346·2	3·728044

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Only, 1913	1335·3	4381	61 03 06·447	199·6	7 17 13·4	187 16 16·4	Don	7722·6	3·887764
			141 39 30·613	459·4	41 37 51·1	221 33 57·8	Chop	6031·6	3·780434
					131 27 01·8	311 22 44·1	Nibs	5888·5	3·770003
Chitina River, East Base, 1913.	628·3	2061	61 01 24·271	751·3	76 00 40·8	255 55 26·8	Chop	1799·4	3·255124
			141 37 58·293	875·5	116 14 57·5	296 13 23·5	Chitina River, West Base	5559·0	3·744994
					140 37 08·6	320 31 30·2	Nibs	9137·4	3·960821
					156 20 47·9	336 19 27·2	Only	3453·0	3·538200
					278 20 57·5	98 25 50·0	Shelf	5074·8	3·705421
					27 46 10·2	207 43 52·5	Don	5082·2	3·706055
Shelf, 1913	1360·4	4463	61 01 00·349	10·8	63 06 39·8	242 59 29·7	Don	8290·6	3·918585
			141 32 24·059	361·5	121 24 42·5	301 18 29·3	Only	7500·1	3·875065
Sub, 1913	1885·0	6184	61 01 36·397	1126·7	81 24 46·4	261 13 48·5	Chop	11420·6	4·057689
			141 31 25·711	386·1	295 29 09·0	115 43 01·1	Chitina	15859·1	4·200278
					313 24 43·4	133 32 27·8	Eck	10999·3	4·041365
					350 08 24·4	170 10 16·8	Bud	11310·2	4·053471
Bud, 1913	1591·7	5222	60 55 36·378	1125·9	121 37 44·5	301 27 51·2	Don	11985·3	4·078650
			141 29 17·152	258·4	146 33 57·4	326 25 00·9	Only	16707·8	4·222919
					164 21 33·6	344 18 50·2	Shelf	10414·6	4·017644
"A" Mountain,[1] 1913	2886·6	9470	61 02 13·64	422·1	325 34 47	145 40 34	Eck	10566	4·02390
			141 29 11·64	174·8	00 23 14	180 23 09	Bud	12297	4·08979
Inter, 1913	2295·2	7530	61 01 39·566	1224·8	5 49 25·5	185 48 19·0	Bud	11299·9	4·053075
			141 28 01·043	15·7	301 40 33·4	121 51 26·5	Chitina	13203·1	4·120676
					305 27 15·4	125 46 50·8	Dane	24884·0	4·395921
					334 17 14·4	154 24 11·0	Fritz	16559·0	4·219034
Crag, 1912	2460·9	8074	60 54 35·16	1088·3	124 59 36	304 31 20	Island	35474·0	4·54991
			141 27 50·19	756·5	127 33 05	307 10 20	Terminus	29531·8	4·47029
					134 35 45	314 07 31	Delay	40654·4	4·60911
					136 11 04	315 46 45	Finis	36028·0	4·55664
Tit,[1] southeast on Crag Ridge, 1912.	2465·2	8088	60 54 08·49	262·8	125 58 07	305 29 44	Island	36044·6	4·55684
			141 27 42·77	644·9	128 40 07	308 17 15	Terminus	30129·6	4·47899
Shag,[1] 1913	2863·3	9394	60 45 08·88	274·8	189 07 30	09 11 04	Eck	23295	4·36726
			141 26 40·26	609·9	198 26 24	18 33 21	Walsh	22720	4·35641
Eck, 1913	1279·6	4198	60 57 31·894	987·1	59 30 03·1	239 24 11·4	Bud	7034·9	3·847257
			141 22 34·795	523·7	126 08 05·1	305 59 29·8	Shelf	10960·7	4·039839
Red Mountain,[1] 1913	2776·8	9110	61 01 30·67	949·3	11 31 02	191 29 34	Eck	7542·4	3·87751
			141 20 54·73	822·0	34 37 59	214 30 39	Bud	13318·0	4·12444
Fritz, 1913	1297·4	4257	60 53 37·330	1155·3	113 56 07·9	293 48 05·1	Bud	9106·6	3·959354
			141 20 04·653	70·2	141 01 37·3	320 50 50·9	Shelf	17660·7	4·247007
					162 42 51·0	342 40 39·8	Eck	7604·6	3·881077
Sway, 1913	2184·5	7167	60 52 38·098	1179·2	124 32 44·5	304 11 36·4	Chop	26461·7	4·422617
			141 19 46·665	704·1	133 34 05·7	313 16 37·3	Chitina River, West Base	24850·7	4·395338
					137 39 15·4	317 22 00·2	Only	26375·0	4·421192
Thumb, 1913	2782·3	9128	60 50 51·665	1599·1	137 17 47·3	316 59 29·9	Chitina River, West Base	27796·3	4·443987
			141 18 50·340	760·3	139 15 59·9	318 53 38·1	Nibs	35254·0	4·547208
					140 45 58·8	320 27 54·6	Only	29426·0	4·468731
					147 03 10·6	326 51 19·4	Shelf	22476·4	4·351727
					229 19 23·3	49 26 36·2	Point	9848·9	3·993387
					244 59 21·4	65 10 54·7	Dane	13204·3	4·120716
Walsh, 1913	1413·1	4636	60 56 44·980	1392·2	11 58 40·1	191 57 28·7	Fritz	5937·4	3·773593
			141 18 42·946	646·7	112 37 09·4	292 33 46·7	Eck	3780·1	3·577499
Tit, 1913	2600·5	8532	60 51 34·696	1073·9	138 33 26·1	318 15 01·9	Only	28631·0	4·456836
			141 18 27·782	419·4	161 25 04·0	341 21 28·2	Eck	11666·3	4·066933
					234 29 30·6	54 36 23·8	Point	8758·0	3·942405
					249 55 17·1	70 06 30·7	Dane	12378·3	4·092660
Chitina, 1913	2543·6	8345	60 57 55·003	1702·4	27 04 59·7	207 01 03·4	Fritz	8955·4	3·952083
			141 15 34·290	515·9	52 40 06·6	232 37 21·7	Walsh	3572·2	3·552937
					70 59 48·1	250 47 48·8	Bud	13111·0	4·117635
					83 36 06·6	263 29 59·0	Eck	6368·2	3·804018
Chitina Mountain, top of first peak,[1] 1912	......	....	60 57 58·91	1823·4	108 59 31	288 26 15	Terminus	36198·5	4·55869
			141 15 49·02	737·6	109 31 51	288 53 04	Island	42302·9	4·62637

[1] No check on this position.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Continued.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Chitina Mountain,[1] peak northwest of, 1912	2883·6	9461	61 02 18·88	584·4	99 24 35	279 03 15	Terminus	22239·2	4·34712
			141 29 28·41	426·5	117 17 29	296 50 40	Delay	30922·2	4·49027
Chitina 2, peak southwest of, 1912	2243·5	7361	60 53 43·65	1351·1	113 58 45	293 10 16	Island	54551·9	4·73681
			141 04 43·37	654·0	114 07 02	293 24 04	Terminus	48438·4	4·68519
					121 26 07	300 37 40	Delay	58230·4	4·76515
Penn, 1913	1982·9	6506	60 51 32·632	1009·9	122 58 26·0	302 52 40·9	Fritz	7100·9	3·851314
			141 13 29·638	447·5	143 36 11·1	323 28 14·7	Eck	13826·9	4·140725
					153 59 56·0	333 55 22·2	Walsh	10760·3	4·031823
Penn Mountain,[1] 1913	......	....	60 49 56·55	1750·3	186 24 18	06 25 11	Point	8168·8	3·91216
			141 11 35·32	533·6	216 37 35	36 42 48	Dane	9062·1	3·95723
Mount Porky,[1] 1913	......	....	60 42 45·50	1408·3	162 44 43	342 40 13	Thumb	15760	4·19756
			141 13 40·80	619·0	176 31 43	356 30 04	Chitina	28203	4·45030
					294 36 43	115 07 03	Mount King	34972	4·54372
Point, 1913	1409·2	4623	60 54 18·807	582·0	27 09 39·8	207 07 07·1	Penn	5780·0	3·761926
			141 10 34·867	525·7	81 34 11·6	261 25 53·8	Fritz	8686·6	3·938849
					121 39 48·1	301 32 41·6	Walsh	8633·7	3·936196
Dane, 1913	2184·6	7167	60 53 51·376	1590·1	59 00 45·8	238 53 52·7	Penn	8327·4	3·920510
			141 05 36·767	554·4	100 44 03·1	280 39 42·6	Point	4574·0	3·660292
Boundary A, 1913	1648·0	5408	60 49 25·813	798·9	108 06 46·5	287 55 08·7	Penn	12691·8	4·103522
			141 00 10·615	160·5	133 58 46·7	313 49 41·4	Point	13078·0	4·116540
					149 07 05·2	329 02 20·3	Dane	9581·7	3·981441
Boundary B, 1913	2630·6	8631	60 52 58·645	1815·1	1 33 06·8	181 32 56·5	Boundary A	6590·1	3·818889
			140 59 58·806	887·1	77 49 25·8	257 37 37·5	Penn	12522·8	4·097702
					107 47 48·8	287 42 53·5	Dane	5352·2	3·728530
					118 20 07·6	298 19 24·9	Blondie	838·1	2·923318
Porky Photo,[1] 1913	2316·9	7601	60 53 37·20	1151·5	341 42 56	161 45 24	Boundary A	8193·9	3·91349
			141 03 00·71	10·7	67 57 50	247 48 41	Penn	10243·3	4·01044
Dennis Photo,[1] 1913	2236·9	7339	60 53 45·68	1413·9	332 14 05	152 18 10	Boundary A	9087·2	3·95843
			141 04 50·71	764·7	62 19 14	242 11 41	Penn	8846·7	3·94678
Blondie, 1913	2644·4	8676	60 53 11·493	355·7	355 24 39·2	175 25 11·6	Boundary A	7007·8	3·845582
			141 00 47·714	719·7	75 11 21·3	255 00 15·7	Penn	11898·1	4·075476
					105 50 46·0	285 46 33·4	Dane	4530·7	3·656170
Senator, 1913	2675·0	8776	60 52 59·501	1841·6	2 22 56·6	182 22 40·7	Boundary A	6619·9	3·820850
			140 59 52·408	790·6	77 48 00·8	257 36 06·9	Penn	12622·8	4·101155
					113 59 37·7	293 58 49·4	Blondie	913·1	2·960537
					107 13 17·0	287 08 16·1	Dane	5436·2	3·735298
Chris,[1] 1913	2480·5	8138	60 48 18·51	573·0	139 22 25	319 13 10	Point	14711	4·16763
			140 59 59·50	899·7	153 44 11	333 39 16	Dane	11493	4·06043
Cairn east of Boundary,[1] 1913	2710·2	8892	60 53 00·91	28·2	3 41 19	183 40 54	Boundary A	6671·6	3·82423
			140 59 42·22	636·9	74 09 01	254 08 52	Senator	159·8	2·20365
Peak King, 1913	5172·8	16971	60 34 50·39	1559·6	133 58 57	313 01 43	Nibs	81914	4·91336
			140 38 52·88	805·3	134 06 37	313 13 41	Only	76027	4·88097
					135 24 08	314 37 25	Shelf	68707	4·83700
					136 34 30	315 48 38	Sub	68880	4·83809
					150 28 05	330 09 40	Monument No. 189	38781	4·58862
Mount Logan, East Dome,[2] 1913	5448·8	17876	60 37 21·24	657·3	121 51 50	300 58 31	Bud	65022	4·81306
			140 28 11·36	172·8	123 22 02	302 07 14	Terminus	92293	4·96517
					127 00 46	305 58 29	Only	80416	4·90534
					128 30 21	307 46 15	Walsh	58324	4·76585
Mount Logan, Middle Dome,[2] 1913	5645·7	18523	60 36 19·54	604·8	129 17 14	308 18 40	Only	79365	4·89963
			140 31 18·17	276·4	130 34 54	309 51 09	Eck	60983	4·78521
					131 42 13	311 01 50	Walsh	57383	4·75878
					140 03 53	319 38 51	Monument No. 189	40464	4·60707
Table Mountain,[1] 1913	......	....	60 27 20·21	625·5	164 58 40	344 51 18	Mount Porky	29661	4·47218
			141 05 13·88	212·2	334 11 40	154 19 54	Mount St. Elias	20064	4·30242
					339 38 40	159 44 11	West Shoulder, Mount St. Elias	16796	4·22521
Pyramid,[1] 1913	......	....	60 22 37·33	1155·4	173 13 42	353 12 43	Table Mountain	8817	3·94532
			141 04 05·87	89·9	325 32 42	145 37 13	West Shoulder, Mount St. Elias	8481	3·92845
					166 52 42	346 44 21	Mount Porky	38408	4·58442

[1] No check on this position.

[2] No trigonometric determination was made of the position and elevation of the highest point of Mount Logan. A photographic determination of its elevation gives 19,850 feet. See special sheet in atlas.

GEOGRAPHIC POSITIONS OF TRIANGULATION STATIONS—*Concluded.*

Station.	Elevation.		Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To station.	Distance.	Logarithm.
	Meters.	*Feet.*	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Mount St. Elias, West Shoulder, 1913	5050·1	16569	60 18 51·27	1586·8	143 58 41	322 50 55	Head	118468	5·073602
			140 58 53·35	819·1	151 11 47	330 22 18	Finis	105710	5·024117
					159 45 33	339 17 11	Sub	84750	4·928140
Mount St. Elias, 1913	5488·8	18008	60 17 36·24	1121·7	143 34 03	322 23 34	Head	122048	5·086531
			140 55 45·35	696·7	150 30 01	329 37 48	Finis	109145	5·038003
					158 33 44	338 02 38	Sub	87947	4·944221
Elbow,[1] 1913	......	....	60 18 22·29	689·9	164 47 10	344 35 23	Mount Porky	46954	4·67167
			141 00 08·35	128·2	232 05 10	52 06 16	West Shoulder, Mount St. Elias	1460	3·16422
					289 24 10	109 27 59	Mount St. Elias	4284	3·63182
Peak McArthur, west, 1913	4344·2	14253	60 36 27·93	864·5	122 53 43	301 44 23	Shelf	85243	4·93066
			140 12 59·17	900·3	123 50 40	302 42 11	Sub	85098	4·92992
					126 05 50	305 24 56	Senator	52522	4·72034
Boundary,[1] 1913	2235	7340	60 53 46	1417·5	286 05 49	106 09 21	Blondie	3818·6	3·58190
			141 04 51	769·4	336 28 49	156 33 03	Snow	11045·1	4·04317
Slope,[1] 1913	2140	7020	60 48 55	1699·2	150 25 53	330 20 23	Point	11532·6	4·06193
			141 04 17	263·2	172 34 00	352 32 51	Dane	9255·0	3·96637
Snow,[1] 1913	2481	8140	60 48 19	572·5	116 14 43	296 02 55	Penn	13637·3	4·13473
			140 59 59	900·0	175 24 47	355 24 05	Blondie	9098·8	3·95899
					139 22 29	319 13 14	Point	14711·8	4·16767
Sharp,[1] 1913	2679	8790	60 50 57	1758·0	72 17 04	252 02 25	Snow	15996·4	4·20402
			140 43 12	179·8	104 14 20	283 59 46	Senator	15573·0	4·19237
Ace,[1] 1913	2641	8665	60 46 44	1352·5	109 32 23	289 24 25	Snow	8800·8	3·94452
			140 50 51	772·2	221 29 23	41 36 04	Sharp	10467·2	4·01983
Black,[1] 1913	2544	8345	60 52 18	544·7	287 28 26	107 36 04	Sharp	8303·9	3·91928
			140 51 56	849·8	44 39 19	224 32 17	Snow	10395·5	4·01684
Turn,[1] 1913	2107	6910	60 46 57	1597·1	147 56 10	327 50 04	Black	11915·5	4·07611
			140 44 51	775·3	191 50 10	11 51 42	Sharp	7755·3	3·88960
Duke,[1] 1913	2524	8280	60 46 26	801·6	94 50 27	274 44 08	Ace	6592·9	3·81908
			140 43 37	560·2	182 35 27	2 35 49	Sharp	8392·9	3·92391
Divide,[1] 1913	2916	9565	60 44 16	507·6	184 03 30	4 04 31	Black	14933·4	4·17416
			140 53 06	97·0	215 53 45	36 02 24	Sharp	15313·1	4·18506
Low,[1] 1913	2645	8675	60 49 32	1002·8	77 16 04	256 54 08	Ace	23371·8	4·36869
			140 25 45	677·3	99 29 49	279 14 34	Sharp	16032·6	4·20500
Sub-End,[1] 1913	2551	8370	60 46 07	222·8	133 45 51	313 36 49	Sharp	12975·2	4·11311
			140 32 51	778·8	225 23 51	45 30 04	Low	9054·8	3·95688
Mount Lucania,[1] 1913	5226·4	17147	61 01 16	496·8	354 52 11	174 54 04	Low	21865·5	4·33976
			140 27 54	813·4	37 03 13	217 23 16	Ace	34060·3	4·53225
Pass [1,3], 1913	......	....	60 40 05	147·6	249 58 45	70 00 34	Alp	2021·1	3·30558
			141 10 13	204·6					
Alp [1,2], 1913	......	....	60 40 27	839·1	70 00 34	249 58 45	Pass	2021·1	3·30558
			141 08 08	127·7	153 21 03	333 11 43	Thumb	21635·8	4·33517
Porky [1,2], 1913	......	....	60 40 15	454·1	290 29 28	110 30 15	Pass	874·5	2·94176
			141 11 07	112·5	261 54 43	81 57 19	Alp	2745·2	3·43858
Bald Top [1,2], 1913	......	....	60 41 58	1787·8	16 09 28	196 08 30	Pass	3640·7	3·56119
			141 09 07	102·6	151 54 28	331 45 59	Thumb	18736·9	4·27270
George [1,2], 1913	......	....	60 40 51	1570·5	61 14 29	241 12 00	Pass	2955·0	3·47056
			141 07 23	347·8	142 46 59	322 45 28	Bald Top	2605·4	3·41587
White Cap [1,2], 1913	......	....	60 41 44	1355·3	47 12 22	227 15 13	Porky	4065·9	3·60916
			141 07 51	768·4	35 13 41	215 15 45	Pass	3754·2	3·57452

[1] Occupied with a 4-inch instrument only.
[2] Computed from base Thumb-Pass. Occupied with a 4-inch instrument only. No signals.
[3] Obtained from solution of 3-point problem.

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS AND LINE PROJECTION STATIONS ALONG THE 141st MERIDIAN FROM THE ARCTIC OCEAN TO MOUNT ST. ELIAS.

Based on Yukon Datum.

Stations.	Latitude. and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
	° ′ ″		° ′ ″	° ′ ″		Meters.	
Monument No. 1 (Cetera of the Boundary)	69 38 45·275	1403·0	0 00 00·0	180 00 00·0	Monument No. 4	19062·7	4·280184
	141 00 00·000	0·0	22 01 28·4	201 49 12·6	Mosquito	22790·8	4·357759
			118 09 14·1	297 59 14·5	Demarcation	7811·9	3·892757
			284 04 55·3	104 14 07·3	Ocean	6552·7	3·816422
			341 47 07·0	161 55 59·7	Bug	19776·6	4·296151
			352 12 05·8	172 13 21·0	Tundra	6394·8	3·805827
Monument No. 2	69 35 22·608	700·6	29 55 35·4	209 43 19·8	Mosquito	17131·3	4·233790
	141 00 00·000	0·0	145 21 08·6	325 11 09·2	Demarcation	12114·8	4·083318
			162 29 23·4	342 25 47·3	Polar	8259·7	3·916965
			180 00 00·0	0 00 00·0	Monument No. 1	6280·5	3·797992
			333 41 42·5	153 50 35·2	Bug	13949·6	4·144562
Monument No. 3	69 31 50·486	1564·6	45 55 46·8	225 43 31·3	Mosquito	11895·3	4·075375
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 2	6573·4	3·817790
			180 00 00·0	0 00 00·0	Monument No. 1	12853·9	4·109036
			313 49 03·0	133 57 55·5	Bug	8567·3	3·932844
Monument No. 4 (Et of the Boundary)	69 28 30·129	933·7	180 00 00·0	0 00 00·0	Monument No. 3	6208·8	3·793008
	141 00 00·000	0·0	0 00 00·0	180 00 00·0	Monument No. 5	6347·9	3·802633
			24 21 34·1	204 11 50·4	Borealis	16544·4	4·218650
Monument No. 5 (Z_1 of the Boundary)	69 25 05·280	163·6	0 00 00·0	180 00 00·0	Monument No. 8	13332·9	4·124924
	141 00 00·000	0·0	38 02 02·0	217 52 18·4	Borealis	11075·4	4·044360
			223 01 02·7	43 09 55·1	Bug	9061·2	3·957185
			334 03 28·2	154 09 28·9	Pass	9641·1	3·984127
Monument No. 6	69 23 01·601	49·6	0 00 00·0	180 00 00·0	Monument No. 8	9500·3	3·977737
	141 00 00·000	0·0	54 22 10·2	234 12 26·6	Borealis	8395·6	3·924052
			133 31 06·9	313 18 51·8	Mosquito	11786·0	4·071365
			180 00 00·0	0 00 00·0	Monument No. 5	3832·6	3·583494
Monument No. 7[1]	69 21 13·55	419·9	0 00 00	180 00 00	Monument No. 8	6152	3·78901
	141 00 00·00	0·0	77 15 45	257 06 02	Borealis	6996	3·84485
			180 00 00	0 00 00	Monument No. 6	3348	3·52478
Monument No. 8 (Y_1 of the Boundary)	69 17 55·024	1705·1	0 00 00·0	180 00 00·0	Monument No. 12	16602·5	4·220174
	141 00 00·000	0·0	16 56 01·0	196 51 32·5	Grizzly	10854·6	4·035612
			222 07 39·1	42 13 39·7	Pass	6287·6	3·798487
			228 15 03·0	48 26 47·0	Backhouse	11022·6	4·042286
			345 14 32·7	165 21 29·4	Empire	19331·6	4·286268
Monument No. 9	69 15 12·862	398·6	30 32 21·0	210 27 52·5	Grizzly	6221·9	3·793926
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 8	5025·1	3·701144
			272 48 10·2	92 57 29·3	Aurora	6577·8	3·818083
Monument No. 10[1]	69 12 20·73	642·4	89 33 04	269 28 35	Grizzly	3161·2	3·49991
	141 00 00·00	0·0	180 00 00	0 00 00	Monument No. 9	5334·5	3·72706
Monument No. 11	69 10 23·601	731·4	159 51 04·1	339 41 20·9	Borealis	19810·3	4·296892
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 8	13988·6	4·145775
			180 00 00·0	0 00 00·0	Monument No. 10	3629·6	3·559859
			313 41 48·7	133 48 45·2	Empire	6810·9	3·833206
Monument No. 12 (X_1 of the Boundary)	69 08 59·245	1835·9	0 00 00·0	180 00 00·0	Monument No. 17	22320·8	4·348709
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 11	2613·9	3·417289
			293 00 39·9	113 07 36·4	Empire	5350·0	3·728357
			355 10 15·4	175 12 34·0	Tub	19611·8	4·292518
Monument No. 13	69 07 34·726	1076·1	0 00 00·0	180 00 00·0	Monument No. 17	19701·7	4·294504
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 12	2619·0	3·418135
			263 53 00·7	83 59 57·2	Empire	4952·5	3·694826
			354 25 40·8	174 27 59·4	Tub	17003·5	4·230539
Monument No. 14	69 04 08·576	265·8	0 00 00·0	180 00 00·0	Monument No. 17	13313·7	4·124300
	141 00 00·000	0·0	142 59 46·1	322 50 35·2	Republic	10815·5	4·034045
			180 00 00·0	0 00 00·0	Monument No. 13	6388·0	3·805365
			215 27 09·7	35 34 06·1	Empire	8489·8	3·928896
			351 05 36·8	171 07 55·3	Tub	10663·7	4·027909
Monument No. 15	69 01 46·447	1439·3	0 00 00·0	180 00 00·0	Monument No. 17	8909·5	3·949855
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 14	4404·2	3·643867
			203 30 35·2	23 37 31·5	Empire	12344·6	4·091477
			344 55 42·9	164 58 01·4	Tub	6349·4	3·802731

[1] No check on this position.

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude. and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Monument No. 16	69 00 15·750	488·1	180 00 00·0	0 00 00·0	Monument No. 12	16221·8	4·210098
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 15	2810·4	3·448768
			199 12 47·1	19 19 43·4	Empire	14963·8	4·175043
			354 23 34·6	174 26 15·7	Turner	19803·1	4·296734
Monument No. 17 (W_1 of the Boundary)	68 56 58·920	1825·6	0 00 00·0	180 00 00·0	Monument No. 20	15499·6	4·190320
	141 00 00·000	0·0	3 25 07·6	183 23 30·9	Riggs	19515·1	4·290370
			180 00 00·0	0 00 00·0	Monument No. 16	6099·2	3·785273
			210 43 05·5	30 45 24·0	Tub	3232·0	3·509478
			351 54 29·4	171 57 10·6	Turner	13746·1	4·138179
Monument No. 18	68 54 10·353	320·8	180 00 00·0	0 00 00·0	Monument No. 17	5223·3	3·717947
	141 00 00·000	0·0	191 39 28·5	11 41 47·0	Tub	8170·4	3·912245
			347 00 26·4	167 03 07·6	Turner	8606·2	3·934812
Monument No. 19	68 50 41·740	1293·3	8 29 36·8	188 28 00·2	Riggs	7879·3	3·896485
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 18	6464·3	3·810522
			180 00 00·0	0 00 00·0	Monument No. 17	11887·5	4·067721
			186 30 39·3	6 32 57·6	Tub	14559·9	4·163160
			314 48 15·1	134 50 56·2	Turner	2727·0	3·435693
Monument No. 20 (V_1 of the Boundary)	68 48 38·715	1199·6	180 00 00·0	0 00 00·0	Monument No. 19	3812·1	3·581160
	141 00 00·000	0·0	225 40 00·8	45 42 41·9	Turner	2705·1	3·432177
			323 47 30·8	143 53 31·7	Incog	7365·6	3·867210
			16 17 45·4	196 16 08·8	Riggs	4147·4	3·617773
Monument No. 21	68 44 56·750	1758·4	0 00 00·0	180 00 00·0	Monument No. 22	3161·3	3·499869
	141 00 00·000	0·0	39 36 03·7	219 22 31·6	Silver	15445·7	4·188807
			62 44 14·9	242 33 08·0	Albion	9064·1	3·957323
			158 06 52·5	338 05 15·8	Riggs	3122·0	3·494439
			180 00 00·0	0 00 00·0	Monument No. 20	6877·8	3·837450
			192 26 39·3	12 29 20·3	Turner	8979·1	3·953234
			257 52 35·3	77 58 36·2	Incog	4450·3	3·648388
Monument No. 22 (U_1 of the Boundary)	68 43 14·725	456·3	180 00 00·0	0 00 00·0	Monument No. 20	10039·1	4·001695
	141 00 00·000	0·0	189 12 46·3	9 15 27·3	Turner	12085·4	4·082260
			48 24 21·0	228 10 49·0	Silver	13165·0	4·119420
			82 59 26·0	262 48 19·2	Albion	8117·9	3·909443
			128 43 01·9	308 26 01·2	Siwash	15734·6	4·196855
			169 07 35·5	349 05 58·9	Riggs	6169·1	3·790223
Monument No. 23	68 40 35·777	1108·6	180 00 00·0	0 00 00·0	Monument No. 22	4925·2	3·692424
	141 00 00·000	0·0	221 12 07·7	41 14 17·4	Firth	2381·6	3·376876
			318 12 45·0	138 17 17·1	Shark	4955·0	3·695048
Monument No. 24	68 37 59·798	1852·9	95 54 24·5	275 40 52·6	Silver	9898·1	3·995554
	141 00 00·000	0·0	100 36 41·0	280 33 26·4	Firth River, South Base	2402·5	3·380663
			137 25 03·5	317 13 56·9	Albion	11907·5	4·075820
			180 00 00·0	0 00 00·0	Monument No. 22	9758·2	3·989370
			180 00 00·0	0 00 00·0	Monument No. 23	4833·1	3·684225
			193 19 20·8	13 21 30·6	Firth	6808·2	3·833033
			250 58 31·8	71 03 04·0	Shark	3492·7	3·543157
Monument No. 25	68 35 14·006	434·0	47 01 18·9	226 48 38·7	Coral	12680·0	4·103119
	141 00 00·000	0·0	122 00 54·4	301 47 22·7	Silver	11611·7	4·064894
			149 54 34·3	329 43 27·8	Albion	16070·5	4·206030
			180 00 00·0	0 00 00·0	Monument No. 22	14895·4	4·173053
			180 00 00·0	0 00 00·0	Monument No. 24	5137·1	3·710718
			207 45 01·9	27 49 34·2	Shark	7091·3	3·850727
Monument No. 26 (T_1 of the Boundary).	68 33 21·511	666·5	180 00 00·0	0 00 00·0	Monument No. 22	18381·1	4·264372
	141 00 00·000	0·0	347 48 16·0	167 49 50·1	Jim	5438·3	3·735464
			356 29 01·3	176 30 37·7	Lynx	19294·8	4·285441
			60 55 23·2	240 42 43·4	Coral	10614·6	4·025905
			134 23 59·9	314 10 28·3	Silver	13780·2	4·139256
			165 23 58·5	345 20 44·0	Firth River, South Base	9367·8	3·971639
			168 38 44·3	348 35 39·8	Firth River, North Base	11366·0	4·055607
Monument No. 27	68 30 06·848	212·2	15 21 23·7	195 16 05·1	Watt	14788·1	4·169912
	141 00 00·000	0·0	95 22 36·5	275 09 56·8	Coral	9317·9	3·969316
			180 00 00·0	0 00 00·0	Monument No. 26	6031·7	3·780437
			354 53 14·5	174 54 51·0	Lynx	13279·7	4·123188
Monument No. 28	68 26 11·283	349·6	0 00 00·0	180 00 00·0	S_1 of the Boundary	5290·4	3·723490
	141 00 00·000	0·0	29 21 41·7	209 16 23·1	Watt	7987·2	3·902393
			131 22 37·9	311 09 58·4	Coral	12363·0	4·092123
			180 00 00·0	0 00 00·0	Monument No. 27	7299·0	3·863261
			0 00 00·0	180 00 00·0	Monument No. 29	5285·2	3·723061
			188 09 25·0	8 10 59·1	Jim	8096·9	3·908321
Monument No. 29	68 23 20·709	641·7					
17·1 feet north of S_1 of the Boundary.	68 23 20·541	636·5	180 00 00·0	0 00 00·0	Monument No. 26	18621·0	4·270004
	141 00 00·000	0·0	184 56 05·5	4 57 39·6	Jim	13354·9	4·125642
			298 18 44·7	118 20 21·0	Lynx	1344·2	3·128463
			107 56 17·4	287 43 09·4	Wee	10162·1	4·006984
			145 25 47·0	325 13 07·6	Coral	16349·3	4·213499

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Monument No. 30	68 21 03·870	119·9	20 44 02·3	200 31 16·8	Pasture	26899·3	4·429741
	141 00 00·000	0·0	32 41 46·2	212 29 01·6	Billie	17531·4	4·243817
			123 12 45·3	303 07 26·8	Watt	4680·9	3·670329
			180 00 00·0	0 00 00·0	Monument No. 29	4240·0	3·627366
Monument No. 31	68 18 38·748	1200·6	150 59 02·6	330 53 44·1	Watt	8073·9	3·907081
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 30	4496·5	3·652876
			279 44 31·6	99 50 30·2	Doodle	4490·9	3·652331
Monument No. 32	68 13 06·612	204·9	180 00 00·0	0 00 00·0	Monument No. 31	10290·9	4·012453
	141 00 00·000	0·0					
Monument No. 33	68 13 02·084	64·6	42 57 08·0	222 44 22·8	Pasture	13976·1	4·145386
	141 00 00·000	0·0	167 22 48·3	347 17 29·9	Watt	17924·8	4·253454
			180 00 00·0	0 00 00·0	Monument No. 31	10431·3	4·018337
			180 00 00·0	0 00 00·0	Monument No. 32	140·3	2·147150
			183 39 18·5	3 40 54·7	Lynx	18562·8	4·268643
			204 35 28·9	24 41 27·4	Doodle	10636·0	4·026779
Monument No. 34	68 11 09·838	304·8	54 39 52·7	234 27 07·7	Pasture	11673·7	4·067207
	141 00 00·000	0·0	111 05 17·8	290 52 33·7	Billie	10150·0	4·006466
			180 00 00·0	0 00 00·0	Monument No. 33	3477·8	3·541309
Monument No. 35	68 08 46·447	1439·2	171 14 21·0	351 09 02·7	Watt	25712·4	4·410143
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 34	4442·8	3·647657
			180 00 00·0	0 00 00·0	Monument No. 33	7920·6	3·898760
			182 33 43·9	2 35 20·2	Lynx	26472·1	4·422788
			347 29 45·0	167 31 18·9	Spud	5408·1	3·733048
Monument No. 36	68 05 39·931	1237·3	32 16 36·2	212 10 46·6	Tip	8190·6	3·913316
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 35	5778·9	3·761848
			246 54 55·5	66 56 29·4	Spud	1272·8	3·104774
Monument No. 37	68 02 49·744	1541·3	0 00 00·0	180 00 00·0	R1 of the Boundary	611·1	2·786128
	141 00 00·000	0·0	69 18 31·2	249 12 41·6	Tip	4675·5	3·669822
			180 00 00·0	0 00 00·0	Monument No. 36	5273·0	3·722057
			0 00 00·0	180 00 00·0	Monument No. 38	725·9	2·860895
			191 28 02·7	11 29 36·7	Spud	5889·6	3·770087
Monument No. 38	68 02 26·314	815·3					
376·7 feet south of R1 of the Boundary	68 02 30·020	930·2	180 00 00·0	0 00 00·0	S1 of the Boundary	38746·1	4·588228
	141 00 00·000	0·0	190 23 40·8	10 25 14·8	Spud	6489·7	3·812224
			336 07 58·2	156 13 14·4	Trap	9808·6	3·991609
			76 36 50·7	256 31 01·1	Tip	4496·0	3·652826
Monument No. 39	67 57 28·826	893·1	152 11 12·4	332 05 22·9	Tip	9374·0	3·971927
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 38	9217·1	3·964594
			264 47 13·7	84 52 29·8	Trap	3985·2	3·600455
			345 47 00·7	165 50 33·1	Old Crow	10907·5	4·037726
Monument No. 40	67 54 13·108	406·1	48 54 11·5	228 43 10·5	Comb	11078·1	4·044466
	141 00 00·000	0·0	163 03 16·0	342 57 26·6	Tip	15006·5	4·176280
			180 00 00·0	0 00 00·0	Monument No. 39	6063·9	3·782751
Monument No. 41	67 51 36·307	1124·8	27 50 14·8	207 43 52·7	Tiny	10365·3	4·015580
	141 00 00·000	0·0	73 48 34·3	253 37 33·3	Comb	8693·2	3·939182
			167 10 30·6	347 04 41·3	Tip	19704·6	4·294567
			180 00 00·0	0 00 00·0	Monument No. 40	4858·2	3·686475
Monument No. 42	67 49 28·530	883·9	0 00 00·0	180 00 00·0	Q1 of the Boundary	10481·4	4·020420
	141 00 00·000	0·0	42 54 37·0	222 48 14·9	Tiny	7109·1	3·851812
			100 25 05·8	280 14 04·9	Comb	8488·4	3·928827
			180 00 00·0	0 00 00·0	Monument No. 40	8817·0	3·945321
			180 00 00·0	0 00 00·0	Monument No. 41	3958·9	3·597579
			211 52 37·2	31 56 09·5	Old Crow	5072·4	3·705214
			340 40 24·3	160 46 36·5	Doc	14297·7	4·155266
Monument No. 43	67 47 16·408	508·3	77 02 44·6	256 56 22·6	Tiny	4966·6	3·696061
	141 00 00·000	0·0	123 59 14·1	303 48 13·3	Comb	10068·6	4·002968
			180 00 00·0	0 00 00·0	Monument No. 42	4093·4	3·612088
			0 00 00·0	180 00 00·0	Monument No. 44	6366·7	3·803914
			197 41 08·1	17 44 40·4	Old Crow	8817·6	3·945351
Monument No. 44	67 43 50·912	1577·3					
69·7 feet north of Q1 of the Boundary	67 43 50·226	1556·3	180 00 00·0	0 00 00·0	R1 of the Boundary	34694·2	4·540257
	141 00 00·000	0·0	302 27 57·7	122 34 09·8	Doc	5608·4	3·748839
Monument No. 45 [1]	67 42 54·1	1676	180 00 00	0 00 00	Monument No. 44	1759·5	3·24539
	141 00 00·0	0	331 52 56	151 55 06	Rock	3522·8	3·54689

[1] No check on this position

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Monument No. 46	67 39 28·13	871·5	0 00 00	180 00 00	P1 of the Boundary	10100·4	4·00434
	141 00 00·00	0·0	14 24 34	194 20 11	Sun	13550·6	4·13196
			66 54 12	246 45 36	Rapid	7161·3	3·85499
			180 00 00	0 00 00	Monument No. 45	6381·9	3·80495
			206 52 59	26 55 10	Rock	3671·7	3·56487
			327 38 29	147 44 33	Gun	8690·4	3·93904
Monument No. 46A	67 35 53·073	1644·3	0 00 00·0	180 00 00·0	P1 of the Boundary	3437·5	3·536249
	141 00 00·000	0·0	0 00 00·0	180 00 00·0	Monument No. 47	3434·0	3·535902
			64 37 44·5	244 29 15·0	Orphan	7217·6	3·858395
			134 04 01·8	313 49 34·1	Barren	15369·5	4·186660
			180 00 00·0	0 00 00·0	Monument No. 46	6662·9	3·823663
			201 53 49·9	22 00 01·8	Doc	12687·9	4·103390
Monument No. 47	67 34 02·207	68·4					
9 feet north of P1 of the Boundary	67 34 02·118	65·6	180 00 00·0	0 00 00·0	Q1 of the Boundary	18220·7	4·260564
	141 00 00·000	0·0	197 16 51·3	17 23 03·2	Doc	15929·1	4·202192
			239 19 10·8	59 25 14·5	Gun	5408·3	3·733058
			0 00 00·0	180 00 00·0	O1 of the Boundary	25316·0	4·403395
Monument No. 47A	67 30 54·12	1676·7	74 45 56	254 45 25	b	411·1	2·61398
	141 00 00·00	0·0	180 00 00	0 00 00	Monument No. 47	5827·1	3·765452
Monument No. 48	67 29 38·24	1184·7	28 37 20	208 32 07	Porcupine	8425·2	3·92558
	141 00 00·00	0·0	78 33 59	258 27 51	Cone	4826·4	3·68362
			146 47 32	326 43 09	Sun	6157·2	3·78938
			180 00 00	0 00 00	Monument No. 47A	2351·0	3·37126
Monument No. 48A	67 27 37·94	1175·4	47 43 40	227 38 27	Porcupine	5454·3	3·73674
	141 00 00·00	0·0	120 21 06	300 14 58	Cone	5481·9	3·73893
			180 00 00	0 00 00	Monument No. 48	3726·7	3·57133
			348 05 16	168 08 17	Rampart	11348·0	4·05492
Monument No. 49	67 27 10·18	315·4	55 09 58	235 04 45	Porcupine	4917·0	3·69170
	141 00 00·00	0·0	127 30 10	307 24 02	Cone	5962·9	3·77546
			180 00 00	0 00 00	Monument No. 48A	860·2	2·93462
			347 07 10	167 10 11	Rampart	10507·8	4·02151
Monument No. 49A	67 25 36·21	1121·8	0 00 00	180 00 00	Fall of the Boundary	1053·6	3·02267
	141 00 00·00	0·0	0 00 00	180 00 00	Monument No. 50	1082·8	3·03455
			2 49 53	182 49 28	Canalaska Mt	6584·6	3·81853
			21 43 47	201 40 26	Porcupine River, West Base.	7012·3	3·84586
			82 31 52	262 27 50	Sunset 2	3139·4	3·49685
			180 00 00	0 00 00	Monument No. 49	2911·3	3·46409
			342 16 58	162 19 59	Rampart	7697·2	3·88633
Monument No. 50	67 25 01·261	39·1					
95·3 feet south of Fall of the Boundary	67 25 02·199	68·1	0 00 00·0	180 00 00·0	O1 of the Boundary	8588·7	3·933926
	141 00 00·000	0·0	3 22 12·9	183 21 47·7	Canalaska Mt	5532·5	3·742923
			46 31 50·9	226 31 20·1	Turner's North Monument	546·2	2·737382
Monument No. 51	67 24 08·211	254·4	163 00 04·2	342 59 33·5	Turner's North Monument	1356·0	3·132271
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 50	1643·5	3·215778
Monument No. 52	67 22 08·82	273·2	0 00 00	180 00 00	Monument No. 53	3306·7	3·51939
	141 00 00·00	0·0	65 01 23	245 00 58	Canalaska Mt	358·8	2·55486
			180 00 00	0 00 00	Monument No. 51	3698·9	3·56807
			291 10 03	111 13 04	Rampart	2511·9	3·40000
Monument No. 53	67 20 22·089	684·3					
293·25 feet south of O1 of the Boundary	67 20 24·973	773·7	0 00 00·0	180 00 00·0	N1 of the Boundary	23553·2	4·372050
	141 00 00·000	0·0	38 08 18·6	218 00 10·7	Junction 2	10263·7	4·011302
			71 40 05·9	251 32 26·2	Chasm	6275·8	3·797672
			173 56 37·0	353 56 11·9	Canalaska Mt	3082·9	3·488957
Monument No. 54	67 18 21·270	659·0	56 13 09·1	236 05 01·2	Junction 2	7625·9	3·882294
	141 00 00·000	0·0	107 19 35·9	287 11 56·2	Chasm	6240·5	3·795221
			180 00 00·0	0 00 00·0	O1 of the Boundary	3832·4	3·583471
Monument No. 55	67 16 15·946	494·0	86 46 15·2	266 38 07·3	Junction 2	6348·6	3·802675
	141 00 00·000	0·0	133 56 27·4	313 48 47·8	Chasm	8273·5	3·917688
			180 00 00·0	0 00 00·0	O1 of the Boundary	7715·0	3·887334
			180 00 00·0	0 00 00·0	Monument No. 54	3882·5	3·589117
			193 09 04·8	13 12 05·7	Rampart	10295·1	4·012632
Monument No. 56	67 13 17·990	557·4	26 01 45·4	205 54 11·6	Arch 2	13533·7	4·131416
	141 00 00·000	0·0	53 03 07·2	232 59 41·5	N. A	3354·9	3·525685
			180 00 00·0	0 00 00·0	Monument No. 55	5513·2	3·741403
			323 08 46·2	143 13 51·1	Tit	6634·0	3·821772

[1] No check on this position.

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Monument No. 57	67 10 02·396	74·2	0 00 00·0	180 00 00·0	Monument No. 58	4251·9	3·628583
	141 00 00·000	0·0	44 13 36·3	224 06 02·6	Arch 2	8514·7	3·930169
			146 26 51·5	326 23 25·8	N. A.	4851·1	3·685842
			150 31 33·4	330 23 25·7	Junction 2	12882·3	4·109992
			180 00 00·0	0 00 00·0	Monument No. 56	6059·5	3·782434
Monument No. 58	67 07 45·149	1398·7					
45·0 feet north of N1 of the Boundary	67 07 44·706	1385·0	264 14 47·4	84 29 16·0	Kite	11416·5	4·057533
	141 00 00·000	0·0	348 04 42·9	168 11 41·4	Salmon	26780·8	4·427824
			0 00 00·0	180 00 00·0	M1 of the Boundary	33840·0	4·529431
			164 34 00·8	344 26 21·4	Chasm	22386·5	4·349987
Monument No. 59[1]	67 04 23·38	724·3	180 00 00	0 00 00	N1 of the Boundary	6236·9	3·79497
	141 00 00·00	0·0	332 39 26	152 45 05	Battle	9699·1	3·98673
Monument No. 60	67 01 42·370	1312·7	54 32 00·8	234 22 09·2	Lone	9568·7	3·980852
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 59	4988·1	3·697938
			309 09 14·7	129 14 53·1	Battle	5744·9	3·759283
Monument No. 61	66 58 09·327	288·9	97 39 30·2	277 29 38·8	Lone	7863·4	3·895610
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 60	6599·9	3·819539
Monument No. 62	66 56 24·593	761·8	31 53 18·6	211 50 35·1	N. C.	4092·8	3·612016
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 61	3244·6	3·511157
			249 17 19·5	69 19 06·8	N. B.	1515·3	3·180498
Monument No. 63	66 53 13·115	406·3	0 00 00·0	180 00 00·0	Monument No. 64	6843·5	3·835278
	141 00 00·000	0·0	138 38 59·1	318 36 15·6	N. C.	3272·6	3·514892
			180 00 00·0	0 00 00·0	Monument No. 62	5931·8	3·773183
			192 21 38·9	12 23 26·3	N. B.	6621·1	3·820933
Monument No. 64	66 49 32·209	997·8					
15·35 feet south of M1 of the Boundary	66 49 32·360	1002·4	303 47 53·5	123 59 45·6	Mesa	11404·4	4·057074
	141 00 00·000	0·0	0 00 00·0	180 00 00·0	Monument No. 68	21757·9	4·337617
			33 15 12·8	213 08 50·8	Fort	9276·3	3·967375
			215 55 10·5	36 02 08·6	Salmon	9430·0	3·974513
Monument No. 65	66 47 14·612	452·6	55 32 40·5	235 26 18·6	Fort	6168·8	3·790203
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	M1 of the Boundary	4267·2	3·630145
			282 21 35·6	102 33 27·6	Mesa	9702·0	3·986860
Monument No. 66	66 43 02·815	87·2	180 00 00·0	0 00 00·0	Monument No. 65	7800·2	3·892106
	141 00 00·000	0·0	243 12 24·3	63 14 27·2	N. D.	1836·9	3·264093
			350 27 37·3	170 29 50·0	Black River	10728·9	4·030555
Monument No. 67	66 39 07·456	231·0	156 19 27·9	336 13 06·2	Fort	12667·2	4·102681
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 66	7291·0	3·862787
			331 36 27·5	151 38 40·1	Black River	3739·4	3·572799
Monument No. 68, (L1 of the Boundary	66 37 49·997	1548·8	180 00 00·0	0 00 00·0	Monument No. 66	9690·5	3·986345
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 67	2399·5	3·380124
			0 00 00·0	180 00 00·0	Monument No. 73	24049·1	4·381098
			160 01 59·4	339 55 37·7	Fort	14896·0	4·173069
			190 39 30·5	10 46 28·3	Salmon	29910·8	4·475828
			345 20 54·8	165 27 05·4	Arctic	19783·5	4·296303
Monument No. 69[1]	66 34 42·26	1309·1	180 00 00	0 00 00	Monument No. 68	5815·7	3·76460
	141 00 00·00	0·0	339 24 59	159 31 10	Arctic	14233·1	4·15330
Monument No. 70	66 32 55·265	1712·0	180 00 00·0	0 00 00·0	Monument No. 68	9130·0	3·960471
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 69	3314·4	3·520405
			333 26 23·8	153 32 34·3	Arctic	11191·2	4·048878
Monument No. 71	66 29 42·95	1330·5	101 09 09	280 57 11	Circle	9864·4	3·99407
	141 00 00·00	0·0	180 00 00	0 00 00	Monument No. 70	5957·3	3·77505
			187 09 16	7 10 28	Black River	14305·4	4·15550
Monument No. 72	66 26 18·808	582·6	130 22 56·0	310 10 58·0	Circle	12705·4	4·103988
	141 00 00·00	0·0	180 00 00·0	0 00 00·0	Monument No. 68	21411·2	4·330641
			180 00 00·0	0 00 00·0	Monument No. 71	6323·7	3·800971
			184 57 07·7	4 59 20·2	Black River	20598·0	4·313826
Monument No. 73, (K1 of the Boundary	66 24 53·652	1662·0	180 00 00·0	0 00 00·0	Monument No. 69	18233·5	4·260867
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 70	14919·0	4·173740
			180 00 00·0	0 00 00·0	Monument No. 71	8961·5	3·952384
			138 19 06·1	318 07 08·7	Circle	14553·8	4·162976
			225 33 00·3	45 39 10·6	Arctic	7009·7	3·845702
			333 20 11·6	153 24 59·0	Curve	8693·4	3·939188
			357 01 19·9	177 02 35·2	Fishing	19739·8	4·295342
			50 02 59·3	229 53 16·5	Igloo	10318·8	4·013630
			180 00 00·0	0 00 00·0	Monument No. 72	2637·9	3·421258

[1] No check on this position...

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude. and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Monument No. 74	66 22 23·373	724·0	148 03 37·7	327 51 40·0	Circle	18294·3	4·262316
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 73	4655·2	3·667934
			308 35 44·1	128 40 31·3	Curve	4991·4	3·698224
Monument No. 75[1]	66 18 37·2	1152	180 00 00	0 00 00	Monument No. 73	11661·5	4·06675
	141 00 00·0	0	180 00 00	0 00 00	Monument No. 74	7006·5	3·84550
			225 03 47	45 08 34	Curve	5511·0	3·74123
Monument No. 76	66 14 59·177	1833·1	15 29 31·1	195 23 29·1	John	18622·6	4·270040
	141 00 00·000	0·0	164 45 43·1	344 43 32·1	Prow	6782·8	3·831408
			180 00 00·0	0 00 00·0	Monument No. 75	6753·2	3·829510
Monument No. 77 (J_1 of the Boundary)	66 13 58·070	1798·8	180 00 00·0	0 00 00·0	Monument No. 76	1892·9	3·277122
	141 00 00·000	0·0	26 42 46·6	206 31 52·5	Tom	20005·2	4·301144
			82 26 10·2	262 15 07·0	Low	9139·5	3·960924
			149 57 52·3	329 48 09·9	Igloo	15803·9	4·198765
Monument No. 78	66 10 43·474	1346·7	0 00 00·0	180 00 00·0	I_1 of the Boundary	11253·6	4·051292
	141 00 00·000	0·0	13 55 31·9	193 50 39·1	Blue	16763·4	4·224362
			29 00 19·0	208 57 07·1	N. E.	5419·4	3·733952
			180 00 00·0	0 00 00·0	Monument No. 77	6027·8	3·780159
Monument No. 79	66 09 55·982	1734·2	0 00 00·0	180 00 00·0	I_1 of the Boundary	9782·5	3·990450
	141 00 00·000	0·0	38 47 50·3	218 44 38·7	N. E.	4193·9	3·622618
			180 00 00·0	0 00 00·0	Monument No. 78	1471·0	3·167619
			0 00 00·0	180 00 00·0	Monument No. 81	9776·1	3·990166
Monument No. 80	66 07 35·350	1095·0	0 00 00·0	180 00 00·0	I_1 of the Boundary	5426·4	3·734508
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 79	4356·2	3·639108
			329 06 17·7	149 08 28·7	Stripe	3506·3	3·544852
Monument No. 81[1]	66 04 40·374	1250·7	0 00 00·0	180 00 00·0	Monument No. 82	2711·7	3·433242
20·7 feet north of I_1 of the Boundary	66 04 40·170	1244·4	0 00 00·0	180 00 00·0	H_1 of the Boundary	22415·1	4·350540
	141 00 00·000	0·0	38 48 10·9	218 43 18·0	Blue	6437·9	3·808745
			150 35 56·9	330 24 54·2	Low	18455·3	4·266121
			183 16 58·4	3 18 13·4	Fishing	17905·3	4·252982
			216 40 32·2	36 42 43·1	Stripe	3014·3	3·479184
			346 37 33·4	166 42 38·7	Kandik	18292·2	4·262266
Monument No. 82	66 03 12·83	397·4	0 00 00	180 00 00	Monument No. 83	5359·9	3·72916
59·4 feet north of Far of the Boundary	66 03 12·25	379·4	60 22 44	240 17 51	Blue	4640·8	3·66659
	141 00 00·00	0·0	180 00 00	0 00 00	I_1 of the Boundary	2723·3	3·43510
			199 18 02	19 20 13	Stripe	5447·0	3·73616
			344 19 12	164 24 17	Kandik	15655·3	4·19466
Monument No. 83	66 00 19·79	613·0					
9·5 feet north of Dome of the Boundary	66 00 19·88	615·8	0 00 00	180 00 00	H_1 of the Boundary	14352·6	4·15693
	141 00 00·00	0·0	127 02 58	306 58 05	Blue	5054·8	3·70370
			189 44 51	9 47 02	Stripe	10633·5	4·02668
Monument No. 84[1]	65 57 27·09	839·1	154 20 24	334 15 32	Blue	9316·4	3·96925
	141 00 00·00	0·0	180 00 00	0 00 00	Monument No. 83	5349·4	3·72830
Monument No. 85 (Close of the Boundary).	65 55 21·196	656·5	0 00 00·0	180 00 00·0	Monument No. 86	5098·5	3·707442
	141 00 00·000	0·0	0 00 00·0	180 00 00·0	H_1 of the Boundary	5100·8	3·707634
			105 50 07·8	285 35 56·7	Bench	12242·8	4·087881
			161 50 13·1	341 45 20·7	Blue	12942·1	4·112003
			180 00 00·0	0 00 00·0	Monument No. 84	3899·5	3·591006
			185 12 47·6	5 14 58·7	Stripe	19813·8	4·296967
Monument No. 86	65 52 36·597	1133·5					
7·6 feet north of H_1 of the Boundary	65 52 36·522	1131·2	0 00 00·0	180 00 00·0	G_1 of the Boundary	32689·8	4·514412
	141 00 00·000	0·0	50 38 44·5	230 27 27·9	Fire	12187·9	4·085928
			125 37 46·0	305 23 35·2	Bench	14490·9	4·161094
			166 56 40·9	346 51 48·6	Blue	17859·6	4·251871
			184 08 47·8	4 10 58·9	Stripe	24897·8	4·396161
Monument No. 87[1]	65 49 50·48	1563·6	74 39 30	254 28 14	Fire	9772·4	3·99000
	141 00 00·00	0·0	180 00 00	0 00 00	Monument No. 86	5145·5	3·71143
			180 00 00	0 00 00	H_1 of the Boundary	5143·0	3·71122
			0 00 00	180 00 00	Monument No. 88	6353·5	3·80301

[1] No check on this position.

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude. and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Loga-rithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Monument No. 88	65 46 25·57	785·4					
13·05 feet north of							
Skip of the Boundary	65 46 25·29	781·4	30 34 04·2	210 25 55·2	Change	13477·9	4·129622
	141 00 00·00	0·0	180 00 00·0	0 00 00·0	H_1 of the Boundary	11500·6	4·060721
			278 21 43·7	98 30 21·3	Seal	7657·8	3·884104
			306 38 45·6	126 44 18·4	Diablo	6232·5	3·794661
Monument No. 89[1]	65 44 03·36	104·1	0 00 00	180 00 00	Horse of the Boundary	11679·9	4·06744
	141 00 00·00	0·0	3 02 19	183 01 23	Union	14877·1	4·17252
			180 00 00	0 00 00	Monument No. 88	4398·2	3·64328
Monument No. 90	65 41 22·456	695·6	0 00 00·0	180 00 00·0	G_1 of the Boundary	11811·1	4·072290
	141 00 00·000	0·0	4 34 02·2	184 33 06·3	Union	9903·8	3·995802
			72 00 09·2	251 52 00·5	Change	7206·9	3·857750
			180 00 00·0	0 00 00·0	Monument No. 89	4983·8	3·697561
			0 00 00·0	180 00 00·0	Monument No. 91	6697·9	3·825939
Monument No. 91	65 37 46·212	1431·3	0 00 00·0	180 00 00·0	Monument No. 92	5117·8	3·709083
6·25 feet south of							
Horse of the Boundary	65 37 46·274	1433·3	0 00 00·0	180 00 00·0	G_1 of the Boundary	5115·1	3·708857
	141 00 00·000	0·0	13 56 36·4	193 55 40·5	Union	3272·8	3·514924
			123 06 20·3	302 58 11·7	Change	8182·6	3·912893
			255 54 04·2	76 05 53·2	Scratch	10259·5	4·011126
Monument No. 92	65 35 00·982	30·4					
14·9 feet south of							
G_1 of the Boundary	65 35 01·129	35·0	0 00 00·0	180 00 00·0	F_1 of the Boundary	25293·8	4·403014
	141 00 00·000	0·0	144 25 45·6	324 17 37·1	Change	11783·1	4·071259
			157 51 52·3	337 50 56·4	Union	2093·0	3·320769
			159 18 57·3	339 07 41·6	Fire	26681·1	4·426204
			232 34 33·7	52 46 22·7	Scratch	12529·5	4·097935
			325 06 39·5	145 17 23·0	Lost	15915·8	4·201828
Monument No. 93	65 32 24·937	772·4	154 34 47·9	334 26 39·5	Change	15968·0	4·203251
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	G_1 of the Boundary	4837·8	3·684646
			180 00 00·0	0 00 00·0	Monument No. 92	4833·2	3·684235
			218 37 42·2	38 49 31·1	Scratch	15939·4	4·202473
			312 04 14·7	132 14 58·1	Lost	12263·8	4·088626
			0 00 00·0	180 00 00·0	Monument No. 94	5215·6	3·717304
Arden of the Boundary	65 31 53·281	1650·3	0 00 00·0	180 00 00·0	F_1 of the Boundary	19475·5	4·289488
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	G_1 of the Boundary	5818·3	3·764795
			308 28 56·9	128 39 40·3	Lost	11629·6	4·065565
Monument No. 94	65 29 36·544	1131·9					
10·4 feet north of							
D'Arcy of the Boundary	65 29 36·442	1128·7	8 48 12·9	188 45 14·8	Casca	16555·6	4·218945
	141 00 00·000	0·0	29 20 37·7	209 18 13·3	Yellow	4172·5	3·620399
			156 05 56·3	336 01 56·1	Halley	8358·2	3·922113
			180 00 00·0	0 00 00·0	Arden of the Boundary	4238·3	3·627190
Monument No. 95[1]	65 26 48·63	1506·2	0 00 00	180 00 00	F_1 of the Boundary	10039·4	4·00171
	141 00 00·00	0·0	180 00 00	0 00 00	Monument No. 94	5200·8	3·71607
			356 13 31	176 13 53	N. F.	4843·4	3·68515
Monument No. 96[1]	65 24 05·59	173·1	169 16 51	349 12 51	Halley	18206·7	4·26023
	141 00 00·00	0·0	180 00 00	0 00 00	Arden of the Boundary	14486·0	4·16095
			180 00 00	0 00 00	Monument No. 95	5049·8	3·70327
			0 00 00	180 00 00	Monument No. 97	4991·6	3·69824
Monument No. 97	65 21 24·430	756·7					
6·0 feet south of							
F_1 of the Boundary	65 21 24·489	758·5					
	141 00 00·000	0·0	0 00 00·0	180 00 00·0	Monument No. 99	9623·4	3·983330
			66 05 22·4	246 02 24·4	Casca	2771·7	3·442739
			170 00 11·3	349 57 47·0	Yellow	11778·9	4·071103
			216 38 36·4	36 49 19·5	Lost	15253·2	4·183362
			301 39 20·8	121 45 09·2	Lime	5828·1	3·765527
			338 43 44·5	158 48 15·8	View, N.E.	10679·1	4·028536
Monument No. 98[1]	65 20 10·45	323·7	114 47 01	294 44 03	Casca	2790·8	3·44573
	141 00 00·00	0·0	180 00 00	0 00 00	F_1 of the Boundary	2293·3	3·36046
			180 00 00	0 00 00	Monument No. 97	2291·3	3·36008
Monument No. 99 (E_1 of the Boundary).	65 16 13·718	426·7	352 05 09·4	172 07 06·5	Back	12196·6	4·086237
	141 00 00·000	0·0	15 17 48·0	195 13 51·8	Pack	12845·9	4·108765
Monument No. 100[1]	65 12 13·65	422·8	289 12 43	109 13 56	East	1101·1	3·041839
	141 00 00·00	0·0	356 58 02	176 58 04	Talus	696·0	2·842616
			40 30 04	220 28 57	West	1483·7	3·171351

[1] No check on this position.

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Monument No. 101	65 09 34·63	1072·6	260 27 52	80 29 49	Back	1702·8	3·231173
	141 00 00·00	0·0	0 00 00	180 00 00	D_1 of the Boundary	5355·7	3·728816
			17 08 25	197 04 47	Skook	10663·3	4·027891
			29 04 33	208 58 56	Hi-yu	9984·5	3·999327
D_1 of the Boundary	65 06 41·705	1291·7	3 33 29·4	183 33 03·7	Squaw	5977·2	3·776496
	141 00 00·000	0·0	55 12 50·8	235 07 13·9	Hi-yu	5908·0	3·771438
			179 46 54·7	359 46 52·5	Slide	8112·2	3·909138
			180 00 00·0	0 00 00·0	Monument No. 99	17718·2	4·248419
			196 35 13·4	16 37 10·4	Back	5882·6	3·769568
			285 15 18·3	105 21 55·0	Barney	5919·0	3·772246
			0 00 00·0	180 00 00·0	C_1 of the Boundary	5643·9	3·751578
Monument No. 102	65 05 15·45	478·5	205 03 36	25 05 50	Game	4534·9	3·656563
	141 00 00·00	0·0	258 57 35	79 04 12	Barney	5818·1	3·764780
			55 28 02	235 24 24	Skook	3814·7	3·581466
			81 48 07	261 42 30	Hi-yu	4902·2	3·690394
			180 00 00	0 00 00	D_1 of the Boundary	2671·5	3·426761
C_1 of the Boundary	65 03 39·476	1222·7	115 06 16·9	295 00 40·0	Hi-yu	5358·2	3·729021
	141 00 00·000	0·0	160 23 07·0	340 15 28·6	Mush	19555·5	4·291270
			188 28 00·9	8 29 57·8	Buck	11406·0	4·057133
			317 02 58·7	137 09 28·3	Castle	8264·0	3·917188
			359 46 48·7	179 46 52·9	Hug	16150·3	4·208178
			0 00 00·0	180 00 00·0	B_1 of the Boundary	16105·8	4·206982
Monument No. 103	65 01 51·42	1592·6	17 33 17	197 30 05	Chief	9204·6	3·964005
	141 00 00·00	0·0	142 54 29	322 50 51	Skook	5210·6	3·716887
			295 38 13	115 44 43	Castle	6245·6	3·795576
			359 43 22	179 43 26	Hug	12803·7	4·107337
			180 00 00	0 00 00	C_1 of the Boundary	3346·5	3·524587
Monument No. 104	64 59 29·14	902·4	134 30 04	314 25 33	Red	5498·3	3·740227
	141 00 00·00	0·0	159 51 18	339 46 40	Skook	9120·8	3·960030
			183 24 37	3 24 47	Pinnacle	2328·4	3·367049
			0 00 00	180 00 00	B_1 of the Boundary	8352·6	3·921824
Monument No. 105	64 54 59·496	1842·7					
5·0 feet north of B_1 of the Boundary	64 54 59·447	1841·0	340 46 34·1	160 49 13·1	Blow	7025·0	3·846649
	141 00 00·000	0·0	0 00 00·0	180 00 00·0	A_1 of the Boundary	17535·9	4·243928
			54 51 50·7	234 41 39·4	Bush	10874·9	4·036427
			87 56 37·2	267 46 06·5	Strata	9160·6	3·961922
			125 07 36·0	304 57 34·7	Crow	10644·5	4·027125
			145 07 29·8	325 04 18·2	Chief	4855·4	3·686226
			209 14 37·1	29 21 06·5	Castle	11526·0	4·061680
Monument No. 106	64 52 02·37	73·4	20 07 32	200 03 49	Birch	9475·9	3·976620
	141 00 00·00	0·0	53 38 36	233 27 30	Eagle Peak	12070·5	4·081726
			143 07 56	322 57 55	Crow	14510·6	4·161686
			163 39 24	343 36 12	Chief	9866·2	3·994150
			180 00 00	0 00 00	B_1 of the Boundary	5484·1	3·739109
			180 39 08	0 39 12	Hug	5440·2	3·735615
Monument No. 107	64 50 14·68	454·6	316 27 37	136 30 09	Lone	3237·2	3·510170
	141 00 00·00	0·0	0 00 00	180 00 00	A_1 of the Boundary	8716·4	3·940337
			30 22 48	210 19 04	Birch	6447·1	3·809366
			68 32 47	248 21 41	Eagle Peak	10444·6	4·018893
Monument No. 108	64 47 57·14	1769·6	0 00 00	180 00 00	A_1 of the Boundary	4457·0	3·649042
	141 00 00·00	0·0	127 29 02	307 18 51	Bush	11207·5	4·049508
			199 44 28	19 47 07	Blow	6848·0	3·835566
			342 59 31	163 01 22	Hog	5560·8	3·745135
Monument No. 109	64 45 33·26	1030·3					
3·7 feet north of A_1 of the Boundary	64 45 33·230	1029·1	0 00 00·0	180 00 00·0	C_1 of the Boundary	10847·7	4·035336
	141 00 00·000	0·0	21 01 51·7	200 56 31·1	Plateau	13116·8	4·117828
			29 19 53·8	209 16 01·0	Yukon	6961·6	3·842706
			67 54 51·7	247 44 52·4	Nut	9466·6	3·976192
			116 44 01·2	296 32 55·0	Eagle Peak	10884·4	4·036806
			199 17 40·6	19 20 13·4	Lone	6748·8	3·829228
Monument No. 110	64 42 35·49	1099·1	136 56 06	316 45 00	Eagle Peak	14236·4	4·153400
	141 00 00·00	0·0	159 21 59	339 18 15	Birch	9252·6	3·966262
			180 00 00	0 00 00	A_1 of the Boundary	5504·5	3·740719
Monument No. 111	64 41 06·64	205·6	0 00 00	180 00 00	Crossing	506·0	2·704148
	141 00 00·00	0·0	83 36 47	263 35 18	Yukon River, West Base	1309·1	3·116959
			345 16 31	165 16 41	Yukon River, East Base	564·3	2·751478
Monument No. 112, 9·5 feet north of	64 40 51·513	1595·2					
Bald of the Boundary.	64 40 51·420	1592·4	90 00 00·0	270 00 00·0	Boundary Astronomical Station	5·37	0·729974
	141 00 00·000	0·0					

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
			° ′ ″	° ′ ″		*Meters.*	
Crossing, 1907	64 40 50·300	1557·7	180 00 00·0	0 00 00·0	Bald	34·7	1·540329
	141 00 00·000	0·0					
C of the Boundary	64 39 42·964	1330·5	189 15 01·0	9 16 52·2	Hog	10118·8	4·005127
	141 00 00·000	0·0	202 51 01·1	22 52 50·7	Pete	4138·4	3·616831
			285 04 39·3	105 08 06·3	Loop	3148·3	3·498077
Monument No. 113[1]	64 39 28·77	891·0	0 00 00	180 00 00	Monument No. 115	10811·8	4·033896
	141 00 00·00	0·0	277 06 50	97 10 16	Loop	3063·5	3·486221
Monument No. 114 (D of the Boundary).	64 37 51·607	1598·0	185 32 42·7	5 33 28·7	Knoll	6988·6	3·844389
	141 00 00·000	0·0	229 08 17·7	49 11 44·6	Loop	4019·5	3·604176
			0 00 00·0	180 00 00·0	Monument No. 115	7802·6	3·892241
Monument No. 114A	64 36 21·45	667·2	0 00 00·0	180 00 00·0	Monument No. 115	5013·5	3·700139
	141 00 00·00	0·0	16 15 24·5	196 13 26·8	Path	6204·0	3·792673
			180 00 00·0	0 00 00·0	Monument No. 114	2789·1	3·445470
			323 29 18·3	143 34 07·3	Table	7165·2	3·855227
Monument No. 115 (E of the Boundary).	64 33 39·660	1228·1	0 00 00·0	180 00 00·0	Monument No. 118	15444·4	4·188770
	141 00 00·000	0·0	12 20 44·5	192 18 25·2	Liberty	9639·8	3·984066
			95 06 02·2	275 00 33·1	Slope	4870·9	3·687611
Monument No. 115A	64 32 33·75	1045·2	0 00 00	180 00 00	Monument No. 116	5616·5	3·749466
	141 00 00·00	0·0	15 36 46	195 34 27	Liberty	7658·2	3·884125
			249 38 51	69 42 01	Smoke	2982·3	3·474552
Monument No. 116	64 29 32·388	1003·0	15 31 22·2	195 29 29·2	Fortymile Dome	6260·9	3·796638
	141 00 00·000	0·0	49 31 11·4	229 28 52·2	Liberty	2709·7	3·432919
			180 00 00·0	0 00 00·0	Monument No. 115	7657·7	3·884101
Monument No. 117	64 28 16·266	503·7	180 00 00·0	0 00 00·0	Monument No. 115	10015·2	4·000659
	141 00 00·000	0·0	204 41 52·3	24 46 41·2	Table	10203·1	4·008731
			246 47 21·7	66 53 43·5	Woody	6145·9	3·788587
Monument No. 118 (F of the Boundary).	64 25 20·954	648·9	136 18 38·0	316 16 45·0	Fortymile Dome	2425·7	3·384842
	141 00 00·000	0·0	161 07 19·6	341 05 00·4	Liberty	6370·2	3·804150
			259 22 16·5	79 25 53·4	Bare	3275·8	3·515315
Monument No. 118A	64 22 21·020	650·9	167 07 03·6	347 05 10·7	Fortymile Dome	7515·5	3·875957
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 118	5572·3	3·746033
			207 31 52·7	27 35 29·6	Bare	6965·3	3·842937
			278 11 51·2	98 15 31·6	John Bull	3311·8	3·520068
Monument No. 119	64 21 14·635	453·2	169 52 27·1	349 50 34·2	Fortymile Dome	9530·6	3·979120
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 118	7628·1	3·882417
			201 21 35·7	21 25 12·6	Bare	8839·5	3·946428
			244 12 53·7	64 16 34·0	John Bull	3640·5	3·561157
Monument No. 120	64 20 22·955	710·9	171 19 31·8	351 17 38·9	Fortymile Dome	11109·7	4·045702
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 119	1600·5	3·204248
			225 49 57·9	45 53 38·2	John Bull	4569·9	3·659902
Monument No. 121[1]	64 18 53·69	1662·8	63 34 50	243 30 37	River	4210·8	3·624361
	141 00 00·00	0·0	180 00 00	0 00 00	Monument No. 118	11992·8	4·078919
Monument No. 122	64 18 19·576	606·2	77 46 37·0	357 42 24·3	River	3858·5	3·586415
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 118	13049·4	4·115590
			310 13 44·3	130 19 43·4	Moose	7028·1	3·846836
Monument No. 123	64 16 29·228	905·1	124 35 20·2	304 31 07·5	River	4580·6	3·660926
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 118	16466·6	4·216605
			281 48 29·8	101 54 28·8	Moose	5481·7	3·738918
Monument No. 123A	64 14 26·373	816·7	180 00 00·0	0 00 00·0	Monument No. 119	12643·1	4·101854
	141 00 00·000	0·0	192 58 30·5	13 02 10·7	John Bull	14599·5	4·164337
			336 57 20·3	156 59 21·6	Little Baldy	4642·3	3·666736
Monument No. 124	64 12 23·316	722·0	85 26 54·3	265 21 24·1	Canyon	4963·4	3·695776
	141 00 00·000	0·0	159 44 20·3	339 40 07·7	River	10889·5	4·037008
			180 00 00·0	0 00 00·0	Monument No. 118	24082·0	4·381693
R6 of the Boundary, 1907	64 09 58·497	1811·5	0 00 00·0	180 00 00·0	Monument No. 126	8925·0	3·950609
	141 00 00·000	0·0	129 35 03·9	309 29 33·9	Canyon	6419·8	3·807523
			205 45 17·3	25 47 25·2	Baldy	4412·7	3·644702
			326 02 49·8	146 09 09·8	Gold	10244·8	4·010504
Monument No. 125	64 08 51·042	1580·6	0 00 00·0	180 00 00·0	Monument No. 126	6836·1	3·834808
	141 00 00·000	0·0	197 32 55·4	17 35 03·3	Baldy	6359·2	3·803402
			335 44 07·7	155 46 31·3	Marmot	5262·6	3·721202

[1] No check on this position.

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Monument No. 125A[1]	64 06 54·75	1695·5	0 00 00·0	180 00 00·0	Monument No. 126	3234·7	3·509837
	141 00 00·00	0·0	28 33 09·7	208 30 34·2	Walker	4902·0	3·690377
Monument No. 126 (G of the Boundary).	64 05 10·290	318·7	108 49 07·2	288 40 54·7	Baby	7832·2	3·893883
	141 00 00·000	0·0	159 11 12·5	339 05 42·6	Canyon	13924·5	4·143779
			180 00 00·0	0 00 00·0	Monument No. 118	37491·3	4·573930
			188 27 17·0	8 29 24·9	Baldy	13041·1	4·115313
Monument No. 126A	64 04 18·563	574·9	0 00 00·0	180 00 00·0	Monument No. 127	5863·4	3·768152
	141 00 00·000	0·0	9 03 51·5	189 02 38·8	Ptarmigan	6968·8	3·843161
			180 00 00·0	0 00 00·0	Monument No. 126	1601·9	3·204635
			345 21 27·9	165 23 07·3	Miller	5948·1	3·774381
Monument No. 127 (H of the Boundary).	64 01 09·217	285·4	0 00 00·0	180 00 00·0	Monument No. 133	22208·3	4·346515
	141 00 00·000	0·0	47 09 05·7	227 07 53·0	Ptarmigan	1497·5	3·175364
			143 25 33·7	323 17 21·3	Baby	12441·7	4·094879
			215 56 30·9	36 02 50·6	Gold	9748·2	3·988923
			346 56 43·5	166 58 10·7	Bedrock	5847·7	3·766982
Monument No. 128	63 58 18·438	570·9	0 00 00·0	180 00 00·0	Monument No. 129	4501·6	3·653365
	141 00 00·000	0·0	24 10 44·9	204 02 10·0	Divide	19154·8	4·282278
			180 00 00·0	0 00 00·0	Monument No. 127	5288·5	3·723336
			353 27 14·3	173 28 57·8	Crag	13818·9	4·140474
Monument No. 129 (Asa of the Boundary).	63 55 53·067	1643·2	350 18 40·6	170 20 24·1	Crag	9360·8	3·971311
	141 00 00·000	0·0	0 00 00·0	180 00 00·0	Monument No. 133	12418·2	4·094057
			197 52 59·1	17 54 26·2	Bedrock	4301·4	3·633612
Monument No. 130	63 54 29·35	908·8	0 00 00	180 00 00	Monument No. 133	9825·7	3·992365
	141 00 00·00	0·0	74 17 12	254 05 54	Lode	10719·2	4·030164
			179 39 16	359 39 16	Reilly	500·0	2·698979
			313 41 50	133 42 23	Sixty	694·5	2·84170
			346 38 35	166 40 19	Crag	6819·3	3·833738
Monument No. 131	63 54 24·77	767·0	103 17 38	283 14 57	Sixtymile River, East Base	2500·4	3·39801
	141 00 00·00	0·0	179 43 51	359 43 51	Reilly	641·9	2·80750
			180 00 00	0 00 00	Monument No. 130	141·9	2·15211
			303 56 06	123 56 39	Sixty	605·2	2·78193
Monument No. 132	63 52 44·436	1376·0	187 34 23·5	7 35 50·7	Bedrock	10022·2	4·000965
	141 00 00·000	0·0	335 02 58·0	155 04 41·5	Crag	3734·6	3·572239
			0 00 00·0	180 00 00·0	I_1 of the Boundary	6576·9	3·818023
			91 55 08·8	271 43 50·1	Lode	10324·4	4·013865
			146 32 18·0	326 29 37·8	Sixtymile River, East Base	4413·3	3·644760
I_1 of the Boundary	63 49 12·044	372·9	85 57 22·4	265 48 47·9	Divide	7865·2	3·895711
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 126	29673·7	4·472371
			184 34 25·1	4 35 52·2	Bedrock	16564·5	4·219179
			206 16 32·9	26 18 16·4	Crag	3558·6	3·551280
Monument No. 133 (I of the Boundary).	63 49 09·376	290·3	50 23 29·7	230 15 18·0	Fred	9750·2	3·989015
	141 00 00·000	0·0	86 33 25·0	266 24 50·4	Divide	7859·8	3·895413
			180 00 00·0	0 00 00·0	I_1 of the Boundary	82·6	1·917039
Monument No. 134	63 46 38·15	1181·4	180 00 00·0	0 00 00·0	Ecc No. 21 A	31·3	1·495544
	141 00 00·00	0·0					
Monument No. 135	63 45 02·895	89·6	132 23 08·6	312 14 34·2	Divide	10622·0	4·026205
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	I_1 of the Boundary	7632·5	3·882667
			236 27 38·2	56 31 58·1	Odell	4760·6	3·677666
			314 56 34·8	135 05 15·3	Ladue	11269·8	4·051918
Monument No. 136	63 41 48·790	1510·8					
161·48 feet south of J of the Boundary	63 41 50·380	1560·0	0 00 00·0	180 00 00·0	Monument No. 142	25506·8	4·406656
	141 00 00·000	0·0	148 53 18·7	328 51 52·0	Interior	2568·1	3·409618
			180 00 00·0	0 00 00·0	Monument No. 133	13593·8	4·133342
			284 04 24·3	104 13 04·4	Ladue	8223·7	3·915069
Monument No. 137	63 39 22·169	686·5	0 00 00·0	180 00 00·0	Monument No. 140	11166·3	4·047910
	141 00 00·000	0·0	52 03 31·0	231 55 02·0	Timber	9932·1	3·997040
			103 10 37·6	283 01 30·4	Round	8623·0	3·935657
			345 49 20·2	165 50 56·2	Junction	6027·3	3·780122
Monument No. 138	63 36 52·453	1624·2	128 10 39·7	308 01 32·6	Round	10680·5	4·028593
	141 00 00·000	0·0	227 49 43·4	47 58 23·3	Ladue	10763·0	4·031931
			309 17 07·0	129 18 43·0	Junction	1907·4	3·280433
			0 00 00·0	180 00 00·0	Monument No. 140	6530·4	3·814938
Monument No. 139[1]	63 34 33·28	1030·6	270 37 57·9	90 48 50·8	Edward	10061·6	4·002668
	141 00 00·00	0·0	0 00 00·0	180 00 00·0	Monument No. 142	11972·2	4·078175

[1] No check on this position.

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Monument No. 140	63 33 21·558	667·5	147 24 26·2	327 15 19·2	Round	15586·6	4·192751
	141 00 00·000	0·0	233 51 14·0	53 58 16·4	Ridge	8052·5	3·905930
			308 01 56·7	128 13 49·2	Point	13992·5	4·145896
			0 00 00·0	180 00 00·0	Monument No. 141	4226·8	3·626010
Monument No. 141	63 31 05·055	156·5	56 49 51·7	236 42 35·6	Summit	6400·6	3·806222
	141 00 00·000	0·0	188 47 17·5	8 48 53·4	Junction	9662·8	3·985103
			0 00 00·0	180 00 00·0	Monument No. 142	5524·4	3·742284
			215 55 09·4	36 02 11·7	Ridge	11084·3	4·044706
Monument No. 142 (K of the Boundary).	63 28 06·645	205·8	0 00 00·0	180 00 00·0	L of the Boundary	32168·4	4·507429
	141 00 00·000	0·0	14 27 44·2	194 22 51·1	Oh-ti	18282·8	4·262042
			264 08 40·7	84 20 32·9	Point	11079·2	4·044508
			327 17 30·8	147 29 25·5	Fra-wa-pe	20596·6	4·313796
Monument No. 143	63 25 16·946	524·7	20 08 31·5	200 03 38·2	Oh-ti	13229·3	4·121537
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 142	5254·6	3·720539
			224 54 44·2	45 07 22·2	Victoria	16584·4	4·219700
Monument No. 144[1]	63 22 44·75	1385·6	180 00 00·0	0 00 00·0	Monument No. 142	9967·3	3·998579
	141 00 00·00	0·0	215 25 49·6	35 38 27·4	Victoria	20197·8	4·305304
Monument No. 145[1]	63 20 38·25	1181·4	0 00 00·0	180 00 00·0	L of the Boundary	18281·2	4·262005
	141 00 00·00	0·0	50 06 39·6	230 01 46·6	Oh-ti	5950·8	3·774578
Monument No. 146[1]	63 17 41·44	1283·2	259 49 20·2	79 52 14·3	Fra-wa-pe	11312·8	4·053572
	14 00 00·00	0·0	0 00 00·0	180 00 00·0	L of the Boundary	12809·5	4·107532
Monument No. 147	63 16 04·273	132·5	0 00 00·0	180 00 00·0	No. 147, Eccentric	132·3	2·121461
	141 00 00·000	0·0					
No. 147, Eccentric	63 16 00·007	0·2	0 00 00·0	180 00 00·0	Monument No. 148	4671·9	3·669495
	141 00 00·000	0·0	207 48 05·3	27 48 54·8	Howard	1658·1	3·219603
			149 37 29·2	329 36 41·7	Hyacinthe	1466·4	3·166266
Monument No. 148	63 13 29·122	901·7	154 15 15·1	334 10 22·3	Oh-ti	10511·6	4·021667
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 142	27171·5	4·434114
			228 31 00·6	48 42 54·4	Fra-wa-pe	14856·2	4·171909
			316 25 37·1	136 29 05·6	Brown	4739·3	3·675712
Monument No. 149	63 10 47·773	1479·1					
3·1 feet north of L of the Boundary	63 10 47·743	1478·3	0 00 00·0	180 00 00·0	Monument No. 150	2235·3	3·349328
	141 00 00·000	0·0	38 57 48·4	218 46 38·9	Flat	16765·4	4·224415
			123 18 58·1	303 08 56·5	Bump	11260·4	4·051552
			162 28 52·2	342 23 59·3	Oh-ti	15168·5	4·180942
M of the Boundary	63 09 40·111	1242·0	43 56 06·6	223 44 57·1	Flat	15194·3	4·181682
	141 00 00·000	0·0	131 20 31·6	311 10 30·1	Bump	12533·3	4·098066
			180 00 00·0	0 00 00·0	L of the Boundary	2094·1	3·320993
Monument No. 150 (M_1 of the Boundary).	63 09 35·552	1100·9	345 03 06·9	165 06 01·3	Moosehorn	10647·3	4·027239
	141 00 00·000	0·0	44 18 25·3	224 07 15·9	Flat	15093·0	4·178776
			131 49 22·9	311 39 21·4	Bump	12627·0	4·101301
Monument No. 151	63 07 34·099	1055·8	180 00 00·0	0 00 00·0	Monument No. 150	3760·5	3·575251
	141 00 00·000	0·0	337 10 41·1	157 13 35·5	Moosehorn	7080·8	3·850080
			56 15 56·2	236 04 46·9	Flat	12677·1	4·103019
Monument No. 152[1]	63 04 39·91	1235·8	81 07 18·1	260 56 08·9	Flat	10670·4	4·028179
	141 00 00·00	0·0	180 00 00·0	0 00 00·0	M of the Boundary	9295·0	3·968250
Monument No. 153 (N of the Boundary).	63 01 18·805	582·3	3 01 47·5	183 00 27·3	Scottie	24144·3	4·382814
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 150	15380·6	4·186973
			347 06 59·9	167 09 55·4	Wienerwurst	12477·5	4·096126
Monument No. 154	62 58 12·726	394·0	0 00 00·0	180 00 00·0	O of the Boundary	17093·5	4·232830
	141 00 00·000	0·0	3 58 42·9	183 57 22·8	Scottie	18393·4	4·264662
			194 11 53·6	14 14 47·8	Moosehorn	11197·3	4·049111
Monument No. 155	62 55 28·819	892·3	0 00 00·0	180 00 00·0	O of the Boundary	12018·6	4·079853
	141 00 00·000	0·0	5 29 29·9	185 28 09·8	Scottie	13335·3	4·125004
Monument No. 156	62 52 57·228	1771·9	0 00 00·0	180 00 00·0	O of the Boundary	7325·0	3·864809
	141 00 00·000	0·0	8 27 34·7	188 26 14·6	Scottie	8675·0	3·938268
Monument No. 157	62 50 30·223	935·8					
25·26 feet south of Ecc. No. 46	62 50 30·472	943·5	0 00 00·0	180 00 00·0	O of the Boundary	2781·2	3·444237
	141 00 00·000	0·0	140 31 28·4	320 18 58·2	Sauerkraut	18676·3	4·271291
			199 22 35·6	19 25 30·9	Wienerwurst	8385·4	3·923521

[1] No check on this position.

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Loga-rithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Monument No. 158	62 49 00·537	16·7					
10·9 feet south of O of the Boundary	62 49 00·644	19·9	45 28 00·4	225 26 40·4	Scottie	1790·3	3·252924
	141 00 00·000	0·0	145 22 40·9	325 10 10·8	Sauerkraut	20898·1	4·320106
			194 35 07·3	14 38 02·7	Wienerwurst	11047·6	4·043269
Monument No. 159	62 45 21·304	659·4	167 01 02·8	346 59 42·7	Scottie	5680·7	3·754404
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	O of the Boundary	6791·1	3·831940
			351 19 31·8	171 19 58·3	Starvation	2800·9	3·447301
			53 10 09·0	233 00 10·8	Mirror	11961·7	4·077793
Monument No. 160 (P of the Boundary).	62 43 48·394	1498·3	17 27 28·8	197 21 58·2	Airs	17718·3	4·248423
	141 00 00·000	0·0	152 52 20·3	332 50 14·0	Mick	4419·9	3·645412
			171 22 24·5	351 21 04·4	Scottie	8508·4	3·929847
			180 00 00·0	0 00 00·0	O of the Boundary	9667·7	3·985323
			340 08 58·9	160 16 15·0	Dave	20656·1	4·315049
Monument No. 161 (Q of the Boundary).	62 40 32·821	1016·1	26 06 26·3	206 00 55·7	Airs	12079·5	4·082048
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 160	6055·2	3·782126
			183 55 16·8	3 55 43·2	Starvation	6177·3	3·790800
Monument No. 162	62 38 17·29	535·3	180 00 00	0 00 00	Monument No. 161	4196·1	3·62285
	141 00 00·00	0·0					
Monument No. 163	62 35 09·970	308·7	39 02 20·5	219 00 57·7	Flag No. 7	2115·9	3·325496
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 160	16050·8	4·205498
			181 29 51·7	1 30 18·1	Starvation	16164·1	4·208551
			188 36 14·7	8 38 47·0	Rupe	16281·6	4·211698
Monument No. 164	62 34 00·819	25·4					
83·5 feet south of R of the Boundary	62 34 01·641	50·8	27 18 22·1	207 10 10·8	Wellesley	17327·9	4·238746
	141 00 00·000	0·0	103 22 39·5	283 17 09·1	Airs	5463·9	3·737501
			180 00 00·0	0 00 00·0	Monument No. 161	12111·2	4·083187
Monument No. 165	62 31 24·952	772·5	0 00 00·0	180 00 00·0	S of the Boundary	5759·1	3·760354
	141 00 00·000	0·0	139 00 06·3	318 54 36·0	Airs	8102·6	3·908626
			180 00 00·0	0 00 00·0	R of the Boundary	4851·1	3·685843
Monument No. 166	62 28 18·739	580·2					
20·0 feet south of S of the Boundary	62 28 18·936	586·2	58 56 39·7	238 48 28·7	Wellesley	9279·1	3·967504
	141 00 00·000	0·0	155 53 02·8	335 47 32·5	Airs	13009·9	4·114273
			180 00 00·0	0 00 00·0	R of the Boundary	10610·2	4·025724
			216 52 57·5	37 00 13·1	Dave	11686·6	4·067690
Monument No. 167	62 27 13·749	425·7	70 47 49·4	250 39 38·3	Wellesley	8417·4	3·925179
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	S of the Boundary	2018·2	3·304959
Monument No. 168	62 24 02·578	79·8	0 00 00·0	180 00 00·0	U of the Boundary	36845·5	4·566385
	141 00 00·000	0·0	18 45 44·5	198 37 08·6	Baultoff	26216·2	4·418570
			111 37 01·6	291 28 50·8	Wellesley	8550·5	3·931990
Monument No. 169	62 18 25·369	785·4	316 10 15·6	136 19 03·8	Niggerhead	12448·1	4·095103
	141 00 00·000	0·0	0 00 00·0	180 00 00·0	U of the Boundary	26405·8	4·421699
			30 22 51·8	210 14 16·3	Baultoff	16672·9	4·222010
Monument No. 170	62 13 24·792	767·6	267 50 18·0	87 59 05·9	Niggerhead	8626·5	3·935836
	141 00 00·000	0·0	0 00 00·0	180 00 00·0	Monument No. 172	10650·2	4·027356
			58 56 39·6	238 48 04·3	Baultoff	9843·1	3·993134
			160 51 11·8	340 43 01·5	Wellesley	24236·0	4·384461
Monument No. 171	62 10 00·136	4·2	232 18 20·0	52 27 07·8	Niggerhead	10894·2	4·037195
	141 00 00·000	0·0	0 00 00·0	180 00 00·0	Monument No. 172	4314·3	3·634909
			98 29 09·2	278 20 34·0	Baultoff	8525·6	3·930727
			164 47 12·7	344 39 02·5	Wellesley	30292·8	4·481340
Monument No. 172 (T of the Boundary).	62 07 40·779	1262·5	180 00 00·0	0 00 00·0	S of the Boundary	38332·3	4·583565
	141 00 00·000	0·0	218 08 48·3	38 17 36·2	Niggerhead	13956·1	4·144765
			301 05 19·9	121 12 07·1	Ed	7806·4	3·892452
Monument No. 173 [1]	62 06 24·48	757·9	60 33 13	240 23 25	Joe	11089·0	4·044894
	141 00 00·00	0·0	180 00 00·0	0 00 00·0	Monument No. 172	2362·2	3·373321
Monument No. 174	62 04 12·401	383·9					
3·33 feet south of U of the Boundary	62 04 12·434	385·0	81 57 41·9	261 47 54·7	Joe	9752·3	3·989108
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Monument No. 172	6450·0	3·809559
			319 25 45·5	139 27 03·5	Beaver	1967·2	3·293857

[1] No check on this position.

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Continued.*

Stations.	Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Monument No. 175	62 03 16·971	525·4					
6·3 feet south of							
V of the Boundary	62 03 17·033	527·3	92 05 02·4	271 55 15·4	Joe	9662·9	3·985107
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	U of the Boundary	1715·1	3·234292
			260 12 33·4	80 13 51·4	Beaver	1298·4	3·113400
			313 29 50·7	133 38 03·4	Hump	11199·5	4·049199
Monument No. 176	62 01 41·545	1286·0	354 10 55·0	174 12 55·9	Rabbit	19768·3	4·295969
	141 00 00·000	0·0	0 00 00·0	180 00 00·0	W of the Boundary	20764·1	4·317314
			201 56 10·7	21 57 28·7	Beaver	3424·9	3·534645
Monument No. 176A	61 58 32·361	1001·8	0 00 00·0	180 00 00·0	Monument No. 178	3857·9	3·586351
	141 00 00·000	0·0	188 03 41·0	8 04 58·8	Beaver	9123·8	3·960175
			207 18 34·7	27 25 21·6	Ed	14571·0	4·163490
Monument No. 177	61 57 54·199	1677·8	0 00 00·0	180 00 00·0	Monument No. 178	2676·5	3·427570
	141 00 00·000	0·0	74 53 51·3	254 42 42·7	Wi-ki	11445·7	4·058644
			187 08 21·4	7 09 39·3	Beaver	10294·9	4·012621
	61 56 27·741	858·7	143 26 29·0	323 16 42·1	Joe	16211·9	4·209833
Monument No. 178	141 00 00·000	0·0	180 00 00·0	0 00 00·0	V of the Boundary	12670·8	4·102803
			185 40 04·6	5 41 22·5	Beaver	12954·9	4·112434
			348 36 54·5	168 38 55·5	Rabbit	10151·6	4·006534
			88 24 56·9	268 13 48·5	Wi-ki	11054·6	4·043544
Monument No. 179	61 53 23·209	718·4	0 00 00·0	180 00 00·0	W of the Boundary	5336·8	3·727284
	141 00 00·000	0·0	116 04 22·3	295 53 13·9	Wi-ki	12302·4	4·089989
			152 43 54·8	332 34 08·2	Joe	21077·1	4·323810
Monument No. 180	61 50 30·700	950·4					
11·83 feet south of							
W of the Boundary	61 50 30·816	954·1	29 55 32·8	209 52 00·0	Cache	7093·8	3·850881
	141 00 00·000	0·0	77 52 34·2	257 50 54·8	Slide	1689·4	3·227743
			107 48 18·5	287 43 32·0	Sheep	4992·3	3·698303
			134 11 39·0	314 00 30·9	Wi-ki	15412·4	4·187871
			180 00 00·0	0 00 00·0	V of the Boundary	23720·3	4·375120
			206 54 11·9	27 02 24·3	Hump	17954·6	4·254175
			241 17 17·2	61 19 18·1	Rabbit	2284·8	3·358856
			353 51 48·0	173 52 11·8	Center	3697·1	3·567856
Monument No. 181	61 48 40·542	1255·0					
13·2 feet north of							
X of the Boundary	61 48 40·412	1251·2	8 14 43·6	188 13 29·9	White River, West Base	8557·4	3·932340
	141 00 00·000	0·0	30 02 33·6	209 55 36·7	Traver	13892·2	4·142771
			52 21 01·3	232 17 28·5	Cache	4469·7	3·650281
			180 00 00·0	0 00 00·0	W of the Boundary	3417·8	3·533745
Monument No. 182	61 44 43·781	1355·3	0 00 00·0	180 00 00·0	Y of the Boundary	2945·5	3·469162
	141 00 00·000	0·0	47 01 14·1	227 00 00·5	White River, West Base	1677·5	3·224658
			305 22 06·4	125 23 11·7	White River, East Base	1334·8	3·125405
			339 17 34·3	159 19 01·1	Kletsan	4098·2	3·612598
Monument No. 183	61 43 51·867	1605·6	110 41 22·3	290 40 08·7	White River, West Base	1311·8	3·117882
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	X of the Boundary	8932·4	3·950967
			232 31 24·3	52 32 29·7	White River, East Base	1371·5	3·137197
Monument No. 184	61 43 08·025	248·6					
61·7 feet south of							
Y of the Boundary	61 43 08·632	267·2	6 05 49·7	186 04 20·7	Dalton	14027·7	4·146987
	141 00 00·000	0·0	75 50 16·6	255 43 19·9	Traver	7173·1	3·855705
			145 44 32·0	325 43 18·3	White River, West Base	2180·1	3·338486
			154 51 29·9	334 47 57·2	Cache	8329·7	3·920631
			180 00 00·0	0 00 00·0	X of the Boundary	10270·8	4·011605
			200 06 32·5	20 09 13·7	Flat Top	7804·2	3·892326
Monument No. 185	61 39 45·307	1402·5	180 00 00·0	0 00 00·0	Y of the Boundary	6294·2	3·798941
	141 00 00·000	0·0	191 08 32·7	11 11 13·9	Flat Top	13884·3	4·142525
			205 29 18·9	25 31 58·5	Little Boundary	6188·4	3·791580
Monument No. 186	61 39 05·882	182·1	129 37 44·1	309 30 47·4	Traver	9030·3	3·955702
	141 00 00·000	0·0	180 00 00·0	0 00 00·0	Y of the Boundary	7514·6	3·875908
			192 20 06·6	12 21 33·4	Kletsan	6783·3	3·831439
			201 22 05·0	21 24 44·6	Little Boundary	7309·0	3·863857
Monument No. 187	61 37 13·302	411·8	180 00 00·0	0 00 00·0	X of the Boundary	21270·5	4·327777
	141 00 00·000	0·0	188 09 19·6	8 10 46·4	Kletsan	10215·1	4·009241
			252 34 05·6	72 38 17·7	Scoria	4405·9	3·644036
Monument No. 187A	61 35 48·659	1506·3	180 00 00·0	0 00 00·0	Y of the Boundary	13619·9	4·134175
	141 00 00·000	0·0	186 29 35·6	6 31 02·4	Kletsan	12814·1	4·107689
			226 51 12·6	46 55 23·7	Scoria	5761·4	3·760529

GEOGRAPHIC POSITIONS OF BOUNDARY MONUMENTS—*Concluded.*

Stations.	Latitude and longitude.	Seconds in meters.	Azimuth.	Back azimuth.	To stations.	Distance.	Logarithms.
	° ′ ″		° ′ ″	° ′ ″		*Meters.*	
Z of the Boundary	61 34 25·326	784·1	146 30 04·5	326 28 35·6	Dalton	2699·6	3·431296
	141 00 00·000	0·0	154 17 20·8	334 10 24·3	Traver	16031·8	4·204982
			180 00 00·0	0 00 00·0	Y of the Boundary	16199·6	4·209503
			185 24 23·2	5 25 49·9	Kletsan	15380·0	4·186956
			212 48 42·7	32 52 53·7	Scoria	7757·4	3·889714
Boundary Crossing, 1913	61 31 15·15	469·0	169 36 49	349 35 20	Dalton	8273·8	3·91771
	140 59 59·89	885·4	179 59 00	359 59 00	Z of the Boundary	5887·1	3·76990
			267 38 15	87 39 35	Lambart, Mt	1349·7	3·13022
Point on Line	61 29 41·21	1275·7	179 59 58	359 59 59	Boundary Crossing	2907·9	3·46357
	140 59 59·89	886·2	204 28 01	24 29 21	Lambart, Mt	3255·9	3·51267
			342 58 28	163 00 56	Crag	8522·5	3·93057
			359 59 50	179 59 50	Bald	2535·9	3·40412
Bald, 1913	61 28 19·29	597·1	193 46 35	13 47 55	Lambart, Mt	5662·3	3·75299
	140 59 59·88	886·6	303 02 07	123 12 08	Bo	12108·0	4·08307
			336 01 59	156 04 27	Crag	6142·8	3·78837
Monument Site, north side of Klutlan Glacier.	61 27 57·08	1766·9	179 59 35	359 59 35	Bald	687·6	2·83731
	140 59 59·87	886·7	300 13 23	120 23 24	Bo	11747·3	4·06994
			333 08 04	153 10 32	Crag	5521·5	3·74206
Monument Site, south side of Klutlan Glacier.	61 26 05·90	182·6	179 59 35	359 59 35	Monument Site, north side of Klutlan Glacier	3441·6	3·53676
	140 59 59·85	887·2	179 59 35	359 59 35	Bald	4129·2	3·61586
			187 58 08	7 59 28	Lambart, Mt	9722·5	3·98778
Monument No. 189	60 52 58·901	1823·0	77 46 14·6	257 34 27·3	Penn	12506·9	4·097151
	141 00 00·000	0·0	118 26 32·7	298 25 50·9	Blondie	818·6	2·913051
			260 47 14·3	80 47 20·8	Senator	116·0	2·064403
			1 23 37·7	181 23 28·4	Boundary A	6597·5	3·819382
Monument No. 190	60 52 20·562	636·4	180 00 00·0	0 00 00·0	Monument No. 189	1186·7	3·074345
	141 00 00·000	0·0	185 25 34·4	5 25 41·0	Senator	1210·7	3·083038
Monument No. 191	60 49 25·380	785·5	148 20 45·9	328 15 51·7	Dane	9676·5	3·985717
	141 00 00·000	0·0	174 07 42·2	354 07 00·5	Blondie	7035·8	3·847316
			180 00 00·0	0 00 00·0	Monument No. 189	6609·0	3·820137
			180 59 22·4	0 59 29·0	Senator	6628·6	3·821423
			180 00 00·0	0 00 00·0	Monument No. 190	5422·5	3·734198

TABLE OF CERTAIN ELEVATIONS NOT INCLUDED IN THE TABLE OF GEOGRAPHIC POSITIONS.

Note: Elevations, unless otherwise specified, refer to top of station mark, or to surface of ground.	Elevation above Mean Sea-level.	
	Meters.	Feet.
Arden	1111·9	3648
Dome (Upper Target)	897·4	2944
Far	974·6	3198
C of the Boundary	735·4	2413
D_1 of the Boundary	1396·7	4582
R 6	934·9	3067
Bald (Lat. 61° 28′ 19″·29)	2338·3	7672
North Monument Site (Klutlan Glacier)	1821·3	5975
South Monument Site (Klutlan Glacier)	1741·5	5714
Boundary Crossing 1913 (Natazhat Ridge)	2965·5	9729
Point on Line (Lat. 61° 29′ 41″·21)	2367·1	7766

PRECISE LEVELLING.

The spirit levelling connecting the work on the Boundary with sea-level at Skagway, Alaska, was done by the accepted methods for precise levelling work of this class, modified along certain lines to suit the exacting conditions introduced by the fact that the only feasible route for the line of levels lay for the greater part of its length, not along a convenient railway, but along a very rough and hilly northern trail which, by courtesy, was called a road, and which was full of sharp bends and broken by several rather long crossings over unbridged rivers.

It was found impossible, owing to the hilly nature of the greater portion of the route, to keep the foresight and backsight at each station even approximately equal, and at the same time to make anything like reasonable progress. The sights were therefore made as long as the ground and the refraction would allow up to three hundred feet, which was adopted as the limiting length of sight, as this was found to be the greatest distance at which, under ordinary conditions, one-thousandth of a foot could be estimated on the rod. For average length of sight see table on page 181.

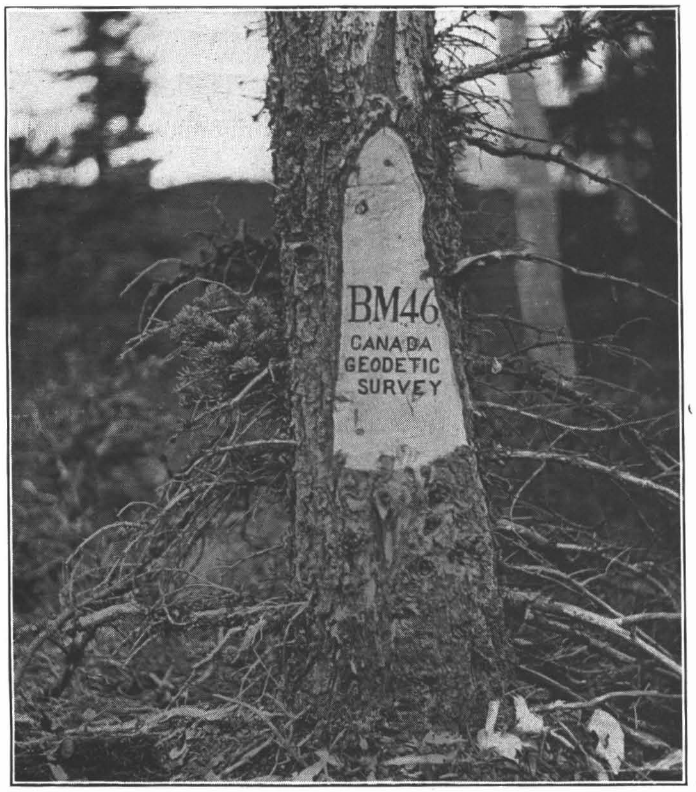
The roughness of the ground also made it very difficult to set the instrument at the first trial in such a position as to get the longest sight possible and also to read to the extreme limits of the rods. To overcome this difficulty an extra man was added to the party, who, with a hand level, located the instrument and rod stations, and at the same time kept the sights as nearly equal as possible by pacing, the usual scheme of counting the rails for this purpose being, of course, not feasible. If, however, one or two instrument stations could be saved by lengthening out a sight so as to cross a ravine or the summit of a hill, this was done, and as soon as possible afterwards the opposite sight was lengthened to balance up. The recorder kept the back and fore-sight intervals totalled and when they differed by over fifty feet in distance, he notified the hand-level man, who then evened up as soon as possible. Thus the sights were kept approximately equal throughout the day's levelling, and in closing on a bench-mark were always balanced up accurately.

Precise levelling.

The precise level used was constructed by Bausch and Lomb in accordance with the Coast and Geodetic Survey designs and specifications of 1900.[1]

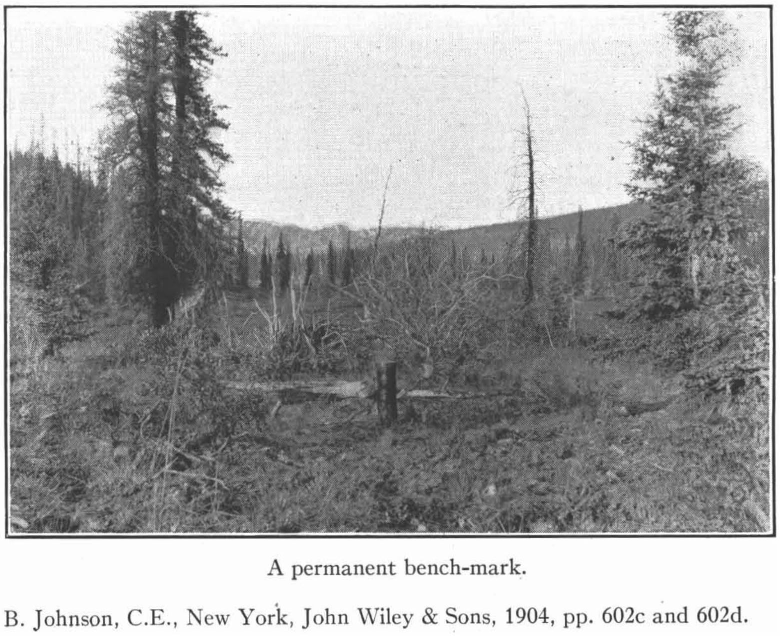
The rods were of cross-shaped section and slightly over 9 feet in length. They were made of selected white

[1]"Report of the Superintendent of the U. S. Coast and Geodetic Survey for 1913." Appendix No. 3—Washington: Government Printing Office.



A temporary bench-mark.

pine, free from knots, shakes, or blemishes. The strips, about two and three-quarter inches by one inch, were boiled in paraffine to drive out the moisture and to impregnate the wood to prevent absorption of moisture later. The strips were boiled for six or seven hours in troughs heated by gas jets, and allowed to cool in the wax, the process being repeated for three days. After being finally removed from the wax the strips were dressed to size, the main portion, which was later to carry the graduations, being made about two and five-eights inches by seven-eighths of an inch. The side strips were than attached and the foot plate or shoe put on. This latter fits the bottom of the rod and carries a flat-bottomed plug, which in use fits the cavity in the turning pin. Silver plugs, one-quarter of an inch in diameter and one-half inch long, were then set in the face of the rod, at the 3-, 6-, and 9-foot points, the bottom of the plug on the shoe being zero. The rods then received three coats of white paint, and were ready for graduation, the first item of which was to mark accurately the 3-, 6-, and 9-foot marks on the silver plugs by comparison with a standard bar, and after painting the graduations black and white showing hundredths of a foot, the rods were given a coat of varnish. In use the faces of the rods were carefully protected, and special boxes were provided for transportation.



A permanent bench-mark.

Three turning pins were used, each having the bearing surface convex upwards in a cavity in the head of the pin, with a lower groove for sand and dirt.[1] When the hand-level man located a rod station by driving in a turning

[1] "Theory and Practice of Surveying," J. B. Johnson, C.E., New York, John Wiley & Sons, 1904, pp. 602c and 602d.

pin, he received a pin for the next point from the rear rodman when he came forward. Thus the instrument man very rarely had to wait for a rodman to get his rod in position, and the speed of the party depended almost entirely on his speed and energy. By adopting an efficient method of setting up the instrument and adhering to it, a little time was saved on each operation, and the speed of the work kept at a high standard, as the following table will show:—

Year.	Working days.	Miles double line.	Average Miles per day double line.	Average number stations per day.	Average length of sight in feet.	Percentage re-levelled.
1908	84	141·6	1·7	63	142	12
1909	119·5	239·4	2·0	69	153	11
1910	68	110·2	1·6	58	144	10

As many as one hundred and ninety-five stations were observed in one day of nine hours.

The line was run forward in the morning and back in the afternoon. At the end of each hour's forward running a temporary bench-mark was set, consisting simply of a wooden plug with a nail in the top. These were entered in the notes as turning points, A, B, C, D, and E, but no record of them was kept in the abstract of results, as they were for checking purposes only. When the limit of error ($K \sqrt{S}$, where $K = 0{\cdot}017$ feet and S = distance in miles) was exceeded on any section, the error could generally be located between two of these temporary bench-marks, and considerable time was thus saved.

At the end of each morning's run a temporary bench-mark[1] of a more permanent type was made, consisting usually of a 4- to 6-inch green stump brought to a point at the top and tipped by a 3-inch copper nail. The side was blazed and on it the words "Canada Geodetic Survey" and the number of the bench-mark were painted in red. Sometimes the nail was driven in a solid root or the bench-mark was made on a large boulder or on rock in place, these marks averaging one to three miles apart. It is estimated that these bench-marks on roots and stumps will be serviceable, under climatic conditions existing in the Yukon, for from twelve to twenty years.

Permanent bench-marks,[2] consisting of capped iron posts or of bronze tablets, were set at an average distance apart of about ten miles. The posts were made of 4-inch iron pipe 4 feet 10 inches long, coated with tar inside and out, split at the bottom for 10 inches, and the split parts turned out at right angles to prevent the post settling. On each post was rivetted a bronze cap marked "Geodetic Survey of Canada, B.M." and showing in feet the elevation above sea-level and the datum, as well as the caution "500 dollars fine for disturbing this mark." Where possible, a bronze tablet of the same size and similarly marked was substituted for the post and cap, the tablet being cemented into rock in place by a central shank on the reverse side.

[1] "Publications of the Dominion Observatory," Vol. i, No. 2—Precise Levels. Ottawa: Government Printing Bureau, 1913.
[2] *Ibid.*

At all river crossings a permanent bench-mark was set on each side of the river, and the line carried over by repeated readings on each side, the instrument being reset between readings. At Yukon Crossing this method was checked by running a line over the ice in winter, and at Dawson the latter method only was used. A summary of the work at river crossings follows:—

River.	Date.	BM. to BM.		Length of sight in feet.	Readings on each side.	Closing in feet.	Remarks.
Takhini	July 24, 1908	P 20	P 21	495	5	$-\cdot0004$	
Yukon at Yukon Crossing	July 23, 1909	P 94	P 95	950	3	$-\cdot026$	Both target and direct readings used.
Yukon at Yukon Crossing	Dec. 3, 1909	P 94	P 95	950	....	$-\cdot0076$	Back and forward over ice. This value accepted. Temp. —30° F.
Pelly	July 21, 1909	P118	P119	598 Longest sight.	....	$-\cdot0048$	Back and forward. 7 stations between B.M.'s.
Stewart	Aug. 31, 1909	P162	P163	350	2	$-\cdot013$	Distance between B. M.'s is 0·83 miles.
Yukon at Dawson	Nov. 16, 1909	P223	P224	....	....	....	Forward and back over ice. Temperature $-10°$ F.

Upon arrival at Yukon Crossing to check the levels over the ice, the temperature stood at $-45°$ Fahrenheit. All oil was carefully cleaned off the various moving parts of the instrument, and four separate attemps to get the check resulted only in the "freezing" of the focussing apparatus, and frost bites for three of the party. A reconnaissance was then made and level stations were chosen exactly 50 feet apart, so that the focus would not have to be changed, the steep east bank of the river being descended by a "switch-back." The levelling was then made at a temperature of $-30°$.

The elevation thus carried in from Skagway, together with a determination of approximate mean sea-level at the Arctic Ocean and the railroad levels of the Copper River and Northwestern Railway, control the adjustment of all the elevations along the Boundary.

STADIA MEASUREMENT.

Between the main projection stations the establishment of the line was generally considered to be one of the duties of the stadia party, although at times when transport conditions were such that they could do so without interfering with the general progress of the work, the main projection party established "intermediates," using the same method as for main points, and these proved to be a great convenience to the stadia party following later.

On the greater portion of the boundary, however, the line between main stations was established by the stadia party, using the method of running toward the forward signal though at some points they were compelled to "line in" their instrument on some convenient ridge between two main stations, thus locating a point on the line from which they ran north and south toward the main station signals.[1]

In addition to the actual establishment of the line, the work of the stadia party included the measurement of the line, the selection of monument sites, and tying them in to the triangulation, and later the setting of the monuments.

The line was measured by ordinary stadia methods, using 4-inch Berger transits with a stadia interval of 1/100. Various styles of rods were used, the work of 1907 and 1908 being done with folding telemeter rods graduated specially for the instruments, while in 1909, 1910, 1911, and 1912 standard Keuffel and Esser rods of both the telescoping and folding patterns were used, graduated to feet and hundredths, the "$c + f$ correction" being applied throughout. For the first four years of the work, two rods were used by each party, and back- and fore-sights were taken at each station, the horizontal distances and differences of elevation being computed from the mean readings. After 1910, however, the stadia parties each used one rod only, keeping it ahead of the instrument and making direct and reverse readings on it, the computations, as before, being made from the mean readings. This method gave practically the same results with about the same amount of instrument work, and released the rear rodman for other duties in connection with the party.

The main objects of this stadia work were to provide a profile of the line, to furnish distances to features of the topography between main projection stations, to furnish the plane-table parties with elevations of points along the line to facilitate their work, and, in addition, to provide a means of checking the mapping of the topography.

The stadia distances were checked by the triangulation, and the differences of elevation by the vertical angles read in connection with the triangulation. This checking was done in sections, the portion of the line between any two consecutive main projection stations being considered a section for this purpose, the differences, horizontal and vertical, being distributed among the stations of a section proportionally to the distance, *i.e.*, these differences or errors were assumed to be uniform throughout a section.

A large scale profile of the season's work was made each year from the stadia notes, while a profile of the entire line on a much smaller scale is published in connection with the topographic sheets.

While it was not always possible for the stadia party to keep ahead of the topographic party, as the rate of progress of the former was regulated largely by the amount of cutting to be done in opening the vista, they were able to furnish useful data to the topographic parties covering a considerable proportion of the work.

Comparison of Stadia Results.

The following tables show at a glance the work done by the various stadia parties in connection with the vista-cutting and monumenting.

The first table gives the distances, and the errors and ratios, horizontal and vertical, along the whole line by sections, each section being the distance from one projection station to the next, except where the work of any year did not end exactly at a projection station. The computed distance in the third column is the value resulting

[1] "Report of the Boundary Commission." U. S. Senate Document No. 247, 55th congress, 2nd session, Washington, 1898. Part ii, appendix iv, pp. 113 and 114.

from the final adjustment of the triangulation. In the last column the ratio given is that of the vertical error to the horizontal distance.

The second table gives a summary of the same information concerning the work year by year, and showing also the grand total. The total distance run by stadia was 556·67 miles, and covers practically the entire line from the Arctic Ocean to the northern slope of the Natazhat Range, except the crossings of the rivers Porcupine, Yukon, and White, and north of the Sixtymile, a short distance was measured by triangles with short bases at right angles to the line, to save time, late in the season of 1907.

TABLE I.

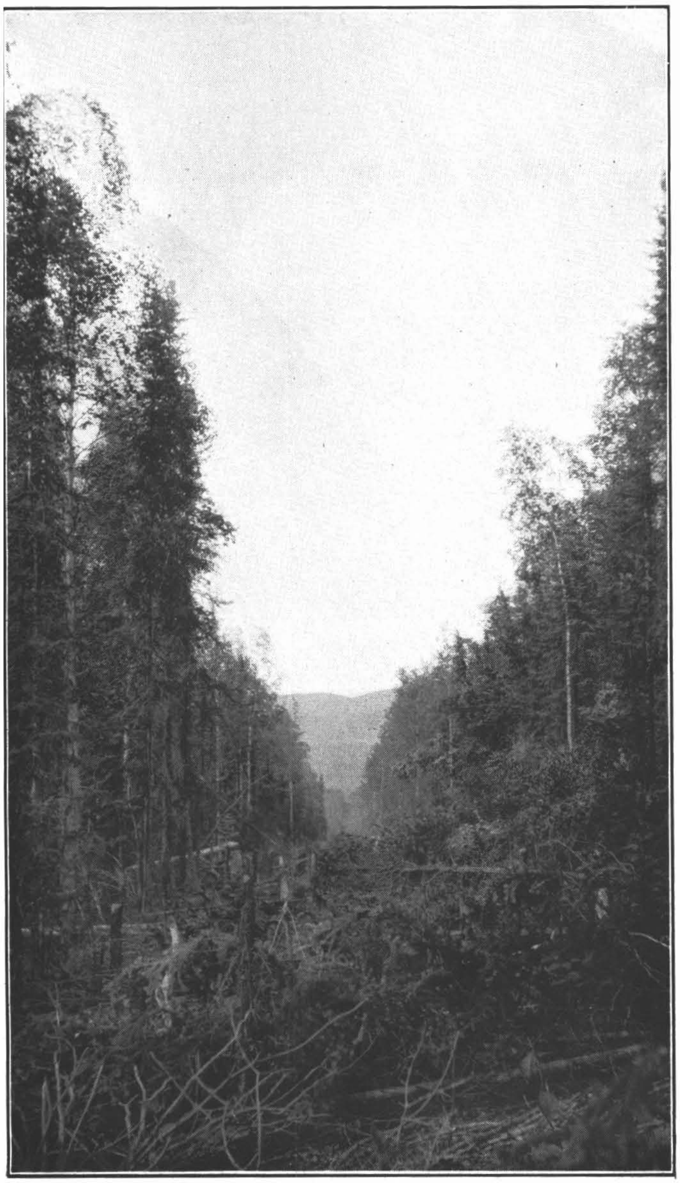
From	To	Computed distance. Feet.	Stadia error. Feet.	Ratio of error to horizontal distance 1 to	Stadia error in elevation. Feet.	Ratio of error in elevation to horizontal distance, 1 to
Cetera	Et	62541·9	− 97·9	639	− 0·6	104236
Et	Z_1	20826·4	−113·4	184	+ 1·8	11570
Z_1	Y_1	43742·7	−230·7	190	+ 24·8	1764
Y_1	X_1	54471·6	+ 33·4	1631	+ 66·1	824
X_1	W_1	73231·6	−304·6	240	+ 47·6	1538
W_1	Mon. No. 19	38245·9	−223·9	171	− 69·3	553
Mon. No. 19	V_1	12507·0	+ 25·0	500	− 14·2	881
V_1	U_1	32936·9	+ 93·1	354	− 41·6	792
U_1	T_1	60306·5	−186·5	323	− 63·6	948
T_1	S_1	61093·8	+160·3	381	+130·0	469
S_1	R_1	127121·0	− 7·8	16298	+ 31·7	4010
R_1	Q_1	113827·1	+149·3	762	− 1·3	87559
Q_1	P_1	59780·5	+133·5	448	+ 7·8	7664
P_1	Mon. No. 50	54976·3	− 35·0	1571	+ 4·7	11697
Mon. No. 51	O_1	22691·4	− 79·5	285	+ 13·8	1644
O_1	N_1	77373·9	+ 57·1	1355	−261·0	297
N_1	Mon. No. 62	69127·0	+178·5	388	− 98·3	703
Mon. No. 62	M_1	41898·9	− 73·5	570	− 41·9	1000
M_1	L_1	71385·5	+175·8	406	−141·8	503
L_1	K_1	78902·2	+ 31·1	2537	−124·4	634
K_1	J_1	66627·6	+353·7	188	− 12·8	5205
J_1	I_1	56697·8	−112·1	506	−138·1	411
I_1	H_1	73542·3	−471·8	156	+ 76·5	960
H_1	G_1	107252·2	−889·7	120	−124·8	859
G_1	F_1	82986·0	−370·6	224	−141·6	586
F_1	E_1	31573·2	−319·6	99	+ 60·3	524
E_1	D_1	58130·4	−184·1	316	+ 53·8	1080
D_1	C_1	18516·7	−127·7	145	− 55·8	332
C_1	B_1	52840·4	−231·4	228	− 7·2	7339
B_1	A_1	57538·3	−525·3	110	+ 0·2	287692
A_1	Mon. No. 111	27087·6	−180·5	150	+ 13·9	1949
Mon. No. 112	D	18279·7	−145	126	+138	132
D	E	25599·6	−125	205	+210	122
E	F	50670·9	− 72	704	+ 5	10134
F	G	123006·6	−215	572	−204	603
G	H	24492·9	− 59	415	− 27	908
H	Mon. No. 129	32120·4	−133	242	− 43	747
Mon. No. 131	I	32042·6	+213·9	150	+113·8	281
I	J	44599·4	+284·6	157	− 28·7	1554
J	K	83676·4	+244·6	342	+135·4	625
K	Mon. No. 147	73385·5	+349·5	210	−425·3	173
Mon. No. 147	L	32155·4	−365·3	88	− 37·9	848
L	M_1	7333·7	+ 5·2	1410	− 1·3	5641
M_1	N	50462·3	− 41·3	1222	− 7·0	7209
N	O	74983·8	+ 25·2	2976	+ 0·5	149967
O	P	31717·4	− 37·4	848	+ 11·5	2758
P	Q	19866·4	− 11·4	1743	− 6·6	3010
Q	R	39735·2	+304·3	131	− 2·4	16566
R	Mon. No. 165	15915·5	− 10·0	1591	− 2·1	7579

TABLE I—*Concluded.*

From	To	Computed distance. Feet.	Stadia error. Feet.	Ratio of error to horizontal distance 1 to	Stadia error in elevation. Feet.	Ratio of error in elevation to horizontal distance, 1 to
Mon. No. 165	S.	18894·6	+ 41·3	458	− 17·0	1112
S.	T.	125763·8	+199·9	629	− 21·6	5822
T.	U.	20961·3	+211·9	99	− 27·9	751
U.	V.	5627·0	+ 9·3	605	+ 11·6	485
V.	W.	77824·2	+141·0	552	−106·6	730
W.	X.	11213·7	+ 24·5	458	+ 31·3	358
X.	Mon. No. 182	24033·1	− 31·3	768	− 13·0	1848
Mon. No. 183	Y.	4391·1	+ 18·1	242	− 6·2	708
Y.	Mon. No. 187	36088·4	+162·8	222	+ 3·3	10936

TABLE II.—SUMMARY OF STADIA WORK BY YEARS, AND GRAND TOTAL.

From	To	Computed distance. Feet.	Stadia error. Feet.	Ratio of error to horizontal distance 1 to	Stadia error in elevation. Feet.	Ratio of error in elevation to horizontal distance, 1 to
1907.						
Mon. No. 112	Mon. No. 129	274170·1	− 749·0	366	+ 79·0	3470
1908.						
Mon. No. 131	Mon. No. 147	233703·9	+1092·6	214	−204·8	1141
1909.						
Mon. No. 165	Mon. No. 187	324797·2	+ 777·5	418	−146·1	2223
Mon. No. 111	Mon. No. 99	214113·4	−1249·0	171	+ 4·9	43697
1910.						
Mon. No. 147	Mon. No. 165	272169·7	−130·7	2082	− 45·3	6008
Mon. No. 99	Mon. No. 77	352051·5	−2163·8	163	−267·7	1315
1911.						
Mon. No. 77	Mon. No. 62	258814·2	+ 487·1	531	−320·9	807
Mon. No. 50	Mon. No. 19	522549·1	+ 331·9	1571	+ 53·5	9767
1912.						
Mon. No. 51	Mon. No. 62	169192·3	+ 156·1	1084	−345·5	490
Mon. No. 19	Mon. No. 1	293060·1	− 937·1	312	+ 70·4	4162
Totals		2914621·5	−2384·4	1222	−1122·5	2596



"A 20-foot clear sky-line."

VISTA CUTTING.

Wherever timber was encountered on the line, a vista was cleared through it having a "20-foot clear sky-line" *i.e.*, nothing except low underbrush was left standing within 10 feet of the line on either side. In some localities this necessitated the felling of trees at a considerably greater distance from the line than ten feet in order to clear away the overhanging branches, as none of these were allowed to remain within the 20-foot limit, and though this increased the cutting very much at certain points, the line now constitutes a very prominent and noticeable feature of the landscape, and one that will remain so for very many years owing to the slow growth of timber in those northern latitudes.

MONUMENTING.

The chief of the stadia party selected the sites for the permanent monuments. Naturally the main projection stations were usually chosen as monument sites, and sufficient sites between these were selected to fulfil the conditions governing the monumenting.

Article II of the Convention of 1906[1] reads, in part, as follows:—

"The location of the 141st Meridian as determined hereunder shall be marked by intervisible objects, natural or artificial, at such distances apart as the Commissioners shall agree upon, and by such additional marks as they shall deem necessary . . . ."

The Commissioners, in accordance with this Article, agreed that the line would be sufficiently marked by setting monuments at suitable intervals along it, subject to the following general conditions:—

1. The monuments should be at an average distance apart of not more than three miles.

2. Except where topographic conditions rendered it impracticable, the distance between any two adjacent monuments should not exceed four miles.

[1]Page 16, this report.

3. The monuments thus set should be intervisible, this being interpreted to mean that each monument should be intervisible with one or more other monuments, though not necessarily with an adjacent monument.

4. The monuments set between points determined by the line projection party should be carefully aligned, and their departure from the true line should in no case exceed one foot.

Thirty-inch conical monuments of aluminum bronze were adopted for general use, except that at the crossings of the larger rivers five-foot pyramidal monuments of the same alloy were substituted for the smaller type.

In all, eleven of these large monuments were set, located as follows:—

Monument No.	1	Arctic Coast.
	32	Old Crow River.
	50	Porcupine River.
	70	Black River.
	111	Yukon River, north bank.
	112	Yukon River, south bank.
	121	Fortymile River.
	130	Sixtymile River.
	147	Ladue River.
	182	White River, north bank.
	183	White River, south bank.

To facilitate transportation on pack-horses, these large monuments were made of the same sectional design as those used in monumenting the Boundary Line along the 49th Parallel west of the summit of the Rocky Mountains, their principal dimensions being: height 63 inches, width at bottom 10 inches, width at top 6 inches, and their average thickness about one-quarter of an inch. The total weight of each, including base-plates, bolts, etc., is about 250 pounds. The cut on page 188 shows dimensions and details of design.

The smaller monuments are 30 inches in height and 9 inches in diameter at the bottom, with four fluted legs, each 9 inches in length. They are of about the same average thickness as the large monuments, and each weighs from 55 to 60 pounds. The details are shown on page 189.

A copy of the specifications for one lot of the small monuments follows, in part, and gives details as to the composition of the alloy, and its tensile strength, and other conditions to be complied with.

Specifications for aluminum bronze Boundary Monuments:—

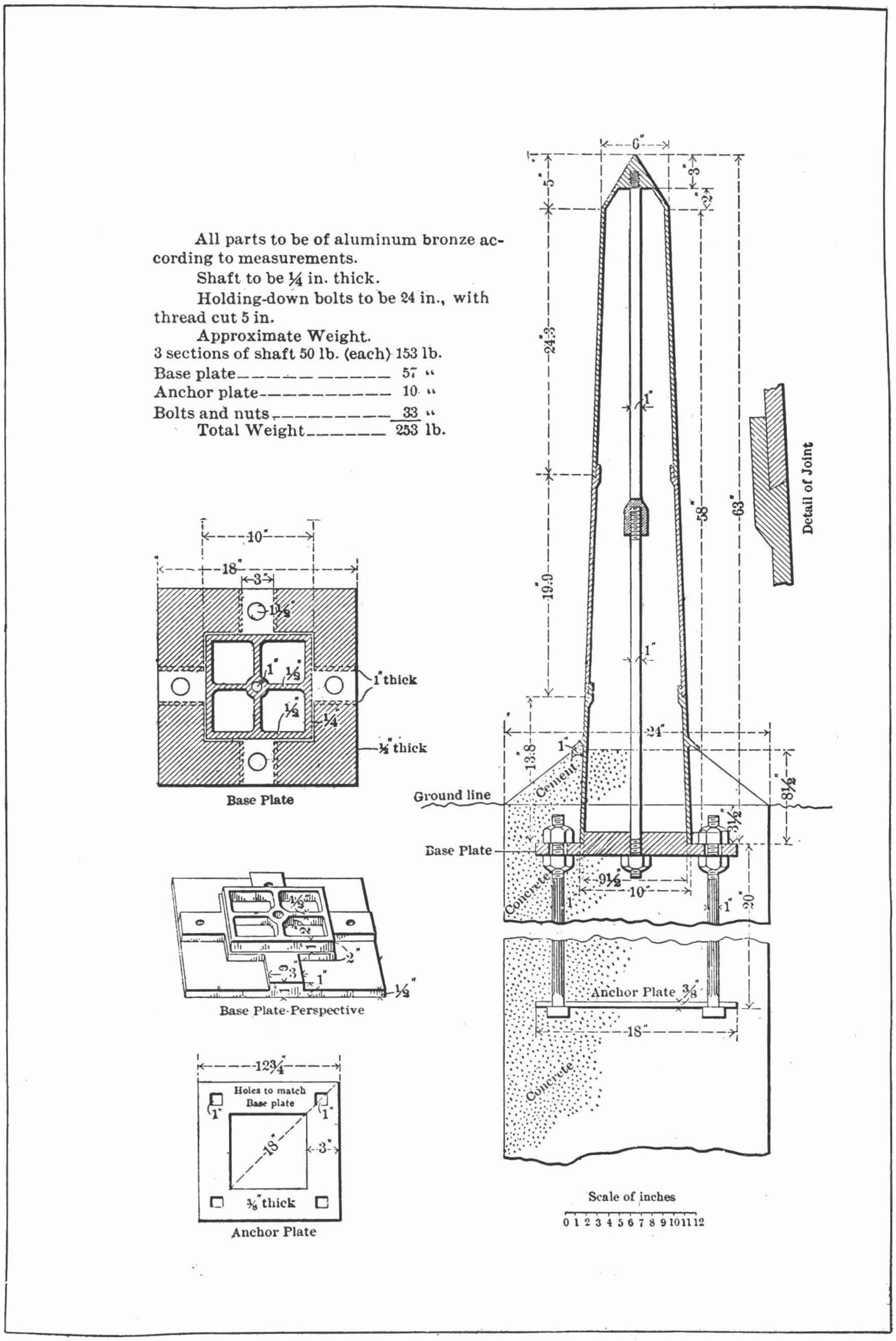
1. The bronze shall consist of aluminum and copper with no admixture of zinc or tin. It shall consist of not less than eight and one-half per cent (8½%) or more than ten and one-half per cent (10½%) of the best aluminum, and the balance of the best copper. The tensile strength of such casting must exceed forty thousand (40,000)pounds per square inch.

2. On two diametrically opposite positions on the monuments are to be cast in raised letters the words " Canada " and " United States," as shown in the accompanying drawings.

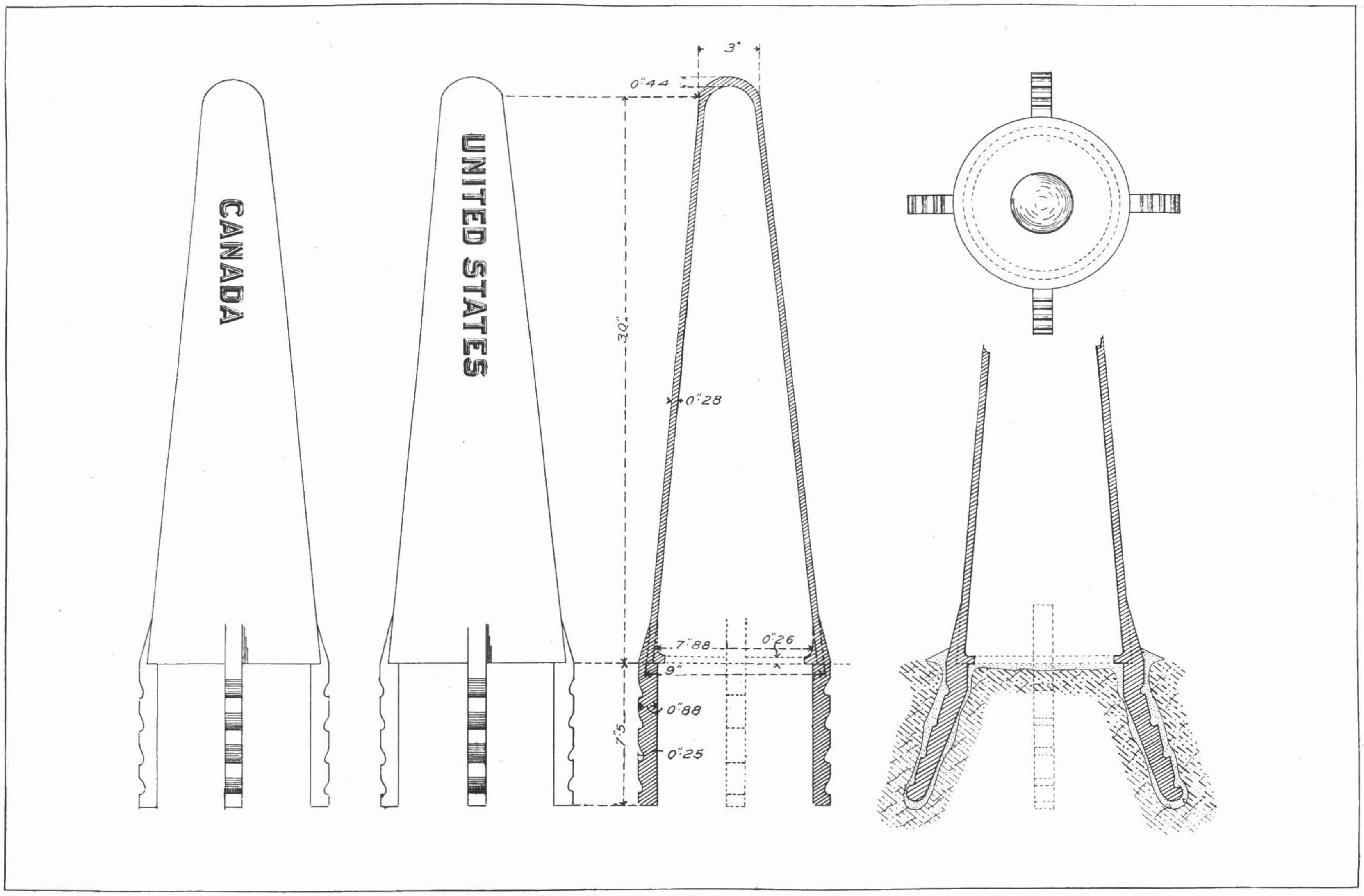
3. The monuments must be good sound castings, free from blow holes or flaws. The body of the monument must be of uniform thickness throughout except at the top, where it is to be made somewhat heavier, as shown in the drawings, to permit of driving the legs into drill-holes in rock.

4. Owing to the great shrinkage of aluminum bronze, great care must be taken that at the junction between body and legs shrinkage cracks do not occur and weaken the legs. The stability of the monument depends on the strength of the legs, and no monuments will be accepted with any defect of the above nature.

5. On completion, the monuments will be examined by an inspector appointed by the department and only those found satisfactory will be accepted.



Details of large monuments.



Details of small monuments.

6. Each monument is to be suitably packed for shipment in a separate box or crate, and delivered f.o.b. cars, Whitehorse, Yukon Territory

In designing these small monuments, provision was made for setting them in solid rock by drilling four holes into which the legs could be driven and then grouted with cement. In practice, however, all the monuments, both large and small, were set in concrete bases, no instance occurring where there was solid rock at the monument site suitable for drilling.

The concrete bases averaged 3 feet square and from 2½ to 3 feet deep. Each contained 200 pounds of cement, except in a few cases where the cement supply was low, with sand and broken rock in the proportion of 1:2:4, the base or pier being finished off smoothly with a rich mixture of cement and sand.

In setting the earlier monuments a wooden frame was made to shape the upper edge of the base, but later, when it was difficult or impossible to procure suitable wood for this purpose except by hewing it out, and when practice had, to some extent at least, made perfection in the matter of excavating base pits square and true with sharp corners and edges, the forms were dispensed with, and much valuable time saved.

For the large monuments a thin layer of rather " poor " concrete was first tamped into the bottom of the pit, then a good mixture added until the proper level was reached for the setting of the anchor plates and bolts. After these had been set, concrete was added almost up to the level of the base-plate, and this was allowed to set until sufficiently strong to support the weight of the monument. The base-plate was then centered and adjusted, the monument assembled and fastened to the base-plate and made plumb, then the remainder of the concrete was tamped in and the facing put on.

In the case of a small monument, good concrete was well tamped in on top of a thin layer of poor mixture until, when the monument was set on the concrete, its base was just about at ground level. It was then centered and made plumb, and the balance of the concrete added and faced, as with the large monuments.

Two methods of centering a monument were employed. If the site had already been tied in to the triangulation, great care was exercised to get the monument exactly over the point selected. This was done either by the instrument man setting four reference hubs from which the monument man measured later, or if only the monument hub itself was set, a large tripod was erected and so adjusted that a plumb-bob suspended from the apex hung directly over the point. Care was then taken not to disturb this tripod during the excavation of the pit or the setting of the monument, which was centered by the plumb-bob.

When the monument was not to be set exactly at the instrument station, the instrument man simply set two hubs on line near the instrument and, say, three or four meters apart, and the monument was set where most convenient between these points, the distance to the instrument station being afterwards carefully measured and recorded.

As may be easily imagined, it was only occasionally that good sand, suitable rock, and a water supply were convenient to a monument site, and it was the first duty of the monumenting party to " prospect " for sand, rock, and water, and then to get them to the site by pack-horse. Rock was usually found reasonably close, and was broken up by hand with a light mashing hammer. Water was carried to the site in cylindrical cans with a capacity of about ten gallons each, three of these usually being required for each base. Good sand was sometimes very difficult to locate, and on one occasion had to be carried over 8 miles.

The cement was specially packed in double sacks, an inner sack of light cotton containing 50 pounds of cement loosely packed, with an outer sack of eight ounce duck for protection against dampness and rough handling. It was found that the cement kept in much better condition and was much more easily handled, particularly on pack-horses, when packed loosely than when made up into small compact packages. The concrete was mixed on a mixing sheet of 10-ounce canvas, 8 feet square, a place being levelled for it when necessary close to the monument site. With this sheet three men, or preferably four, could mix the concrete for a pier in about four batches.

Type of large monument. (Monument No. 182.)

In spite of the roughness of some parts of the country, it was found possible to take the monument, the materials for the pier, and the tools, by pack-horse to every site but two on the whole line between Mount Natazhat and the Arctic Ocean. Curiously enough, these two exceptions were Nos. 12 and 181, originally projection stations X and X_1, although over five hundred miles apart. In these two cases the outfit had to be back-packed by the men for a short distance.

Type of small monument, and method of numbering. See page 192.

It should not be judged, however, that because it was possible to take the horses to most of the sites, it was easy to do so. It was found more economical, on account of the great weight of material to be moved, to spend time prospecting for and making a trail up to a site, than to attempt to carry the material any distance on the men's backs. When neither sand, rock, nor water was available at a site, the total weight to be moved was about eighteen hundred pounds, made up as follows:—

	lbs.
Monument	55
Mixing sheet, tools, etc.	45
Water	300
Sand	400
Stone	800
Cement	200
Total	1,800

It can easily be seen how the monumenting pack-train came to be known as the "goat train." The horses soon learned to recognize the pickets and signals left by the instrument party, and after a hard climb would gather round the first signal they came to, and appeared quite indignant at not having their packs removed, if it did not happen to be the monument site.

The monuments were numbered consecutively from the north, No. 1 being the large monument on the Arctic coast. At various points where the distance between adjacent monuments, as originally set, seemed excessive, and where a suitable site could be found, extra monuments were set by the inspection party, each of these new monuments being given the same number as the monument immediately north of it, qualified by an "A," thus, 46 A. The numbers were drilled into the monuments, using specially prepared brass templates. The figures are one and one-half inches in height and each figure is composed of a series of eighth or three-sixteenth-inch holes drilled to a depth of about one-eighth of an inch. A brass collar with set-screws was originally designed to hold the templates on the monument during the drilling, but a good strong leather thong was found to be an efficient substitute for the cumbersome collar.

TOPOGRAPHY.

Article II of the Convention of 1906[1] specified that the location of the marks should be described " by such views, maps, and other means " as the Commissioners should think necessary.

In accordance with this clause and the resultant decision of the Commissioners, a belt of topography along the boundary averaging four and a half to five miles wide, was mapped on a field scale of 1/45,000, with a contour interval of 100 feet. From the Arctic Ocean to Mount Natazhat this mapping was done by ordinary plane-table methods, while between Mounts Natazhat and St. Elias the photo-topographic camera was employed, using the plane table for securing the details of some of the glaciers and main valley bottoms.

For the plane-table mapping, Fauth telescopic alidades with verniers reading to 1′, and standard United States Geological Survey 18 inch by 24 inch plane tables with Johnson head tripods were used. Stadia measurements along the Boundary Line furnished contour and stream crossings and the positions of summits, and stadia and foot traverses of streams and gentle slopes controlled the drainage and location and spacing of contours where necessary. These traverses were adjusted between control points and the sketching was done by the topographer from monument sites, triangulation stations and other points occupied by the plane table. Timber sheets showing the character and density of the timber, and bare and burned areas, were also made in the field by the topographer, from which the timbered areas were shown on the published sheets by conventional symbols.

The triangulation, as already shown, furnished the trigonometric control for the topography, but when the topography was in advance of the triangulation, as it was on one or two occasions at the beginning of a season, the topographers measured a short base and used a small temporary system of triangulation until they could adjust their work to the main scheme.

As already explained on page 32, an approximate datum of 835 feet above mean sea-level was adopted for water level of the Yukon River at the crossing of the boundary, the elevations being carried north and south by the vertical angles read in connection with the triangulation. A temporary datum was also adopted at the White

[1] Page 16, this report.

River when independent work was commenced there in 1909, and these datum-planes were later adjusted to the precise level results at Monument No. 126, to mean sea-level at the Arctic Ocean, and to the Copper River and Northwestern Railway levels.[1] When all adjustments were made, the assumed datum at the Yukon was found to be in error only 38·4 feet, the correction being plus, and the elevations deduced from the vertical angles were found to be very satisfactory, the corrections being small, considering the distances the elevations had been carried.

For the rough and almost inaccessible region between Mount Natazhat and Mount St. Elias the photo-topographic camera was used, governed, like the plane table, by trigonometric control. In this region the camera proved itself indispensable, as, on account of bad weather conditions and the ruggedness of the country, the mapping probably could not have been done by any other method without serious loss of time. Both the Canadian and the United States patterns of camera were used, following the usual method as laid down in Deville's " Photographic Surveying"[2] and Flemer's " Photographic Methods and Instruments."[3] In 1907 and 1908 a photographic survey was also made of the topographic belt from the Yukon south for over one hundred miles.

The camera work was plotted in the office on a scale of 1/40,000, with a contour interval of 100 feet, the sheets being therefore similar to the plane-table sheets,except that the former embraced fifteen minutes in latitude each, while the latter covered only ten minutes.

It is interesting to note that in plotting the topography between Mount St. Elias and the Logan Glacier, extensive use was made of a series of photos taken from a shoulder of St. Elias by the official photographer of the Abruzzi expedition in 1896. The focal length and azimuths of these photos were found graphically, and in combination with the photos taken by the topographers of the Boundary Survey, they yielded considerable valuable information.

MAPS.

The total area covered by the two methods, plane-table and camera, was about six thousand square miles, though only a little over half of this is shown on the boundary sheets, their scope being confined to the narrow belt along the line.

Each of the sheets covers fifteen minutes of latitude, and is published in the conventional colours. All are on a scale of 1/62,500 which, for all practical purposes, may be taken as one mile to the inch. There are thirty-eight sheets in all, the sheet showing the Arctic Coast being No. 1, and the others being numbered consecutively southward with Mount St. Elias on Sheet No. 38.

In addition to the usual details of the ordinary map as to title, scale, etc., these sheets show the names[4] of the chiefs of the parties and sub-parties who did the work, both United States and Canadian, and bear certificates showing that the maps are true copies of the originals. The certificates read as follows:—

We certify that this map is a copy of Sheet No......... of the thirty-eight (38) maps prepared and adopted by us under Article II of the Convention between Great Britain and the United States, signed at Washington April 21, 1906, on which we marked the Boundary Line as established in accordance with said Convention.

[1] See page 182, this report.
[2] Ottawa: Government Printing Bureau, 1895.
[3] " Report of the Superintendent of the U. S. Coast and Geodetic Survey for 1897," Appendix No. 10. Washington: Government Printing Office.
[4] Page 102, this report.

On each sheet this certificate bears the signatures, in facsimile, of the two Commissioners. The thirty-eight maps referred to in this certificate are the original maps prepared in quadruplicate, printed on special bond paper, and actually signed by the Commissioners, two sets of which have been deposited by each Commissioner with his Government. The certificates on these quadruplicate "originals" read:—

We certify that this map is one of the two (2) duplicate sets of thirty-eight (38) maps prepared and adopted by us under Article II of the Convention between Great Britain and the United States signed at Washington April 21, 1906, and that we have marked thereon the Boundary Line as established in accordance with said Convention.

These maps were engraved on copper, and the engravings were then transferred to stone, from which the maps were printed. A limited edition of the maps was printed for each Government and is to be issued in atlas form, complete with title page, index sheet, and a profile of the line.

In addition to the regular thirty-eight sheets there are two supplementary sheets, one on a scale of 1/125,000 showing the topography in the vicinity of Monument No. 1 at the Arctic Coast and as far west as Demarcation Bay, and the other on a scale of 1/250,000, showing such topography as it has been possible to develop from photographs secured by the parties working in the region between Mount Natazhat and Mount St. Elias.

It is interesting to note that in developing the topography outside the limits of the regular boundary maps, the topographers have been able to identify two of the peaks seen by Abruzzi from the summit of Mount St. Elias, and named by him Bona and Lucania. In plotting from the photographs, a high peak was noted well to the westward of Mount Natazhat, and a search through the results of the triangulation showed a peak, called "Dome" at the time of observation, in latitude 61° 23′ 03″.16 and longitude 141° 45′ 04″.22, this being later identified as Mount Bona.

Mount Lucania is also well connected with the triangulation, the computations giving its position as, latitude 61° 01′ 16″.05 and longitude 140° 27′ 54″.15, with an elevation of 17,147 feet. While in the field the observers took this peak to be Mount Steele, named by McArthur when he saw it in 1900 from the mountains on the east side of Lake Kluane.

Abruzzi says of these peaks:—

On the far horizon, somewhere between fifty and one hundred miles off, a broad summit towered up behind the western corner of Mount Logan, which was ascertained by the compass to be at 328°. H.R.H. named this peak "Lucania" in remembrance of the ship that had brought us to America. West of this new peak, at about the same distance and due north of St. Elias, we described another great mountain at 326°, which we believed to be identical with the peak christened Mount Bear by Russell in 1891. Finally, to the northwest, some 200 miles off, a conical peak soared up at 311°, apparently of even greater height than the other two. This was christened the "Bona," after a racing yacht then belonging to H.R.H. These three peaks really seem to rival Mount St. Elias in height, and must approach 18,000 feet in height. None of them showed any sign of volcanic activity.[1]

On his panoramic view, taken from the northwestern ridge of Mount St. Elias at an elevation of 16,500 feet, he marks these peaks and also Mount Logan and Mount Bear, and even a casual examination of his statement in the above paragraph will show that there has been an error, probably typographical, as his bearings give 15° between Mount Bona and Mount Bear, and only 2° between Mount Bear and Mount Lucania. Mount Bear is easily identified from Russell's description,[2] and by laying

[1] Abruzzi: "The Ascent of Mount St. Elias," p. 159.
[2] "Thirteenth Annual Report of the United States Geological Survey," Part ii, p. 47.

off Abruzzi's bearings on the map, beginning with Mount Bear as 326°, Mount Bona reads 311° almost exactly, while Mount Lucania reads 348°, Abruzzi's 328° being evidently a typographical error for this. The magnetic declination also shows as 29°, which is fairly correct.

The elevation of Mount Bona, determined trigonometrically, is only 16,421 feet and it is distant from Mount St. Elias only about eighty miles, but the evidence in favour of the identification is so strong that Abruzzi's estimate of distance and elevation may safely be disregarded.

The only departure from conventional mapping methods will be noticed in connection with the glaciers and snowcapped peaks of the southern portion of the line. It was early seen that on account of the vastness of the ice and snow-fields, and the great number of permanently ice and snow-capped mountains, ordinary methods suitable for indicating small fields of snow and ice would be entirely inadequate. After considerable experimenting and discussion, it was finally decided to contour these vast fields in blue, using brown as usual for the terraine, as it was felt that with so much detailed information on file as to the conformation of these fields, shown on the photographs of the region, it would be a mistake not to take advantage of it and incorporate it in the maps.

OBSERVATIONS FOR MAGNETIC DECLINATION.

The earliest value of the magnetic declination in the vicinity of the 141st Meridian of which we have record was determined at sea south of Mount St. Elias in May, 1778, by Captain Cook. Observations on shore at Port Mulgrave (Yakutat Bay) were made by Captain Dixon in 1787, by Malaspina in 1791, by Vancouver in 1794, by Khromchenko in 1823, and since the purchase of Alaska by the United States, by officers of the Coast and Geodetic Survey in 1874, 1880, 1892, and 1903, and at several triangulation stations between Port Mulgrave and Mount St. Elias in 1892 and 1894.

In 1887, Wm. Ogilvie, D.L.S., made magnetic observations at several places in connection with his determination of the 141st Meridian at its intersection with the Yukon River, and an extended series of observations was made at Camp Davidson on the Yukon near the boundary by J. E. McGrath of the Coast and Geodetic Survey in 1889-91, while J. H. Turner of the same bureau made observations in 1889-90 at Rampart House on the Porcupine River, in the valley of the Three Rivers, and at the mouth of the Firth River. Observations were made near a number of Ogilvie's stations by J. C. Pearson, magnetic observer of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington in 1907, and by J. W. Green of the Coast and Geodetic Survey in 1908.

In connection with the demarcation of the 141st Meridian, magnetic observations were made by A. I. Oliver in 1908, 1909, and 1910, by D. W. Eaton in 1910, by Thos. Riggs, jr., in 1910 and 1913, by W. C. Guerin in 1909 and 1910, by F. S. Ryus in 1910, by A. C. Baldwin in 1911, and by W. B. Gilmore in 1912. The results in 1908, 1909, and 1910, for which the year only is shown, were determined by the compass needle and protractor of the plane table, and are not reduced to mean of day. The other results of observations taken since 1907 were determined by means of Coast and Geodetic Survey compass declinometers. The results of these observations are shown in the following table.

VALUES OF THE MAGNETIC DECLINATION IN THE VICINITY OF THE 141ST MERIDIAN.

Note.—Results since 1907 showing the year only are by compass needle and plane-table protractor. Other results since 1907 are from observations with U. S. C. & G. Survey compass declinometers.

Station.	Latitude.	Longitude.	Date.	Declination, East	Observer.
	° ′	° ′		° ′	
Near Monument No. 1	69 39	141 00	1912 Aug. 2	40 22	W. B. Gilmore.
Mosquito	27	141 13	1912 July 22	40 38	"
Aurora	15	140 50	1912 July 11	40 37	"
Near Empire	69 08	140 53	1912 June	40 42	"
Tub	68 58	140 58	1912 June 17	39 51	"
Siwash	48	141 18	1911 July 30	39 01	A. C. Baldwin.
Shark	39	140 55	1911 July 28	39 11	"
Valley of Three Rivers	37	141 00	1890 April	40 33	J. H. Turner.
Coral	31	141 14	1911 July 18	38 09	A. C. Baldwin
Wee	25	141 14	1911 July 15	38 09	"
Yankee	19	141 13	1911 July 8	37 52	"
Pasture	68 08	141 14	1911 July 1	38 20	"
Comb	67 50	141 12	1911 June 26	38 55	"
Gun	36	140 58	1911 June 13	38 42	"
Near Monument No. 50	25	141 00	1912 May 30	37 04	W. B. Gilmore.
Camp Colonna	67 25	140 59	1890 June	38 06·8	H. W. Edmonds.
Storm	66 51	141 08	1910 Aug. 28	37 03	T. Riggs, jr.
	37	141 02	1910	37 25	A. I. Oliver.
	37	140 57	1910	37 35	"
	36	140 54	1910	37 15	"
	36	141 07	1910	37 45	"
	34	141 04	1910	38 15	"
	33	141 03	1910	37 10	"
	33	141 02	1910	37 35	"
	33	141 03	1910	37 30	"
	31	141 02	1910	37 15	"
	29	141 00	1910	37 30	F. S. Ryus.
	25	141 00	1910	37 20	"
Igloo	21	141 11	1910 Aug. 1	36 40	T. Riggs, jr.
	21	141 00	1910	37 00	F. S. Ryus.
	19	141 02	1910	37 15	"
Fishing	14	140 59	1910	37 15	"
Fishing	14	140 59	1910	36 50	A. I. Oliver.
	11	140 59	1910	37 10	F. S. Ryus.
Stripe	06	140 58	1910 July 20	37 06	A. I. Oliver.
	66 00	141 00	1910	37 00	W. C. Guerin.
Bench	65 57	141 16	1910 July 15	36 34	A. I. Oliver.
Kandik	55	140 54	1910 July 11	37 01	"
	55	141 00	1910	37 00	W. C. Guerin.
Fire	65 48	141 12	1910 July 9	36 31	A. I. Oliver.
	46	141 00	1910	36 45	W. C. Guerin.
Seal	46	140 50	1910 July 7	37 12	A. I. Oliver.
	44	141 00	1910	36 45	W. C. Guerin.
	39	141 00	1910	36 55	"
Union	36	141 01	1910 June 28	36 37	A. I. Oliver.
	34	141 04	1910	36 45	W. C. Guerin.
Halley	34	141 04	1910 June 27	36 26	A. I. Oliver.
Yellow	28	141 03	1910 June 19	36 36	"
	26	141 01	1910	36 40	W. C. Guerin
	21	141 00	1910	37 10	"
Casca	21	141 03	1910 June 13	36 22	A. I. Oliver.
	20	141 01	1910	36 40	F. S. Ryus.
Nation	16	141 08	1910 June 9	36 35	A. I. Oliver.
View, N.E.	16	140 55	1910 June 8	36 20	"
	16	141 00	1910	37 10	F. S. Ryus.
	14	141 02	1910	39 00	"
	13	140 56	1910	35 00	"
	13	141 04	1910	36 55	"
	12	140 56	1910	35 15	"
	10	140 59	1910	36 10	"

VALUES OF THE MAGNETIC DECLINATION, ETC.—*Continued.*

Stations.	Latitude.	Longitude.	Date.	Declination, East.	Observer.
	° ′	° ′		° ′	
	10	141 00	1910	36 20	F. S. Ryus.
	10	141 00	1910	36 00	W. C. Guerin.
	04	141 00	1910	36 00	"
	65 00	141 00	1910	36 05	"
	64 57	141 03	1910	36 05	"
	57	141 00	1910	36 00	"
	52	141 01	1910	35 45	"
	47	141 04	1910	35 10	"
Fort Egbert................................	47	141 12	1908 June 20	35 55·5	J. W. Green.
Fort Egbert................................	47	141 12	1905 July	35 51	E. Smith.
	42	141 00	1910	35 30	W. C. Guerin.
Monument No. 112..........................	41	141 00	1913 June 29	35 07	T. Riggs, jr.
Boundary..................................	41	141 00	1907 Aug. 27	35 31·0	J. C. Pearson.
Camp Davidson.............................	41	140 54	1908 June 19	35 36·2	J. W. Green.
"	41	140 54	1907 Aug. 28	35 41·2	J. C. Pearson.
"	41	140 54	1889–91	35 44·8	J. E. McGrath.
"	41	140 54	1888 Feb. 27	35 46·4	W. Ogilvie.
Monument No. 114A.........................	36	141 00	1913 June 30	34 55	T. Riggs, jr.
Fortymile.................................	26	140 32	1887 Sept. 12	35 01·1	W. Ogilvie.
"	25	140 35	1908 June 19	34 41·2	J. W. Green.
"	25	140 35	1907 Aug. 26	34 50·6	J. C. Pearson.
Monument No. 121..........................	19	141 00	1913 July 10	34 37	T. Riggs, jr.
Monument No. 126A.........................	04	141 00	1913 July 17	34 25	"
Dawson....................................	04	139 26	1912 Sept. 25	34 57	T. Riggs, jr.
"	04	139 26	1908 June 15	35 04·0	J. W. Green.
"	04	139 26	1907 Aug-Sept	35 02·4	J. C. Pearson.
	02	141 01	1908	34 10	A. I. Oliver.
	01	141 04	1908	34 45	"
	01	140 58	1908	34 35	"
	01	140 58	1908	34 05	"
	00	141 03	1908	34 05	"
	00	140 58	1908	34 45	"
	64 00	140 54	1908	34 25	A. I. Oliver.
	63 59	141 03	1908	34 35	"
	58	141 03	1908	34 00	"
	57	141 04	1908	34 35	"
	57	141 04	1908	34 05	"
	55	141 00	1908	33 40	"
	53	141 00	1908	33 30	"
	52	141 03	1908	33 30	"
	52	141 02	1908	32 55	"
	52	140 59	1908	33 10	"
	50	141 02	1908	33 10	"
	50	141 01	1908	32 45	"
	50	141 02	1908	33 00	"
	49	141 02	1908	33 30	"
	45	141 01	1908	33 00	"
	44	141 02	1908	34 50	"
	42	140 57	1908	34 20	"
	42	140 58	1908	33 15	"
Monument No. 136..........................	42	141 00	1910 Aug. 6	33 37	D. W. Eaton.
	41	140 57	1908	32 00	A. I. Oliver.
	40	141 02	1908	33 10	"
	40	141 00	1908	33 50	"
Monument No. 137..........................	39	141 00	1910 Aug. 2	33 48	D. W. Eaton.
	39	141 00	1908	35 30	A. I. Oliver.
	39	141 00	1908	34 30	"
	39	141 02	1908	32 20	"
	38	141 02	1908	34 15	"
	38	141 03	1908	33 10	"
	38	140 57	1908	33 15	"
	38	141 03	1908	33 30	"

VALUES OF THE MAGNETIC DECLINATION, ETC.—*Continued.*

Station.	Latitude.	Longitude.	Date.	Declination, East.	Observer.
	° ′	° ′		° ′	
Monument No. 138	37	141 00	1910 Aug. 1	33 50	D. W. Eaton.
	36	140 57	1908	33 05	A. I. Oliver.
	36	140 58	1908	33 20	"
	·36	140 59	1908	35 20	"
Monument No. 139	34	141 00	1910 July 27	33 29	D. W. Eaton.
	34	141 04	1908	33 30	A. I. Oliver.
Monument No. 140	33	141 00	1910 July 23	33 35	D. W. Eaton.
	32	141 04	1908	31 20	A. I. Oliver.
	31	140 58	1908	34 00	"
	31	140 59	1908	34 05	"
Monument No. 141	31	141 00	1910 July 22	33 32	D. W. Eaton.
	30	140 57	1908	34 10	A. I. Oliver.
Summit	29	141 08	1910 July 18	33 22	D. W. Eaton.
Monument No. 142	28	141 00	1910 July 16	33 56	"
Nonument No. 143	25	141 00	1910 July 14	33 56	"
Monument No. 144	23	141 00	1910 July 9	33 07	"
Stewart River	22	139 28	1887 Aug. 27	33 53	W. Ogilvie.
Monument No. 145	21	141 00	1910 July 6	33 52	D. W. Eaton.
Stewart	18	139 29	1907 Sept. 7	34 04·4	J. C. Pearson.
Monument No. 146	18	141 00	1910 June 29	33 40	D. W. Eaton.
	18	141 00	1908	33 10	A. I. Oliver.
	18	140 58	1908	33 30	"
	17	140 56	1908	33 00	"
	16	140 57	1908	32 35	"
	16	140 55	1908	32 52	"
	63 16	141 04	1908	34 50	A. I. Oliver.
Monument No. 147	16	141 00	1913 July 27	33 56	T. Riggs, jr.
	16	140 56	1908	33 45	A. I. Oliver.
	12	141 04	1908	32 00	"
White River	12	139 38	1887 Aug. 26	34 28	W. Ogilvie.
	12	140 56	1908	32 45	A. I. Oliver.
	11	141 01	1908	32 30	"
	07	141 00	1909	32 35	"
	07	141 01	1909	32 40	"
	07	140 58	1909	32 45	"
	06	141 00	1909	33 30	"
	06	141 01	1909	33 20	"
	06	140 58	1909	33 10	"
	05	140 57	1909	33 35	"
	05	141 01	1909	33 40	"
	05	140 59	1909	33 15	"
	05	140 59	1909	33 05	"
	04	141 04	1909	33 10	"
	04	141 02	1909	32 55	"
	04	140 56	1909	32 30	"
	63 00	140 56	1909	33 15	"
	62 58	140 56	1909	33 10	"
	57	141 00	1909	32 25	"
	57	140 56	1909	32 55	"
	57	140 58	1909	32 45	"
	57	140 57	1909	33 30	"
	56	141 02	1909	32 30	"
	56	141 00	1909	32 20	"
	55	141 04	1909	32 15	"
	55	140 57	1909	33 05	"
	55	141 01	1909	32 45	"
	54	141 02	1909	31 50	"
	54	141 02	1909	31 50	"
	54	140 58	1909	32 35	"
	53	141 00	1909	32 25	"
	53	140 59	1909	33 00	"
	53	141 03	1909	32 45	"
	53	140 55	1909	32 00	"

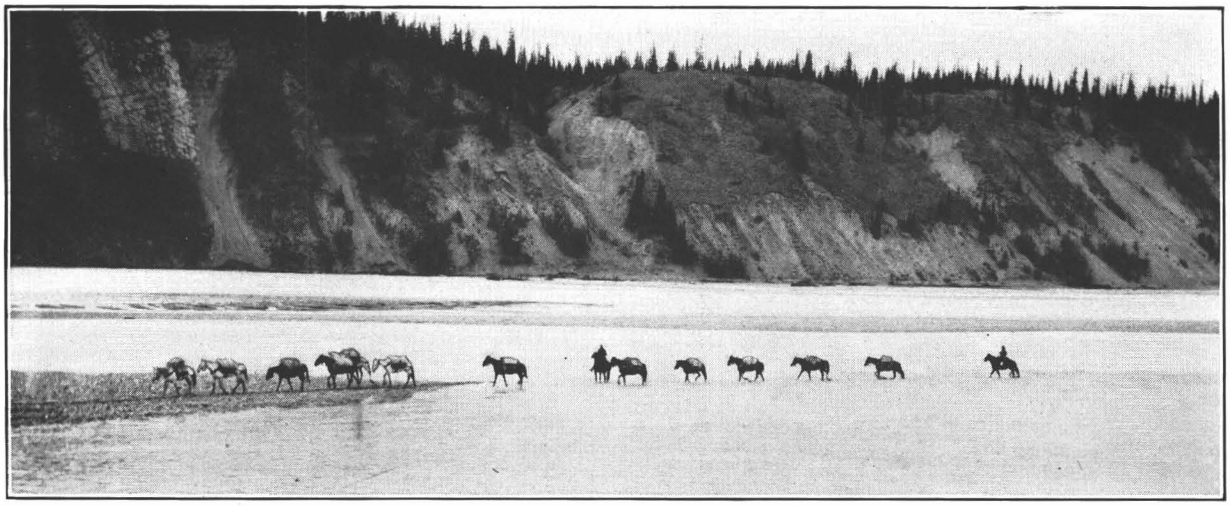
VALUES OF THE MAGNETIC DECLINATION, ETC.—*Concluded.*

Station.	Latitude.	Longitude.	Date.	Declination, East.	Observer.
	° ′	° ′		° ′	
	53	140 56	1909	32 00	A. I. Oliver.
	53	140 58	1909	32 30	"
	46	141 02	1909	33 00	"
	45	140 59	1909	33 00	"
	44	140 59	1909	32 45	"
	44	140 56	1909	33 10	"
	42	141 11	1909	32 30	"
	39	141 00	1909	32 35	"
	39	140 57	1909	32 15	"
	39	141 01	1909	32 20	"
Monument No. 163	35	141 00	1913 Aug. 5	32 51	T. Riggs. jr.
	34	141 00	1909	32 15	A. I. Oliver.
	33	141 03	1909	32 10	"
	32	141 00	1909	32 25	"
Monument No. 166	28	141 00	1913 Aug. 7	32 54	T. Riggs, jr.
	28	141 00	1909	32 35	W. C. Guerin.
	62 25	140 59	1909	32 40	"
	18	141 00	1909	32 30	"
	14	141 00	1909	32 58	"
	14	141 04	1909	32 20	"
	11	141 00	1909	32 35	"
	04	141 00	1909	35 30	"
	62 03	141 00	1909	35 05	"
Monument No. 177	61 58	141 00	1913 Aug. 15	30 54	T. Riggs, jr.
	57	141 00	1909	35 10	W. C. Guerin.
	56	141 00	1909	32 35	"
Rabbit	52	140 58	1909	32 00	"
Kletsan	44	140 58	1909	30 15	"
	38	141 00	1909	31 00	"
Monument No. 187	37	141 00	1913 Aug. 19	31 33	T. Riggs, jr.
Yahtse, East Base	59 49	141 08	1894 July	30 30	J. E. McGrath.
Mount Hoorts	45	139 32	1892 Aug.	30 51	"
Malaspina, Northeast Base	45	140 06	1892 Aug.	30 42	"
Malaspina, Southwest Base	44	140 12	1894 June	30 43	"
Port Mulgrave	34	139 47	1892 Sept. 3	29 55·8	J. H. Turner.
Ocean Cape	32	139 52	1892 Aug.-Sep.	30 24	J. E. McGrath.
At sea	28	140 53	1778 May 7	24 26	Capt. J. Cook.

INSPECTION OF FIELD WORK.

During the seasons of 1912 and 1913, there was carried out a thorough inspection of the work on the whole line from the Arctic Ocean to Mount Natazhat. This included the checking of the alignment of various monuments chosen at random, the comparison of parts of the topography as mapped, with the country itself, as to accuracy and character, the numbering of the monuments, and the completion of the tying-in of such monuments as were not sufficiently well connected with the main triangulation scheme. A critical inspection of each monument was also made as to verticality, size, and condition of base, distance between monuments, etc.

This inspection was made by the United States and Canadian Chiefs of Party, assisted on various sections by chiefs of sub-parties. In 1912 this was done as a subsidiary portion of the regular work of the survey, and it was practically all accomplished, as far as the section north of the Porcupine River was concerned, during the return trip from the Arctic Ocean to Rampart House. The party working south of the Porcupine



Inspection party's pack-train travelling up the bars of the upper White River.

that season made a trip from Rampart House along the line to the Yukon after their regular work, for the purpose of making the inspection of this section. In 1913 a special inspection party under the Canadian and United States Chiefs of Party covered the section between the Yukon River and Mount Natazhat, thus completing the field work on the Boundary.

All monuments checked for alignment were found to be on line, and the topography shown on the plane-table sheets was excellent, every detail being shown as far as the scale would permit, and the different topographical features of the terrain being well distinguished and emphasized.

CONCLUSION.

The field work, a great deal of which had to be done in portions of the country hitherto considered practically impassable, was completed under the direction of the original Commissioners, Mr. O. H. Tittmann for the United States and Dr. W. F. King for His Britannic Majesty, and constitutes a lasting tribute to their efficient administration and supervision. Practically all the maps had also been prepared under their direction, as sheets 1 to 32, inclusive, had already been signed by them before the resignation of Mr. Tittmann on April 15, 1915, and the death of Dr. King on April 21, 1916.

The work was completed under the direction of Mr. E. C. Barnard, appointed Commissioner for the United States, April 30, 1915, and Mr. J. J. McArthur, appointed Commissioner for His Britannic Majesty, January 6, 1917, by printing and signing the last six sheets, numbers 33 to 38, preparing and signing the report, and transmitting to their respective Governments, as provided in the Convention, the signed report and duplicate atlases of signed joint maps. The engraved copper plates, original drawings, field sheets, record books and negatives have been stored in a vault of the Engraving Division of the United States Geological Survey, Washington, D.C. subject to the order of the Secretary of State.

Mr. Thos. Riggs, jr., having resigned as Engineer to the United States Commissioner in May, 1914, the greater part of the work in connection with the preparation of this report devolved upon Mr. J. D. Craig, D.L.S., who had been in complete charge of the field work under the British Commissioner, and the Commissioners desire to express here their appreciation of the efficient manner in which this arduous task has been accomplished.

In conclusion, the Commissioners, on behalf of the former Commissioners and themselves, wish to express also their appreciation of the conscientious and efficient services rendered by all engaged on the work, especially by the chiefs of the field parties, whose good judgment, energy, and efficiency brought about the completion of the work in record time and without a serious accident.

It is also most gratifying to record that the location of the International Boundary along the 141st Meridian, and the preparation of the maps and report have been accomplished in a spirit of hearty co-operation, and to state that the cordial relations that so long existed between the former Commissioners have been continued by their successors.

Attached hereto are appendices as follows:—

I. Early explorations and negotiations.
II. Later negotiations, and details of operations on the Boundary prior to the Convention of 1906.
III. Descriptions of triangulation stations, and sketches of the triangulation.
IV. Special equipment used on the work.
V. Ration Lists.
VI. Game.

E. C. BARNARD,
United States Commissioner.

J. J. McARTHUR,
His Britannic Majesty's Commissioner.

APPENDIX I.

EARLY EXPLORATIONS AND NEGOTIATIONS.

The 141st Meridian became, in part, the boundary between Alaska and the British possessions in North America by virtue of the Treaty of 1825, the full text of which is here given:—

Treaty Between Great Britain and Russia, Signed at St. Petersburgh, February 28/16, 1825.

[Translation.]

Au Nom de la Très Sainte et Indivisible Trinité.

Sa Majesté le Roi du Royaume Uni de la Grande Bretagne et de l'Irlande, et Sa Majesté l'Empereur de toutes les Russies, désirant resserrer les liens de bonne intelligence et d'amitié qui les unissent, au moyen d'un accord qui régleroit, d'après le principe des convenances réciproques, divers points relatifs au commerce, à la navigation, et aux pêcheries de leurs sujets sur l'Océan Pacifique, ainsi que les limites de leurs possessions respectives sur la côte nord-ouest de l'Amérique, ont nommé des Plénipotentiaires pour conclure une Convention à cet effet, savoir:—Sa Majesté le Roi du Royaume Uni de la Grande Bretagne et de l'Irlande, le Très Honorable Stratford Canning, Conseiller de Sa dite Majesté en Son Conseil Privé, etc. Et Sa Majesté l'Empereur de toutes les Russies, le Sieur Charles Robert Comte de Nesselrode, Son Conseiller Privé Actuel, Membre du Conseil de l'Empire, Secrétaire d'Etat dirigeant le Ministère des Affaires Etrangères, etc.; et le Sieur Pierre de Poletica, Son Conseiller d'Etat Actuel, etc. Lesquels Plénipotentiaires, après s'être communiqué leurs pleins-pouvoirs respectifs, trouvés en bonne et due forme, ont arrêté et signé les Articles suivans:

Art. I. Il est convenu que, dans aucune partie du grand Océan, appelé communément Océan Pacifique, les sujets respectifs des Hautes Puissances Contractantes ne seront ni troublés, ni gênés, soit dans la navigation, soit dans l'exploitation de la pêche, soit dans la faculté d'aborder aux côtes, sur des points qui ne seroient pas déjà occupés, afin d'y faire le commerce avec les indigènes, sauf toutefois les restrictions et conditions déterminés par les Articles qui suivent.

II. Dans la vue d'empêcher que les droits de navigation et de pêche exercés sur le grand océan

In the Name of the Most Holy and Undivided Trinity.

His Majesty the King of the United Kingdom of Great Britain and Ireland, and His Majesty the Emperor of all the Russias, being desirous of drawing still closer the ties of good understanding and friendship which unite them, by means of an agreement which may settle, upon the basis of reciprocal convenience, different points connected with the commerce, navigation, and fisheries of their subjects on the Pacific Ocean as well as the limits of their respective possessions on the northwest coast of America, have named Plenipotentiaries to conclude a Convention for this purpose, that is to say:—His Majesty the King of the United Kingdom of Great Britain and Ireland, the Right Honourable Stratford Canning, a member of His said Majesty's Most Honourable Privy Council, etc., and His Majesty the Emperor of all the Russias, the Sieur Charles Robert Count de Nesselrode, His Imperial Majesty's Privy Councillor, a member of the Council of the Empire, Secretary of State for the Department of Foreign Affairs, etc., and the Sieur Pierre de Poletica, His Imperial Majesty's Councillor of State, etc. Who, after having communicated to each other their respective full powers, found in good and due form, have agreed upon and signed the following Articles:

Art. I. It is agreed that the respective subjects of the High Contracting Parties shall not be troubled or molested, in any part of the Ocean, commonly called the Pacific Ocean, either in navigating the same, in fishing therein, or in landing at such parts of the coast as shall not have been already occupied, in order to trade with the natives, under the restrictions and conditions specified in the following Articles.

II. In order to prevent the right of navigating and fishing, exercised upon the ocean by the par les sujets des Hautes Parties Contractantes ne deviennent le prétexte d'un commerce illicite, il est convenu que les sujets de Sa Majesté Britannique n'aborderont à aucun point où il se trouve un établissement Russe, sans la permission du Gouverneur ou Commandant; et que, réciproquement, les sujets Russes ne pourront aborder, sans permission, à aucun établissement Britannique, sur la côte nord-ouest.

III. La ligne de démarcation entre les possessions des Hautes Parties Contractantes sur la côte du continent et les îles de l'Amérique nord-ouest, sera tracée ainsi qu'il suit:

A partir du point le plus méridional de l'île dite Prince of Wales, lequel point se trouve sous la parallèle du 54e degré 40 minutes de latitude nord, et entre le 131e et le 133e degré de longitude ouest (méridien de Greenwich), la dite ligne remontera au nord le long de la passe dite Portland Channel, jusqu'au point de la terre ferme où elle atteint le 56e degré de latitude nord: de ce dernier point la ligne de démarcation suivra la crête des montagnes situées parallèlement à la côte, jusqu'au point d'intersection du 141e degré de longitude ouest (même méridien); et finalement, du dit point d'intersection, la même ligne méridienne du 141e degré formera, dans son prolongement jusqu'à la Mer Glaciale, la limite entre les possessions Russes et Britanniques sur le continent de l'Amérique nord-ouest.

IV. Il est entendu, par rapport à la ligne de démarcation déterminée dans l'Article précédent:

1. Que l'île dite Prince of Wales appartiendra toute entière à la Russie.

2. Que partout où la crête des montagnes qui s'étendent dans une direction parallèle à la côte depuis le 56° degré de latitude nord au point d'intersection du 141° degré de longitude ouest, se trouveroit à la distance de plus de 10 lieues marines de l'océan, la limite entre les possessions Britanniques et la lisière de côte mentionnée ci-dessus comme devant appartenir à la Russie, sera formée par une ligne parallèle aux sinuosités de la côte, et qui ne pourra jamais en être éloignée que de 10 lieues marines.

V. Il est convenu en outre, que nul établissement ne sera formé par l'une des deux Parties dans les limites que les deux Articles précédents assignent aux possessions de l'autre. En conséquence, les sujets Britanniques ne formeront aucun établissement, soit sur la côte, soit sur la lisière de terre ferme comprise dans les limites des possessions Russes, telles qu'elles sont désignées dans les 2 Articles précédens; et, de même, nul établissement ne sera formé par des sujets Russes au delà des dites limites.

subjects of the High Contracting Parties, from becoming the pretext for an illicit commerce, it is agreed that the subjects of His Britannic Majesty shall not land at any place where there may be a Russian establishment, without the permission of the Governor or Commandant; and, on the other hand, that Russian subjects shall not land, without permission, at any British establishment, on the north-west coast.

III. The line of demarcation between the possessions of the High Contracting Parties, upon the coast of the continent, and the islands of America to the north-west, shall be drawn in the manner following:

Commencing from the southernmost point of the island called Prince of Wales Island, which point lies in the parallel of 54 degrees 40 minutes, north latitude, and between the 131st and 133rd degree of west longitude (meridian of Greenwich), the said line shall ascend to the north along the channel called Portland Channel, as far as the point of the continent where it strikes the 56th degree of north latitude; from this last mentioned point, the line of demarcation shall follow the summit of the mountains situated parallel to the coast as far as the point of intersection of the 141st degree of west longitude (of the same meridian); and, finally, from the said point of intersection, the said meridian line of the 141st degree, in its prolongation as far as the Frozen Ocean, shall form the limit between the Russian and British possessions on the continent of America to the north-west.

IV. With reference to the line of demarcation laid down in the preceding Article it is understood:

1st. That the island called Prince of Wales Island shall belong wholly to Russia.

2nd. That whenever the summit of the mountains which extend in a direction parallel to the coast, from the 56th degree of north latitude to the point of intersection of the 141st degree of west longitude, shall prove to be at the distance of more than 10 marine leagues from the ocean, the limit between the British possessions and the line of coast which is to belong to Russia, as above mentioned, shall be formed by a line parallel to the windings of the coast, and which shall never exceed the distance of 10 marine leagues therefrom.

V. It is moreover agreed, that no establishment shall be formed by either of the two parties within the limits assigned by the two preceding Articles to the possessions of the other; consequently, British subjects shall not form any establishment either upon the coast, or upon the border of the continent comprised within the limits of the Russian possessions, as designated in the two preceding Articles; and, in like manner, no establishment shall be formed by Russian subjects beyond the said limits.

VI. Il est entendu que les sujets de Sa Majesté Britannique, de quelque côté qu'ils arrivent, soit de l'océan, soit de l'intérieur du continent, jouiront à perpétuité du droit de naviguer librement, et sans entrave quelconque, sur tous les fleuves et rivières qui, dans leurs cours vers la mer Pacifique, traverseront la ligne de démarcation sur la lisière de la côte indiquée dans l'Article III de la présente Convention.

VII. Il est aussi entendu que, pendant l'espace de 10 ans, à dater de la signature de cette Convention, les vaisseaux des deux Puissances, ou ceux appartenant à leurs sujets respectifs, pourront réciproquement fréquenter, sans entrave quelconque, toutes les mers intérieures, les golfes, havres, et criques sur la côte mentionnée dans l'Article III, afin d'y faire la pêche et le commerce avec les indigènes.

VIII. Le Port de Sitka, ou Novo Archangelsk, sera ouvert au commerce et aux vaisseaux des sujets Britanniques durant l'espace de 10 ans, à dater de l'échange des ratifications de cette Convention. Au cas qu'une prolongation de ce terme de 10 ans soit accordée à quelque autre Puissance, la même prolongation sera également accordée à la Grande Bretagne.

IX. La susdite liberté de commerce ne s'appliquera point au trafic des liqueurs spiritueuses, des armes à feu, des armes blanches, de la poudre à canon, ou d'autres munitions de guerre; Les Hautes Parties Contractantes s'engageant réciproquement à ne laisser ni vendre, ni livrer, de quelque manière que ce puisse être, aux indigènes du pays les articles ci-dessus mentionnés.

X. Tout vaisseau Britannique ou Russe naviguant sur l'Océan Pacifique, qui sera forcé par des tempêtes, ou par quelque accident, de se réfugier dans les ports des parties respectives, aura la liberté de s'y radouber, de s'y pourvoir de tous les objets qui lui seront nécessaires, et de se remettre en mer, sans payer d'autres droits que ceux de port et de fanaux, lesquels seront, pour lui, les mêmes que pour les bâtimens nationaux. Si, cependant, le patron d'un tel navire se trouvoit dans la nécessité de se défaire d'une partie de ses marchandises pour subvenir à ses dépenses, il sera tenu de se conformer aux ordonnances et aux tarifs de l'endroit où il aura abordé.

XI. Dans tous les cas de plaintes relatives à l'infraction des Articles de la présente Convention, les autorités civiles et militaires des deux Hautes Parties Contractantes, sans se permettre au préalable ni voie de fait, ni mesure de force, seront tenues de faire un rapport exact de l'affaire et de ses circonstances à leurs Cours respectives, lesquelles s'engagent à la régler à l'amiable, et d'après les principes d'une parfaite justice.

XII. La présente Convention sera ratifiée, et les ratifications en seront échangées à Londres

VI. It is understood that the subjects of His Britannic Majesty, from whatever quarter they may arrive, whether from the ocean, or from the interior of the continent, shall forever enjoy the right of navigating freely, and without any hindrance whatever, all the rivers and streams which, in their course towards the Pacific Ocean, may cross the line of demarcation upon the line of coast described in Article III of the present Convention.

VII. It is also understood, that, for the space of ten years from the signature of the present Convention, the vessels of the two Powers, or those belonging to their respective subjects, shall mutually be at liberty to frequent, without any hindrance whatever, all the inland seas, the gulfs, havens, and creeks on the coast mentioned in Article III for the purposes of fishing and of trading with the natives.

VIII. The port of Sitka, or Novo Archangelsk, shall be open to the commerce and vessels of British subjects for the space of ten years from the date of the exchange of the ratifications of the present Convention. In the event of an extension of this term of ten years being granted to any other Power, the like extension shall be granted also to Great Britain.

IX. The above-mentioned liberty of commerce shall not apply to the trade in spirituous liquors, in fire-arms, or other arms, gunpowder, or other warlike stores; the High Contracting Parties reciprocally engaging not to permit the above-mentioned articles to be sold or delivered, in any manner whatever, to the natives of the country.

X. Every British or Russia vessel navigating the Pacific Ocean, which may be compelled by storms or by accident, to take shelter in the ports of the respective Parties, shall be at liberty to refit therein, to provide itself with all necessary stores, and to put to sea again, without paying any other than port and light-house dues, which shall be the same as those paid by national vessels. In case, however, the master of such vessel should be under the necessity of disposing of a part of his merchandise in order to defray his expenses, he shall conform himself to the regulations and tariffs of the place where he may have landed.

XI. In every case of complaint on account of an infraction of the Articles of the present Convention, the civil and military authorities of the High Contracting Parties, without previously acting or taking any forcible measure, shall make an exact and circumstantial report of the matter to their respective Courts, who engage to settle the same, in a friendly manner, and according to the principles of justice.

XII. The present Convention shall be ratified, and the ratifications shall be exchanged at dans l'espace de 6 semaines, ou plutôt si faire se peut.

En foi de quoi les Plénipotentiares respectifs l'ont signé, et y ont apposé le cachet de leurs armes.

Fait à St. Pétersbourg, le 28/16 Février, de l'an de Grâce 1825.

(L.S.) STRATFORD CANNING.
(L.S.) LE COMPTE DE NESSELRODE.
(L.S.) PIERRE DE POLETICA.

London within the space of six weeks, or sooner if possible.

In witness whereof, the respective Plenipotentiaries have signed the same, and have affixed thereto the seal of their arms.

Done at St. Petersburgh, the 28/16th day of February, in the year of Our Lord, 1825.

[L.S.] STRATFORD CANNING.
[L.S.] COMTE DE NESSELRODE.
[L.S.] PIERRE DE POLETICA.

(Hertslet's Commercial and Slave Trade Treaties, vol. III, p. 362.)

The diplomatic exchanges following the Russian Ukase of 1821[1] shortly developed the fact that there was an immediate necessity for defining the boundaries of the Russian possessions in northwest America, and for settling the question of the extent of Russia's maritime jurisdiction in the waters adjoining the coast, this latter point particularly being the cause of an immediate protest on the part of the Governments of the United States and Great Britain against the validity of Russia's authority to issue such a sweeping decree.

From 1741[2] when Bering[3] and Chirikof first sighted the Alaskan coast until the investment of full authority in the Russian American Company in 1799, the history of Alaska shows a series of struggles between the Russians and the natives, with the former gradually tightening their hold on the country and reducing the natives almost to a state of slavery. The fame of the richness of the fur harvest in the new country attracted the attention of the traders of other nations, and Spain, England, France, and the United States all sent expeditions to attempt to secure for themselves a share of the riches, Russia, however, retaining the supremacy.

The first Russian settlements[2] had been established on Kodiak Island in 1784. All thought up to this time had been of discovery, exploration, and hunting the fur-bearing animals. By 1786 other settlements had been established, they had all been fortified, and everything possible had been done to impress upon the natives the power and greatness of Russia. Various Russian trading companies were formed whose sole aim was to accumulate vast quantities of fur, and it is to be noted that the Russian Government had little to do with the settlements, and that they were solely under the direction of, and depended upon the support of, the different companies. Finally in August, 1799, the trading privileges of the country were handed over by Imperial Ukase for a period of twenty years to the Russian American Company. From this date the history of Alaska is practically the history of this great monopoly.

When the privileges of the company were renewed by the Ukase of 1821, more stringent regulations were laid down to protect the company's interests, and all foreign vessels were prohibited from trading on the coast, and it was this sweeping assumption of maritime authority by the Russian Government that brought forth the immediate protests of the Governments of Great Britain and the United States. The Treaty of

[1] "Appendix to the case of His Majesty's Government before the Alaska Boundary Tribunal," London: McCorquodale & Co., Limited, 1903. Vol. i, page 7.
[2] Bancroft's "History of Alaska," chapters iv and v. The History Company, San Francisco, 1890.
[3] "The Tracks and Landfalls of Bering and Chirikof," Prof. Geo. Davidson: Geographic Society of the Pacific, San Francisco, 1901.
[2] *Ibid*, chapter xi.

1824 settled the matter as far as the States were concerned, but the negotiations with Great Britain were not concluded until the following year, when the Treaty was signed which made the 141st Meridian, or rather that part of it lying between Mount St. Elias and the Arctic Ocean, the eastern boundary of the more northerly portion of the Russian possessions.

Throughout all these negotiations, the land boundary, important though it was, was really subordinated to the question of the extent of Russia's maritime jurisdiction. Mr. W. H. Dall of the United States Coast and Geodetic Survey says in a " Memorandum on the Alaska Boundary " in 1888:[1] " It is also necessary to remember that at that period, (1825) and for many years later, the region in question was regarded by all the civilized world as a horrid wilderness, peopled by blood-thirsty savages, in itself valueless, and of importance only through its relation to the *amour propre* of the nations concerned and the daring voyages of a few adventurous fur traders. Considered as territory, a few miles more or less, in one direction or the other, would have been regarded as of absolutely no importance by either nation."

We also find in " The Life of the Right Hon. Stratford Canning " by Colonel Lane-Pole,[2] the following reference to these negotiations: " The object of this instrument (the Treaty of 1825) was a good deal more than a mere question of boundary, though the latter was made to cover and mask the larger design."

It is worthy of record that the Treaty of 1824 between Russia and the United States gave to the latter trading privileges along the coast of Russian America, and moreover swept away for all time the Russian contention that the Tzar owned not only the land but could prohibit foreign vessels from approaching the coast.

It is interesting to note that the Russian Government was guided in its negotiations largely by the representations of the Russian American Company, just as was the British Government by those of the Hudson's Bay Company.

The Russian Company, according to M. Poletica, Active-Councillor of State, would have been satisfied with the adoption of such a degree of longitude as would have left the Mackenzie River outside of their territory,[3] and at the first informal meeting between the representatives of the two countries in St. Petersburgh in 1823, the intersection of the 57th degree of north latitude and the 135th meridian of west longitude was unofficially suggested by Sir Charles Bagot, acting for Great Britain, as roughly indicating the southerly limit of Russia's possessions on the coast. He was later instructed[4] to attempt to obtain Chatham Strait or Stephens Passage as the boundary on the coast, or, failing to obtain these, to insist upon the adoption of the 135th meridian northward from the head of Lynn Canal as the separating line, though the Hudson's Bay Company would apparently have been satisfied with a line due north from the summit of the mountains, which they considered a continuation of the Rockies, and thence along the summit northwesterly to the Frozen Ocean.[5]

As a reply to the Russian proposal that the 55th degree of north latitude should be the dividing line, the British representative on February 16, 1824, proposed as the boundary, a line " through Chatham Straits to the head of Lynn Canal, thence

[1] Alaskan Boundary Tribunal. " Counter case of the United States and Appendix." Government Printing Office, Washington, 1903. Appendix, page 99.

[2] London: Longmans, Green & Co., 1888. 2 vols. 8vo.

[3] "Appendix to the case of His Majesty's Government before the Alaska Boundary Tribunal," London: McCorquodale & Co., Limited, 1903. Vol. i, page 53.

[4] *Ibid*, page 62.

[5] *Ibid*, page 64.

northwest to the 140th degree of longitude west of Greenwich, and thence along that degree to the Polar Sea."[1]

As a *contre projet* the Russians proposed a line following the Portland Canal as far as the mountains which run along the coast, thence along these mountains parallel to the sinuosities of the coast as far as the 139th degree of longitude (meridian of London), and thence north along the meridian.[2]

The discussions were chiefly concerned with the location of the more southerly portion of the boundary, but Sir Charles Bagot insisted on a line running north from Mount St. Elias, or at least the 140th meridian, being taken as the dividing line between the more northerly possessions of the two countries.[3]

This proposition was rejected by the Russians on March 29, 1824, and negotiations were temporarily suspended, but later, principally upon the recommendations of the Hudson's Bay Company, to whom the matter was again referred, the British Ambassador at St. Petersburgh was advised that he might accede materially to Russia's wishes in the matter of the territorial boundary. He was empowered to allow Russia's claim that the southern portion of the boundary should follow the summit of the mountains nearest the sea, and that the 139th degree of west longitude should form the boundary between the respective inland possessions.[4] Again, however, negotiations were suddenly suspended in August, 1824, on account of Russia's insistence in her claims of maritime jurisdiction.

In December of that year, Mr. Stratford Canning was sent to the Russian court to take up the negotiations again, and in his instructions we find the following clause with reference to the northern portion of the boundary: "I omitted in my last instructions to Sir Charles Bagot (though I had signified to Count Lieven) that I intended to require a small extension of the line of demarcation from the point where the lisière on the coast terminates in latitude 50 degrees to the northward. The extension required is from 138 degrees to 141 degrees west longitude, the latter being the parallel which falls more directly on Mount St. Elias."[5] This selection of a more westerly degree of longitude was foreshadowed in a message dated 29th May, 1824, from the Right Hon. George Canning, the British Secretary of Foreign Affairs, to Count Lieven, Russian Ambassador to England, when he wrote: "The qualifications will consist . . . in the selection of a somewhat more western degree of longitude as the boundary to the northward of Mount St. Elias."[6]

It is noticed, however, that the draft Convention embodied in Mr. Stratford Canning's final instructions mentions the 140th degree of longitude and not the 141st,[7] and it is in the *contre projet* submitted by Mr. Canning in February, 1825, that we first find the 141st meridian officially mentioned as the possible boundary.[8] This *contre projet* was modified by the Russians in some respects, but they allowed the clause with reference to the 141st meridian to remain unchanged and the Convention was signed February 28/16, 1825, the ratifications being exchanged about two weeks later. The wording of Article III which has reference to the boundary is as follows:—

III. The line of demarcation between the possessions of the High Contracting Parties, upon the coast of the Continent and the islands of America to the north-west, shall be drawn in the manner following:

Commencing from the southernmost point of the island called Prince of Wales Island . . . . the line of demarcation shall follow the summit of the mountains situated parallel to the coast as far as the point of intersection of the 141st degree of west longitude (of the same meridian); and, finally

[1] *Ibid*, page 67. [2] *Ibid*, page 72. [3] *Ibid*, page 74. [4] *Ibid*, page 85. [5] *Ibid*, page 114. [6] *Ibid*, page 81.
[7] *Ibid*, page 116. [8] *Ibid*, page 124.

from the said point of intersection, the said meridian line of the 141st degree, in its prolongation as far as the Frozen Ocean, shall form the limit between the Russian and British possessions on the continent of America to the north-west.

The insistence of Russia's demands that the southeastern portion of the boundary should be a line roughly paralleling the coast at some distance inland, no doubt accounts to a large extent for the gradual change on the part of the British diplomats from a probable asquiescence in the choice of the 135th meridian as the northerly portion of the boundary, to what practically amounted to a demand that the 141st meridian be selected.

When Alaska was ceded to the United States by Russia in 1867, the description of the boundaries of the Russian possessions was taken practically direct from the Treaty of 1825 between Great Britain and Russia. This description is contained in Article I of the Treaty of 1867, the full text of which reads as follows:—

Treaty Concerning the Cession of the Russian Possessions in North America by His Majesty the Emperor of all the Russias to the United States of America.

(Concluded March 30, 1867. Ratified by the United States May 28, 1867. Exchanged June 20, 1867. Proclaimed by the United States, June 20, 1867.)

Sa Majesté l'Empereur de toutes les Russies et les Etats-Unis d'Amérique, désirant raffermir, s'il est possible, la bonne intelligence qui existe entre eux, ont nommé, à cet effet, pour leurs Plénipotentiaires, savoir: Sa Majesté l'Empereur de toutes les Russies, le Conseiller Privé Edouard de Stoeckl, son envoyé extraordinaire et ministre plénipotentiaire aux Etats-Unis; et le Président des Etats-Unis, le Sieur William H. Seward, Secrétaire d'Etat, lesquels, après avoir échangé leurs pleins-pouvoirs, trouvés en bonne et due forme, ont arrêté et signé les articles suivants:

Article I.

Sa Majesté l'Empereur de toutes les Russies s'engage, par cette convention, à céder aux Etats-Unis, immédiatement après l'échange des ratifications, tout le Territoire avec droit de souveraineté actuellement possédé par Sa Majesté sur le continent d'Amérique ainsi que les îles contiguës, le dit Territoire étant compris dans les limites géographiques ci-dessous indiquées, savoir: la limite orientale est la ligne de démarcation entre les possessions Russes et Britanniques dans l'Amérique du Nord, ainsi qu'elle est établie par la convention, conclue entre la Russie et la Grande-Bretagne, le 16/28 Février, 1825, et définie dans les termes suivants des Articles III et IV de la dite convention.

[*Translation.*]

The United States of America and His Majesty the Emperor of all the Russias, being desirous of strengthening, if possible, the good understanding which exists between them, have, for that purpose, appointed as their Plenipotentiaries: The President of the United States, William H. Seward, Secretary of State; and His Majesty the Emperor of all the Russias, the Privy Councillor, Edward de Stoeckl, his Envoy Extraordinary and Minister Plenipotentiary to the United States.

And the said Plenipotentiaries, having exchanged their full powers, which were found to be in due form, have agreed upon and signed the following articles:—

Article I.

His Majesty the Emperor of all the Russias agrees to cede to the United States, by this convention, immediately upon the exchange of the ratifications thereof, all the territory and dominion now possessed by his said Majesty on the continent of America and in the adjacent islands, the same being contained within the geographical limits herein set forth, to wit: The eastern limit is the line of demarcation between the Russian and the British possessions in North America, as established by the Convention between Russia and Great Britain, in February 28–16, 1825, and described in Articles III and IV of said Convention, in the following terms:—

" A partir du point le plus méridional de l'Ile dite Prince of Wales, lequel point se trouve sous la parallèle du 54me degré 40 minutes de latitude nord, et entre le 131me et le 133me degré de longitude ouest (méridien de Greenwich) la dite ligne remontera, au nord le long de la passe dite Portland Channel, jusqu'au point de la terre ferme, où elle atteint le 56me degré de latitude nord; de ce dernier point la ligne de démarcation suivra la crête des montagnes situées parallèlement à la côte jusqu'au point d'intersection du 141me degré de longitude ouest (même méridien), et finalement, du dit point d'intersection la même ligne méridienne du 141me degré formera, dans son prolongement jusqu'à la mer Glaciale, la limite entre les possessions Russes et Britanniques sur le continent de l'Amérique nord-ouest.

" IV. Il est entendu, par rapport à la ligne de démarcation déterminée dans l'article précédent:

" 1° Que l'Ile dite Prince of Wales, appartiendra toute entière à la Russie;" (mais dès ce jour en vertu de cette cession aux Etats-Unis).

" 2° Que partout où la crête des montagnes qui s'étendent dans une direction parallèle à la côte, depuis le 56me degré de latitude nord au point d'intersection du 141me degré de longitude ouest se trouverait à la distance de plus de dix lieues marines de l'océan la limite entre les possessions Britanniques et la lisière de côte mentionnée ci-dessus comme devant appartenir à la Russie " c'est-à-dire la limite des possessions cedées par cette Convention: " sera formée par une ligne parallèle aux sinuosités de la côte et qui ne pourra jamais en être éloignée que de dix lieues marines."

La limite occidentale des territoires cédés passe par un point au détroit de Behring sous la parallèle du soixante-cinquième degré trente minutes de latitude Nord à son intersection par le méridien qui sépare à distance égale les Iles Krusenstern ou Ignalook et l'Ile Ratmonoff ou Noonarbook et remonte en ligne directe, sans limitation, vers le Nord jusqu'à ce qu'elle se perde dans la mer Glaciale. Commençant au même point de départ, cette limite occidentale suit de là un cours presque Sud-ouest, à travers le détroit de Behring et la mer de Behring, de manière à passer à distance égale entre le point Nord-ouest de l'île Saint-Laurent et le point Sud-est du cap Choukotski jusqu'au méridien cent soixante-douzième de longitude Ouest; de ce point, à partir de l'intersection de ce méridien, cette limite suit une direction Sud-ouest de manière à passer à distance égale entre l'île d'Attou et l'île Copper du groupe d'îlots Kormandorski dans l'océan Pacifique Septentrional jusqu'au méridien de cent quatre-vingt treize degrés de longitude

" Commencing from the southernmost point of the Island called Prince of Wales Island, which point lies in the parallel of 54 degrees 40 minutes north latitude, and between the 131st and the 133rd degree of west longitude (meridian of Greenwich), the said line shall ascend to the north along the channel called Portland Channel, as far as the point of the continent where it strikes the 56th degree of north latitude; from this last-mentioned point the line of demarcation shall follow the summit of the mountains situated parallel to the coast as far as the point of intersection of the 141st degree of west longitude, (of the same meridian); and finally, from the said point of intersection, the said meridian line of the 141st degree, in its prolongation as far as the Frozen Ocean.

" IV. With reference to the line of demarcation laid down in the preceding Article, it is understood—

" 1st.—That the island called Prince of Wales Island shall belong wholly to Russia," (now, by this cession, to the United States).

" 2nd.—That whenever the summit of the mountains which extend in a direction parallel to the coast from the 56th degree of north latitude to the point of intersection of the 141st degree of west longitude shall prove to be at the distance of more than ten marine leagues from the ocean, the limit between the British possessions and the line of coast which is to belong to Russia as above mentioned (that is to say, the limit to the possessions ceded by this Convention) shall be formed by a line parallel to the windings of the coast, and which shall never exceed the distance of ten marine leagues therefrom."

The western limit within which the territories and dominion conveyed, are contained, passes through a point in Behring's Straits on the parallel of sixty-five degrees thirty minutes north latitude, at its intersection by the meridian which passes midway between the islands of Krusenstern, or Ignalook, and the island of Ratmanoff, or Noonarbook, and proceeds due north, without limitation, into the same Frozen Ocean. The same western limit, beginning at the same initial point, proceeds thence in a course nearly southwest, through Behring's Straits and Behring's Sea, so as to pass midway between the north-west point of the island of St. Lawrence and the south-east point of Cape Choukotski, to the meridian of one hundred and seventy-two west longtitude; thence, from the intersection of that meridian, in a south-westerly direction, so as to pass midway between the island of Attou and the Copper Island of the Komandorski couplet or group in the North Pacific Ocean, to the meridian of one hundred and ninety-three degrees west

Ouest, de manière à enclaver, dans le Territoire cédé toutes les îles Aléoutes situées à l'est de ce méridien.

ARTICLE II.

Dans le Territoire cédé par l'article précédent à la Souveraineté des Etats-Unis sont compris le droit de propriété sur tous les terrains et places publics, terres inoccupées, toutes les constructions publiques, fortifications, casernes et autres édifices qui ne sont pas propriété privée individuelle. Il est toutefois entendu et convenu que les églises construites par le Gouvernement Russe sur le Territoire cédé, resteront la propriété des membres de l'Eglise Grecque Orientale résidant dans ce Territoire et appartenant à ce culte. Tous les archives, papiers, et documents du Gouvernement ayant trait au susdit Territoire, et qui y sont maintenant déposés seront placés entre les mains de l'agent des Etats-Unis; mais les Etats-Unis fourniront toujours quand il y aura lieu des copies légalisées de ces documents au Gouvernement Russe, aux officiers ou sujets Russes qui pourront en faire la demande.

ARTICLE III.

Il est réservé aux habitans du territoire cédé le choix de garder leur nationalité et de rentrer en Russie dans l'espace de trois ans; mais s'ils préfèrent rester dans le territoire cédé ils seront admis, à l'exception toutefois des tribus sauvages à jouir de tous les droits, avantages et immunités des citoyens des Etats-Unis et ils seront maintenus et protégés dans le plein exercice de leur liberté, droit de propriété et religion. Les tribus sauvages seront assujéties aux lois et règlements que les Etats-Unis pourront adopter de temps en temps à l'égard des tribus aborigènes de ce pays.

ARTICLE IV.

Sa Majesté l'Empereur de toutes les Russies nommera, aussitôt que possible un agent ou des agents chargés de remettre formellement à l'agent ou aux agents nommés par les Etats-Unis, le territoire, la souveraineté, les propriétés, dépendances, et appartenances ainsi cédés et de dresser tout autre acte qui sera nécessaire à l'accomplissement de cette transaction. Mais la cession, avec le droit de possession immédiate, doit toutefois être considérée complète et absolue à l'échange des ratifications sans attendre la remise formelle.

longitude, so as to include in the territory conveyed the whole of the Aleutian Islands east of that meridian.

ARTICLE II.

In the cession of the territory and dominion made by the preceding article, are included the right of property in all public lots and squares, vacant lands, and all public buildings, fortifications, barracks, and other edifices which are not private individual property. It is, however, understood and agreed that the churches which have been built in the ceded territory by the Russian Government, shall remain the property of such members of the Greek Oriental Church resident in the territory, as may choose to worship therein. Any Government archives, papers, and documents relative to the territory and dominion aforesaid, which may now be existing there, will be left in the possessoin of the agent of the United States; but an authenticated copy of such of them as may be required, will be, at all times, given by the United States to the Russian Government, or to such Russian officers or subjects, as they may apply for.

ARTICLE III.

The inhabitants of the ceded territory, according to their choice, reserving their natural allegiance may return to Russia within three years; but if they should prefer to remain in the ceded territory, they, with the exception of uncivilized native tribes, shall be admitted to the enjoyment of all the rights, advantages, and immunities of citizens of the United States, and shall be maintained and protected in the free enjoyment of their liberty, property, and religion. The uncivilized tribes will be subject to such laws and regulations as the United States may from time to time adopt in regard to aboriginal tribes of that country.

ARTICLE IV.

His Majesty the Emperor of all the Russias shall appoint, with convenient dispatch, an agent or agents for the purpose of formally delivering to a similar agent or agents appointed on behalf of the United States, the territory, dominion, property, dependencies and appurtenances which are ceded as above, and for doing any other act which may be necessary in regard thereto. But the cession, with the right of immediate possession, is nevertheless to be deemed complete and absolute on the exchange of ratifications, without waiting for such formal delivery.

ARTICLE V.

Immédiatement après l'échange des ratifications de cette convention, les fortifications et les postes militaires qui se trouveront sur le territoire cédé seront remis à l'agent des Etats-Unis et les troupes Russes qui sont stationnées dans le dit Territoire, seront retirées dans un terme praticable et qui puisse convenir aux deux parties.

ARTICLE VI.

En considération de la susdite cession les Etats-Unis s'engagent à payer à la Trésorerie à Washington, dans le terme de dix mois après l'échange des ratifications de cette convention, sept millions deux cent mille de dollars en or, au Représentant diplomatique ou tout autre agent de Sa Majesté l'Empereur de toutes les Russies dûment autorisé à recevoir cette somme. La cession du territoire avec droit de souveraineté faite par cette convention, est déclarée libre et dégagée de toutes réservations, privilèges, franchises ou des possessions par des compagnies Russes ou tout autre légalement constituées ou autrement ou par des associations sauf simplement les propriétaires possédant des biens privés individuels et la cession ainsi faite transfère tous les droits, franchises et privilèges appartenant actuellement à la Russie dans le dit Territoire et ses dépendances.

ARTICLE VII.

Lorsque cette convention aura été dûment ratifiée par Sa Majesté l'Empereur de toutes les Russies d'une part et par le Président des Etats-Unis avec l'avis et le consentement du Sénat de l'autre, les ratifications en seront échangées à Washington dans le terme de trois mois, à compter du jour de la signature, ou plus tôt si faire se peut.

En foi de quoi les Plénipotentiaires respectifs ont signé cette convention et y ont apposé le sceau de leurs armes.

Fait à Washington le 18–30 jour de mars de l'an de Notre-Seigneur mil huit cent soixante-sept.

[L.S.] EDOUARD DE STOECKL.
[L.S.] WILLIAM H. SEWARD.

ARTICLE V.

Immediately after the exchange of the ratifications of this Convention, any fortifications or military posts which may be in the ceded territory, shall be delivered to the agent of the United States, and any Russian troops which may be in the territory, shall be withdrawn as soon as may be reasonably and conveniently practicable.

ARTICLE VI.

In consideration of the cession aforesaid, the United States agree to pay at the Treasury at Washington, within ten months after the exchange of the ratifications of this Convention, to the diplomatic representative or other agent of His Majesty the Emperor of all the Russias, duly authorized to receive the same, seven million two hundred thousand dollars in gold. The cession of territory and dominion herein made is hereby declared to be free and unincumbered by any reservations, privileges, franchises, grants, or possessions, by any associated companies, whether corporate or incorporate, Russian or any other, or by any parties except merely private individual property holders; and the cession hereby made conveys all the rights, franchises, and privileges now belonging to Russia in the said territory or dominion, and appurtenances thereto.

ARTICLE VII.

When this Convention shall have been duly ratified by the President of the United States, by and with the advice and consent of the Senate, on the one part, and on the other by His Majesty the Emperor of all the Russias, the ratifications shall be exchanged at Washington within three months from the date hereof, or sooner, if possible.

In faith whereof, the respective Plenipotentiaries have signed this Convention, and thereto affixed the seals of their arms.

Done at Washington, this thirtieth day of March, in the year of our Lord one thousand eight hundred and sixty-seven.

[L.S.] WILLIAM H. SEWARD.
[L.S.] EDOUARD DE STOECKL.

Various Exploratory Expeditions.

That portion of the 141st Meridian agreed upon as part of the boundary between the possessions of the two Governments, lay in what was in 1825 practically unknown and unexplored territory.

In 1829, Chistiakof, Governor of the Russian American Company, had ordered an inland exploration north of the Nushagat River,[1] and it was on this expedition that the Russians met, on the Kuskokwim, with natives of the lower Yukon, who told them of the easy crossing from one river basin to the other. Under Baron Wrangell, Chistiakof's successor, explorations were carried on, on even a larger scale, among other points visited being St. Michael's near the mouth of the Yukon, then known as the Kwikpak, where a settlement was founded.

Glazonof, under Wrangell's instructions, did a vast amount of exploratory work around the delta of the Yukon in 1833 and 1834. In 1838, after Wrangell had been relieved from office, Malakhof ascended the Yukon as far as the present site of Nulato, where he built a small blockhouse. In 1842, Lieut. Zagoskin of the Imperial Navy made important explorations on the Kuskokwin, lower Yukon and Koyukuk. He explored the Yukon as far as the mouth of the Tanana, explored a few miles of the lower Koyukuk, and ascended the Innoko and crossed to the Kuskokwin, which he followed down to the Kuskokwim-Yukon portage.

The trading post of Nulato was founded in 1842, and became the most inland as well as the most northern of the Russian American Company's Posts.[2]

No further explorations of any account appear to have been made into the interior from the westward until 1865, except perhaps the work done by two parties in 1843 on the Sushitna and Copper Rivers for the purpose of extending trade with the natives. It is probable also that a few hardy adventurers had made trips farther up the great river which they knew as the Kwikpak.

Meanwhile, to the east of the 141st Meridian the Hudson's Bay Company was gradually extending its operations and establishing posts in the then wilderness.

The early knowledge of the geography of this northern region up to about 1887 was due almost entirely to the expeditions carried out by the officers of this company in connection with their various establishments, and it seems impossible to refer to the early history of the country without making some mention of their work.

As early as 1789, Mackenzie, in the service of the Company, had descended the great river which bears his name, and had reached the shores of the Arctic Ocean. Sir John Franklin in 1826 descended the Mackenzie River and traced the North American Coast as far as 149° 37′ west longitude, the next visitors on the coast being Dease and Simpson of the Hudson's Bay Company's service who, in 1837, made practically the same trip, and were successful in getting as far west as Point Barrow.

The exploration of the Liard and upper Yukon is almost entirely due to the energy of Robert Campbell.[3] As early as 1840 he crossed over from the Liard to the Pelly, but it was not until 1843 that he got as far as the junction of the Pelly and the Lewes, where the Indians told such tales of the ferociousness of the natives farther downstream that he could not induce his men to go farther, and was forced to return to the post at Pelly Banks. In 1848, however, he established Fort Selkirk on the point of

[1] "Bancroft's History of Alaska," Chapter xxvi.

[2] "Travel and Adventure in the Territory of Alaska," Whymper. London: John Murray, 1868. Page 169.

[3] "Report of an Exploration in the Yukon District, N.W.T. and adjacent northern portion of British Columbia," by George M. Dawson, 1887. Ottawa: Queen's Printer, 1898. Page 135 *et seq.*

land betwen the two rivers, but on account of the spring floods it was moved in 1852 to a new site on the south bank of the Lewes below the junction.

Meanwhile, in 1842, J. Bell had crossed from the Peel to the Porcupine, and had descended the latter river for some distance. Again in 1846, while in charge of the post at Peel River, he crossed to the Porcupine and descended to the Yukon, where Fort Yukon was founded during the following year, 1847. It was not, however, until Campbell, in 1850, descended the river from Fort Selkirk to Fort Yukon that it was proved that both posts were on the same river.

In 1861 Robert Kennicott of the Smithsonian Institution,[1] following the old Hudson's Bay Company route, crossed the divide at the head of the Porcupine and wintered at Fort Yukon.

In 1865 the Western Union Telegraph expedition began work with the idea of building an overland line from Europe to America across Asia and Bering Strait.[2] The attempt was abandoned in 1867 owing to the success of the Atlantic cable, but their explorations and surveys resulted in the gleaning of considerable information about the interior of Alaska and what is now the Yukon, one direct result being a fairly good map of the Yukon River between Nulato and Fort Yukon. Dr. W. H. Dall, the head of this party, reached Fort Yukon by an up-river journey from the mouth of the Yukon. Ketchum and Labarge, also members of the expedition, ascended the Yukon River as far as Fort Yukon during the winter of 1866–7, and in the spring of 1867 went as far as Fort Selkirk by boat. Whymper, and others of the party, accompanied by Russian traders as far as the mouth of the Tanana, also made the trip to Fort Yukon. Whymper states[3] that the mouth of the Tanana, 240 miles above Nulato, is the farthest point ever reached by Russian traders, and that occasionally traders of the Hudson's Bay Company reached this same point from the eastward. He also makes note of the relief experienced by his party at the welcome contrast between the rather dirty Russian forts and the clean new establishment of the Hudson's Bay Company at Fort Yukon, for although the post had been founded in 1847, a new building had been begun in 1864, and was still unfinished when they arrived there. He also states that the fort was known to be well within the boundaries of Russian America, and gives interesting data as to the distances to other forts of the Hudson's Bay Company, and the time consumed in bringing supplies to Fort Yukon from England, via York Factory and the Mackenzie and Porcupine Rivers through the whole series of the Company's forts.

Although Alaska was ceded by Russia to the United States by the Treaty signed on March 30, 1867,[4] it was not until August, 1869, that the Hudson's Bay Company at Fort Yukon was notified by Capt. C. W. Raymond, Corps of Engineers, United States Army, that the fort was within the territory of the United States, and that trading by the Company must cease.[5] He took possession of the buildings, but they were later abandoned and allowed to go to ruin. Thus the Hudson's Bay Company was trading in Alaska for some little time after its purchase by the United States.

Ketchum and Labarge, on their return to Fort Yukon in 1867, reported the river navigable for the whole 600 miles to Fort Selkirk, a fact which, of course, had been known to the Hudson's Bay Company since 1850. This establishment was known as Mr. Campbell's Fort, and was then an abandoned station, having been burned down by the Chilkat Indians in 1852, after its abandonment.

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[1] Smithsonian Reports: Washington 1861, pp. 39–40; 1864, pp. 416–420.
[2] " Alaska and its Resources," W. H. Dall, Boston, 1870.
[3] " Travel and Adventure in the Territory of Alaska." Page 210.
[4] Appendix i, page 208.
[5] Dawson's Report, page 139. Raymond: " Report of a Reconnaissance of the Yukon River, 1871." page 16.

" Its existence in the centre of the inland or 'Wood Indian' country had very seriously interfered with a lucrative and usurious trade which the Chilkoot and Chilkat Indians of Lynn Canal had long been accustomed to carry on with these people, acting as intermediaries between them and the white traders on the Pacific, and holding the passes at the headwaters of the Lewes with all the spirit of robber barons of old. In 1852 rumours were current that these people meditated a raid upon the post, in consequence of which the friendly local Indians staid by it nearly all summer of their own accord. It so happened, however, that they absented themselves for a couple of days, and at that unlucky moment the Coast Indians arrived. The post was unguarded by a stockade, and yielding to sheer force of numbers the occupants were expelled, and the place was pillaged on the 21st of August."[1] It had been at one time the most important post of the Hudson's Bay Company to the west of the Rockies in the Far North, and with the exception of Fort Yukon and Fort Reliance, near the present site of Dawson, Y.T., was the farthest permanent post ever maintained by the Company in the northwest.[2]

The headwaters of the Yukon were first reached by white men from Lynn Canal about 1878, though traders from the lower river had probably visited this section before that date. Lieut. Schwatka, of the United States Army, when he crossed Chilkoot Pass in 1883 and descended the river, followed in the trail of numerous prospectors and miners who had already made the trip. He, however, made the first survey of the river, a survey later found to be reasonably accurate by Wm. Ogilvie, Dominion Land Surveyor, who in 1887 carried a micrometer survey across the Pass and down the river to his winter quarters near the International Boundary.

At the mouth of the Pelly on his way down stream, Ogilvie met Dr. Dawson of the Canadian Geological Survey who had come in via the Stikine River to Dease Lake, down the Dease River, up the Liard River and over Campbell's old Pelly River route,—though he was unable to find any trace of the old trail,—and down the Pelly to the mouth. After the meeting Dr. Dawson travelled up the Lewes and out to salt water over Chilkoot Pass.

Dr. Dawson's assistant, R. G. McConnell, had separated from him at the junction of the Dease and the Liard and had gone down stream to Fort Simpson, and after doing considerable exploring on the Slave, Salt and Hay Rivers, wintered at Fort Providence. In the spring he returned to Fort Simpson over the ice with dog teams, built a boat, decended the Mackenzie to the Peel, and ascended the Peel to Fort McPherson. He then crossed the mountains by the Peel River portage to Lapierre House, decended the Porcupine, passing Rampart House, to Fort Yukon, worked his way up the Yukon in a small boat and came out over Chilkoot Pass in September, 1888.[3]

In 1885, in the course of a remarkable exploratory reconnaissance of the Copper, Tanana, and Koyukuk Rivers, a party under Lieut. Henry T. Allen, United States Army, visited Nicolai's village on the Chitistone in about longitude 142° 50′, this being the first approach to the 141st Meridian from the Copper River region.[4]

Ogilvie wintered in 1887–8 on the Yukon near the crossing of the 141st Meridian, where he determined the longitude and marked a temporary boundary line.[5] In the

[1] Dawson's Report, page 138.
[2] Dawson's Report, page 134.
[3] " Report on an Exploration in the Yukon and Mackenzie Basins, N.W.T." R. G. McConnell, B.A., Montreal: William Foster Brown & Co., 1891.
[4] " An Expedition in the Copper, Tanana, and Koyukuk Rivers in the Territory of Alaska, 1885." Washington, 1887.
[5] For details see page 218, *et seq.*

spring of 1888 he crossed over from the Yukon to the Porcupine watershed by going up Tatonduk River, across the divide and down the Porcupine to the mouth of the Bell. He ascended this latter river, crossed through McDougall's Pass, and reached Fort McPherson on the Peel River. From here he ran a micrometer traverse down the Peel and up the Mackenzie, eventually reaching Edmonton in December, 1888, having accomplished as the result of his twenty months' work, a good determination of the position of the Boundary on the Yukon and Fortymile Rivers, about 1900 miles of accurate instrumental survey, and nearly 800 miles of track survey, the greater portion of this latter being through a country previously unknown and untravelled by white men.[1]

In 1889, McGrath and Turner ascended the Yukon River to Fort Yukon, where they separated, Turner spending the winter of 1889-90 at Rampart House on the Porcupine River, and McGrath going on up the Yukon to the vicinity of the Boundary where he remained until the spring of 1891, when he descended the river and went out via St. Michael.[2]

In 1890 I. C. Russell[3] of the United States Geological Survey carried a geologic reconnaissance from the mouth of the Yukon to its headwaters, returning to the coast by way of Chilkoot Pass.

In 1891 an expedition, organized by, and under the direction of, Schwatka, after coming in via the Taku route crossed from Fort Selkirk to Skolai Pass and thence down the Chitina and Copper Rivers to the coast. Dr. C. Willard Hayes, of the United States Geological Survey, who was the geologist of the party, made a remarkably accurate traverse of the whole route, and was therefore the first to locate the boundary at its crossing of the White River.[4]

In 1898, a United States Geological Survey topographic party in charge of W. J. Peters, with Alfred H. Brooks as geologist, went in via White Pass down the Yukon to the mouth of White River, and after ascending the White River and Snag Creek, portaged to Mirror Creek, a tributary of the Tanana, and descended this latter river to the Yukon, gaining much valuable information of the lower White River valley and of the country along the Boundary in the vicinity of Snag Flats.[5]

Another United States Geological Survey topographic party in charge of E. C. Barnard (now the United States Boundary Commissioner), which accompanied the party in charge of Mr. Peters as far as the mouth of White River, continued down the Yukon to the vicinity of the International Boundary Line, and during the summer of 1898 mapped the Fortymile Quadrangle which includes part of the Yukon River immediately below the International Boundary Line and the Fortymile district west of the Boundary.[6]

From this time on, the discovery of gold in various parts of that far northern region naturally attracted to it a great deal of attention, and it was visited by many geologists and explorers, too numerous to be mentioned in this brief sketch, each doing his share to extend the geographical and geological knowledge of the vast northland, until it was soon far from being the *terra incognita* it had been even a few years before.

[1] "Annual Report of the Department of the Interior for the year 1887." Ottawa: McLean, Roger & Co., 1888. Ditto for the year 1889. Ottawa: Queen's Printer, 1890.

[2] For details see page 225, *et seq.*

[3] "National Geographic Magazine." Vol. iii, Washington, 1891.

[4] National Geographic Magazine, vol. iv, 1892, pp. 117–162.

[5] "A reconnaissance in the White and Tanana River basins, Alaska, in 1898." Alfred H. Brooks, United States Geological Survey, 20th Annual Report, 1898–9, part vii, pp. 431, *et seq.*

[6] "Maps and descriptions of Routes of Exploration in Alaska in 1898." United States Geological Survey, Washington, D.C., 1899.

Mention might perhaps be made of a topographical reconnaissance survey made in 1900, from the head of Chilkat River to Lake Kluane and thence down-stream to Dawson, by J. J. McArthur, Dominion Land Surveyor, (now His Britannic Majesty's Boundary Commissioner) as this trip had a more or less direct connection with the work done later during the survey of the boundary.

The discovery of gold was followed also by the rapid establishment of many different trading and transportation companies, and the Yukon valley particularly became the scene of great mercantile activity, and in connection with the establishment of transportation companies it may be of interest to note that the first trading steamboat ascended the Yukon River as early as 1869.[1]

[1] Ogilvie: " Early Days on the Yukon." Ottawa: Thorburn & Abbott, 1913, page 69.

APPENDIX II.

LATER NEGOTIATIONS LEADING UP TO THE ACTUAL DEMARCATION OF THE BOUNDARY, WITH DETAILS OF FIELD WORK ON THE BOUNDARY PRIOR TO THE CONVENTION OF 1906.

Just as the gradual advance of traders from the east and west had made it imperative in 1821 that the limits of the areas open to the various nations should be described on paper by treaties and conventions, so the further advance of discovery, exploration, and commerce rendered necessary an actual demarcation of these limits on the ground.

The first official reference to this necessity we find in a resolution, dated March 12, 1872, of the Legislative Assembly of British Columbia, addressed to the Honourable Joseph William Trutch, Lieutenant-Governor of the province, asking him to draw the matter to the attention of the Dominion Government. In July of the same year a resolution to the same effect[1] was passed by the Executive Council of the same province. Accordingly the matter was brought to the attention of the Colonial Office, and the British Ambassador at Washington enquired, in November, 1872, if the United States Government would be willing to agree to the appointment of a commission to consider the matter. President Grant also, in his Annual Message to Congress, 2nd December, 1872, recommended the establishment of the line before conflicting interests should make the matter of settlement a difficult one. A Bill[2] authorizing the surveying and marking of the boundary, was actually reported to Congress in that month and received its first and second readings, but owing "to the immense amount of more important business," it went no further. The Corps of Engineers, United States Army, suggested, as an alternative to marking the line completely, that it would be sufficient to decide on several important isolated points to be marked, and among these we find the points where the 141st Meridian crosses the Yukon and Porcupine Rivers. The British Government also about this time took steps to ascertain the probable cost of the survey, and in November, 1873, Capt. D. R. Cameron, R.A., Commissioner at Ottawa in connection with the location of the International Boundary along the 49th Parallel, was asked to give an estimate of the approximate cost of the proposed survey, and of the time necessary to complete it. Owing to pressure of other business his estimate was not completed until February, 1875. Meanwhile, in February, 1874, Mr. J. S. Dennis, Surveyor General of Dominion Lands, made a report to the Honourable the Minister of the Interior at Ottawa, in which he stated, in part . .[3]

. . . "The undersigned is of the opinion that it is unnecessary at present . . . . to incur the expense of determining and marking any portion of the boundary under consideration, other than at certain of the points mentioned in the extract alluded to in the despatch from Sir Edward Thornton to the Earl of Granville, dated February 15th, 1873, that is to say:—

"1. . . . . .

"2. . . . . .

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[1] "Alaska Boundary Tribunal. Appendix to the British Case." Vol. i, page 162 *et seq.*

[2] 42nd Congress } H. R. 3254
3rd Session }
(Mis. Doc. No. 20)

[3] "Alaska Boundary Tribunal. Appendix to the British Case." Vol. i, page 177.

" 3. The points where the 141st meridian west of Greenwich crosses the rivers Yukon and Porcupine.
. . . . . .
" The points of crossing of the Yukon rivers and Porcupine might be fixed by a separate Commission. . . . . .
" This might be easily done in one season. . . . ."

Capt. Cameron, in his estimate also, gave as an alternative the marking of certain points, instead of surveying the whole line, his points being practically the same as those suggested by the United States engineers and by Mr. Dennis, and including the points on the Yukon and Porcupine Rivers. Congress, however, failed to make an appropriation at that time, and the matter was dropped, only to become acute again in November, 1876, on account of the "Peter Martin" affair. Peter Martin, a United States subject but a British prisoner, was being taken from Laketon, Cassiar, British Columbia, via the Stikine River to Victoria for trial. He escaped from his escort on what he alleged was United States territory near the mouth of the river, but was recaptured. The complications of this case drew attention anew to the necessity for a proper demarcation of the boundary, and caused the British and Canadian Governments to renew their requests at Washington for a Joint Commission to mark the boundary, at least in part.

With the exception of agreeing on a provisional boundary on the Stikine River in 1878, nothing was done with regard to surveying or marking the line. In 1884 and until 1888 we find the matter coming up incidentally and informally between Mr. Dall of the United States Coast and Geodetic Survey and Mr. G. M. Dawson of the Geological Survey of Canada, but without any practical results.

Wm. Ogilvie, D.L.S., 1887–8.

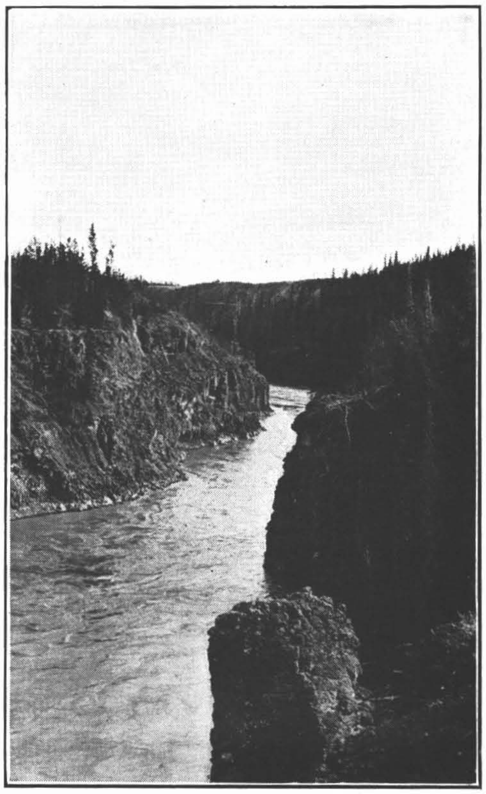
In 1887, owing to "the fact that somewhat important developments of placer gold mining had of late been attracting a yearly increasing number of miners and prospectors into a portion of the district in question ",[1] the Ogilvie expedition was sent into the then Far North to undertake exploratory and survey work, the latter including the preliminary determination of the point at which the 141st Meridian crosses the Yukon River.

The difference between conditions as they existed at that time and as they were found by those working on the later demarcation of the boundary is perhaps best illustrated by a few quotations from Mr. Ogilvie's graphic reports of his twenty months' work in the north.

In the first place, trouble was anticipated with the natives in certain localities. We have seen how Campbell, in 1843, was forced, to turn back at the mouth of the Pelly by the timidity of his men upon hearing tales of the alleged ferociousness of the natives farther down the Yukon. So, too, Ogilvie heard disquieting reports upon his arrival at Chilkoot on May 24, 1887. He says:[2] " The first news I received on landing was that there was trouble in the interior on the Lewes River in the vicinity of where I intended to go. A miner, who had recently arrived from the interior, stated that there had been a fight between the Indians and the miners at the mouth of the Stewart River. The result of the affair, he alleged, was that four Indians and two white men had been killed, and that the Indians had come up the river as far as the canyon to lie in wait for any white men who might be going into the country. I did not have

[1] Dawson's Report: pages 1 and 2.
[2] " Annual Report of the Department of the Interior for the year 1889." Ottawa: Queen's Printer, 1890. Part viii, page 3 *et seq.*

an opportunity of questioning him as he had gone to Juneau City the day before I arrived. The rumour seemed to me to be somewhat improbable; but true or false, it was an unpleasant one to hear, and the only way to verify it was to go and see whether the Indians were hostile or not. Happily the whole story proved to be untrue, as I subsequently learned from the miners in the interior, that he had difficulties with them, in consequence of which he was ordered in mid-winter to leave the region, which the miners consider equivalent to a sentence of death." This incident merely serves to show how vague was the knowledge, even at that late date, of conditions in the interior.



Looking down Miles Canyon.

He started his survey from Pyramid Island in Chilkat Inlet, the latitude and longitude of this point having been determined by the United States Coast and Geodetic Survey in 1869. From here he carried a micrometer traverse up Taiya (Dyea) Inlet, over Taiya (Chilkoot) Pass and thence downstream to the crossing of the 141st Meridian. The Indians of the coast who had a fancied grievance against the English, asked $20 per hundred pounds for packing his instruments and supplies over the mountains to Lake Lindeman, and only after being informed by Commander Newell, of the U.S.S. *Pinta*, that the party had a permit from the Great Father at Washington to pass through the country safely, and that they would be punished if they interfered, did they finally consent to carry the outfit as far as the summit for $10 per hundred pounds.

Ogilvie took two canoes with him from Peterborough, Ontario, and with these, after carrying them over the summit, and with a boat built at the head of Lake Bennett, he transported his supplies and outfit to the boundary, and made the landings necessary in connection with the micrometer traverse. The canoes were later taken over to the Mackenzie and were used by him on his trip up that river, and were left at Fort Chipewyan, after having been carried "about 170 miles" and doing "about 2,500 miles of work for the expedition."

At the mouth of the Pelly River, as arranged, he met Dr. Dawson of the Canadian Geological Survey, who had come in via the Stikine River, Dease Lake, and the Liard and Pelly Rivers, and after spending, as he says, "three days hard work" on "a correspondence designed to satisfy my friends and acquaintances for the ensuing twelve months," Dr. Dawson started up stream and he down. After attempting to ascend the White River, and carrying his traverse up the Fortymile as far as the canyon, he reached the vicinity of the boundary on the Yukon on September 14 the trip from salt water having occupied one hundred and eight days.

It may be of interest to note his description of the river which was to become, ten years later, the most famous in the world; little did he imagine the rush so soon to follow into the "Klondike": "Six and one-half miles above Fort Reliance, the

Whitehorse Rapids.

Ton-dac River of the Indians (Deer River of Schwatka) enters from the east. It is a small river about forty yards wide at the mouth, and shallow; the water is clear and transparent, and of a beautiful blue colour. The Indian catch great numbers of salmon here. They had been fishing shortly before my arrival, and the river, for some distance up, was full of salmon traps. A miner had prospected up this river for an estimated distance of 40 miles in the season of 1887. I did not see him, but got some of his information at secondhand. The water being so beautifully clear I thought it must come through a large lake not far up; but as far as he had gone, no lakes were seen. He said the current was comparatively slack, with an occasional 'ripple' or small rapid. Where he turned back the river is surrounded by high mountains, which were then covered with snow, which accounts for the clearness and purity of the water."

The point selected for his winter quarters was on the north bank of the Yukon River, about three miles above the present boundary, its selection being governed principally by the fact that after traversing about four miles of the river bank on both sides he was able to discover only one tree of a diameter large enough to be used as a transit stand. He wished to get one of 22 inches, but was forced to accept one of 18 inches, enlarging it by attaching side pieces. "Round this stump" he built his transit house "of the ordinary form," some of the party meanwhile being engaged in building the "residence" and the magnetic observatory. He says:

A few remarks descriptive of our residence may not be uninteresting.

After clearing away the top soil and excavating some distance into the side of the hill for a foundation, the bottom round of the house was laid and imbedded in the place so cleared; the next round of logs was then put up and fitted in place; it was then rolled off, and on top of the first round was laid a thick layer of moss; the second round of logs was then put back in its place on top of the moss which was so thick that the second round did not lie on the saddles at the corners, but rode on the moss. This was done with each succeeding round until the requisite height was reached, when the ordinary kind of shanty roof, consisting of poles, was put on. On these was laid a layer of moss about one foot thick, and on this about one foot of clay. In the roof were two ventilators, which could be closed altogether if necessary.

To heat the building, a large stone furnace was built, in size 3 by 8 feet; the front end of this was fashioned into a fireplace, with an oven on top for cooking; the other end was formed into a chimney. The structure was a large mass of stones bound together by a tough, white clay, whcih we found in the vicinity, and which baked hard and white and did not crack with the heat. When this mass was once heated, which it took two days to do, it retained the heat for a long time.

With the weight of the roof and walls the moss between the logs was so pressed that it filled every crevice, and almost made a solid wall. During the winter the ventilators were kept open all the time; yet the lowest temperature observed in the house during our stay was 48° Fahrenheit; the average in the morning before the fire was lighted was about 60° Fahrenheit.

He had considerable trouble with his instruments, which were more or less damaged by their rough trip into the country. The levels for use with the astronomical transit were found to be useless, and had to be repaired and refilled with alcohol, of which he fortunately had a supply for preserving specimens, and "the reflecting telescope, intended for the observation of occultation of stars by the moon, having got out of order, owing, I suppose, to the continued damp, cool weather during the season, I had to fit up a tourist's telescope to take its place."

He speaks of navigation on the river as follows: "On the 22nd September a small steamboat named the *New Racket* passed my camp on her way up to Fortymile River, with supplies . . . . Three other steamboats which navigate the river, the *Yukon*, the *St. Michael*, and the *Explorer*, belong to the Alaska Commercial and Fur Trading Company."

Referring to the difficulties of winter observing, he says: "When I say that some of my observations were taken when the temperature was lower than fifty below zero, and often when it was lower than forty, and seldom higher than thirty below, one can appreciate the difficulty of getting the most accurate work from such limited appliances as the transportation facilities at that time afforded. Not only did the temperature add to the personal discomfort and interfere with bodily freedom through excessive clothing, for one must be very warmly clothed indeed to remain standing still in an open-roofed observatory for two hours in such temperatures, but it also seriously interfered with the instruments used, and imparied their delicacy."

However, in spite of the many difficulties and inconveniences, he was able to give a location for the boundary which compared most favourably with the final determination made in 1906, until which time his line stood as the accepted boundary. He also determined the azimuth of the line and produced it north and south a short distance. During the winter he also returned to the Fortymile River and continued his traverse up that river to the boundary crossing, which he marked by blazing trees on either side.

Having completed his work at the boundary, in the spring of 1888 he was again on his way over to the Mackenzie, which he ascended and returned to civilization at Edmonton in December of that year.

In his report, Mr. Ogilvie writes as follows concerning his method of determining the longitude:—[1]

> In order to get all the data possible to determine the longitude of my observatory, I took every moon culmination I could get all through the months of November, December, January, and a part of February. To make these as accurate as possible, I observed the following method: A list of stars was selected succeeding each other in right ascension, at intervals of four or five minutes as nearly as possible, and containing ten stars. Their positions were such that the moon transited about midway in the group. The list contained, when possible, four moon-culminating stars, two polar stars, and four stars near the zenith. The first half of the group was observed with the transit clamp east; the transit of the moon's limb was then observed; the telescope then turned clamp west and the other half of the stars observed. From the star transits were deduced, by the method of least squares, the correction to the time of the passage of the moon's limb and the azimuth and collimation errors of the transit. The collimation and azimuth errors were applied with their proper signs to the moon at its transit; thus the right ascension of the moon was known for the place, and from the Ephemeris right ascension at its transit at Washington, or the right ascension at its upper and lower transit at Greenwich, the longitude of the observatory was deduced.[2]

[1] "Annual Report of the Department of the Interior for the year 1889." Queen's Printer, Ottawa, 1890. Part viii, page 12 *et seq.*

[2] "Annual Report of the Department of the Interior for the year 1887." Ottawa: Maclean, Roger & Co., 1888. Part ii, pages 25 and 26.

The instrument used for these observations was a transit, F. O. 2, by Troughton & Sims, of 28 inches focal length and 2½ inches aperture, and was one of those used by the British Commission on the survey of the 49th parallel. Ogilvie found the value of one division of the level to be:—

at 28° Fahrenheit......2.03″
at 41° " ......2.41″

He continues:

I here insert a table of the results of the moon culminations I observed at my observatory. All the culminations observed in 1887 were computed from the British Ephemeris by using the right ascension of the moon's bright limb at upper and lower transit at Greenwich. All culminations observed in 1888 were computed from the American Ephemeris, by using the moon's right ascension at meridian passage at Washington. These were occasionally checked by computing from the hourly Ephemeris. I give date of observation, the number of stars observed, the deduced right ascension of the moon's bright limb, and the resulting longitude, for the purpose of comparison, first giving the observations taken on the moon's bright limb when crescent, following with those taken when it was waning:—

OBSERVATIONS ON FIRST LIMB.

Date.	No. of Stars.	Deduced R. A. of Moon's Limb.	Deduced Longitude in Time.
		h. m. s.	*h. m. s.*
Sept. 29, 1887	7	23 14 59·47	9 23 35·89
Nov. 23, 1887	9	23 30 40·62	9 23 24·19
" 25, 1887	10	1 02 24·39	9 23 26·61
Dec. 21, 1887	5	23 59 02·65	9 23 28·02
" 22, 1887	6	0 44 59·11	9 23 23·73
" 23, 1887	8	1 30 39·34	9 23 21·54
" 27, 1887	6	4 46 14·33	9 23 27·32
" 29, 1887	8	6 37 24·78	9 23 33·16
Jan. 18, 1888	8	0 25 46·91	9 23 29·15
" 20, 1888	8	1 57 41·35	9 23 30·19
" 21, 1888	8	2 44 25·21	9 23 27·50
" 23, 1888	9	4 23 12·90	9 23 37·72
" 26, 1888	8	7 09 44·15	9 23 30·92
Feb. 23, 1888	8	7 39 49·33	9 23 32·68
	Mean		9 23 29·47
	Probable error of mean		± 3·01

It would be a waste of time to sum these by weights, having regard to the moon's rate of motion, the number of stars observed, and the probable error of each night's work, as the accuracy of the result depends mainly on the accuracy of the observed transit of the moon's limb. This could be deduced from the observations themselves, but as I had not time when observing to do this, and have not done it since, I do not consider it worth the time to do it now, as it would affect the mean result very little.

OBSERVATIONS ON SECOND LIMB.

Date.	No. of Stars.	Deduced R. A. of Moon's Limb.	Deduced Longitude in Time.
		h. m. s.	*h. m. s.*
Nov. 30, 1887	3	....	9 23 40·42
Dec. 1, 1887	8	6 04 00·16	9 23 44·18
" 2, 1887	6	7 00 27·73	9 23 52·24
" 3, 1887	7	7 57 27·54	9 23 46·07
" 6, 1887	7	10 46 19·81	9 23 39·96
" 7, 1887	4	11 41 28·83	9 23 45·44
" 29, 1887	8	6 39 41·95	9 23 39·70
Jan. 31, 1888	8	12 02 21·99	9 23 44·87
	Mean		9 23 44·11
	Probable error of mean..		± 2·81

The mean of both is $9^h\ 23^m\ 36^s{\cdot}79$ in time, or in arc 140° 54′ 11″·8, west of Greenwich. It will be noticed that on the 29th December both limbs of the moon were observed. The moon arrived at opposition that evening a little more than an hour before it transited at my station, so that it was sensibly full on both limbs at the time of my observation. The mean of the longitudes deduced from that night's work agrees very closely with the mean of the two series.

Unfortunately, of all the occultations arranged for with Mr. King before leaving Ottawa, through the two lunations of October-November and November-December, of which about sixty would occur here, none were observed.

Soon after getting my transit mounted and adjusted, I got a culmination of the moon on the 29th September. I intended this as a check on the survey, and as a basis for the computation of the times of the occultations; but I did not see the moon or a star again until November, after both lunations of the programme were over. I then computed a lot of occultations in the next lunation, but was as unfortunate with them as with the others.

Later he says:

Three occultations were observed; I did not compute the longitude from them, as I had not time. But I always made the preparatory computation twice over, and sometimes three times, so that I had the time of occultation very close, for the longitude used in the computation ($9^h\ 23^m\ 36^s$). I found the computed and the observed time so nearly the same that it was probable the difference was chiefly due to personal error in observation. I was therefore not so anxious to deduce the longitude from them as I otherwise would have been. Mr. W. F. King, Chief Inspector of Surveys, has computed the longitude from one of the occultations, the result of which I give.

December 5, 1887—Occultation of Alpha Leonis. Chronometer time of immersion $1^h\ 27^m\ 12^s{\cdot}6$. Emersion not visible. Chronometer fast $9^h\ 31^m\ 42^s{\cdot}51$.

This occultation was observed in daylight near the horizon, and with a small telescope, so it cannot be called good.

January 23, 1888—Occultation of 75 Tauri. Chronometer time of immersion $12^h\ 4^m\ 16^s{\cdot}25$. Emersion not visible. Chronometer fast $9^h\ 33^m\ 23^s{\cdot}42$.

January 23, 1888—Occultation of Alpha Tauri. Chronometer time of immersion $16^h\ 31^m\ 07^s{\cdot}55$. Emersion $17^h\ 18^m\ 49^s{\cdot}35$. Chronometer fast for immersion $9^h\ 33^m\ 23^s{\cdot}81$; for emersion $9^h\ 33^m\ 23^s{\cdot}87$.

Mr. King's longitudes in time, computed from the times of immersion and emersion of the last star, are respectively $9^h\ 23^m\ 45^s{\cdot}28$, and $9^h\ 24^m\ 11^s{\cdot}22$. In the case of this occultation the immersion was by the moon's dark limb, and there was no difficulty in observing it, but my telescope was much too small to show when the star emerged from the moon's bright limb, and the emersion was not noted until the star stood out clear from the moon, probably a second or more too late, the effect of which would be to make the resulting longitude too great.

Regarding these lunar observations we read in the report of Mr. (later Dr.) W. F. King:[1]

It was important for him (Ogilvie) to get his longitude there as accurately as possible, both as a check on his survey and also to give an approximation to the point where the boundary line, as defined by the treaty, crosses the Yukon River.

There being no telegraph line, and the journey being too long and too rough to permit him to carry his time by means of a chronometer with any certainty of it keeping its regular rate, the alternative was lunar observations.

The principle of lunar observations is this: the place of the moon among the fixed stars being determined at any known local time and the place of the moon being predicted and tabulated in the Nautical Almanac for each hour of Greenwich time, the Greenwich time is found at which the moon has the place given by the observation; that is, the Greenwich time corresponding to the local time of the observation is found, and thence by the difference of these times the longitude from Greenwich is obtained. The Greenwich predictions, in fact, supply the place of the corresponding observations, as well as of the signals in the method by the electric telegraph. The local time, of course, must be accurately determined in this as in the other method.

The methods commonly used for determining the Greenwich time are moon culminations and occultations of stars by the moon.

In the former of these methods, the transit of the moon is observed, as well as the transits of a sufficient number of stars to determine the adjustment errors of the instrument used, and the chronometer correction. The deduced time of transit of the moon's centre over the meridian is the right ascension of the moon. This by comparison with the right ascensions tabulated for each hour in the Almanac, gives the Greenwich time of the moon's transit, and the local time is given by the chronometer with its correction applied.

The occultation of a star is the passage of the moon between the observer and the star, eclipsing the latter. The observation consists in noting the exact time at which the star disappears under the the moon's limb and again when it reappears. Transit observations of stars must also be taken to determine the correction of the chronometer. The Greenwich time of the occultation is found from the tabulated right ascensions and declinations of the star and the moon, and the moon's parallax, by a somewhat lengthy calculation.

Both these methods are capable of considerable accuracy, but in comparing them with the telegraphic method it is to be noted that in the latter an error in the observations amounting to one-tenth of a second causes an error in the longitude of just the same amount, but in any lunar method, on account of the comparatively slow motion of the moon with reference to the stars, its right ascension changing only about one second in twenty-seven seconds of time, an error of one-tenth of a second in the observed right ascension produces an error in the longitude twenty-seven times as great.

In the moon culmination observations, moreover, there is difficulty in accurately observing the transit of the moon's limb. The accuracy of this observation is not to be compared with that of a star transit. In this respect the occultations are preferable, since the disappearance and reappearance are perfectly instantaneous.

All lunar methods, however, are subject to great uncertainty from the fact that in the present state of the lunar theory, the place of the moon cannot be predicted with the accuracy required in this work. To cut out the effect of these imperfectly known discrepancies in the moon's motions, corresponding observations had to be taken at some place of known longitude as near as possible to Mr. Ogilvie's station, so that corrections might be obtained from the observations at the known station to be applied to the tabulated moon's place in the subsequent working out of the corresponding observations taken by Mr. Ogilvie.

For this purpose I went to Kamloops, the longitude of which had been determined by telegraph, and which was the nearest point so determined to the locality in which Mr. Ogilvie intended to winter.

I remained at Kamloops during two lunations, from the new moon in October to the new moon in December, observing the transit of the moon whenever possible, as well as all the star occultations which occurred above the horizon at Kamloops and at the northern station. Mr. Ogilvie was to

[1] "Annual Report of the Department of the Interior for the Year 1887." Ottawa: Maclean, Roger & Co., 1888. Part ii, page 23.

observe the same phenomena. Unfortunately my list of occultations observed as well as of moon transits is very fragmentary. Unusually cloudy weather prevailed during the whole time of my stay, very few nights being clear.

A further programme was arranged to be carried out in April and May next. The partial failure of the October and November programme renders the carrying out of this one more important, and I hope that greater success will be obtained.

Regarding his observations for latitude, Mr. Ogilvie says:[1]

I determined the latitude of a point 60 feet north of my transit stand by setting up very carefully my 4-inch transit in the prime vertical. To insure all possible steadiness I suspended heavy weights from the tension screw of the instrument, so that the foot screws and the rest of the instrument were almost as rigid as if solid. By several trials I very carefully determined the value of a division of the striding level of the instrument, and found it to be 20″, and it was sensitive enough to plainly show one-fourth of this, and less than that could be estimated. I used on the telescope the eye-piece of the astronomical transit, which gave me power enough to see distinctly when a star crossed the wires, and yet was not too powerful for proper definition. I used three wires in the telescope, of which the aperture was one inch and the focal length 10 inches. I had a reference object fixed west of the instrument about half a mile, consisting of a box with an inch and a half slit in one side of it, which was covered with a piece of white cotton. In the box was placed a candle, the light of which shone through the cotton in the slit, presenting a bright clear mark, without any radiation of light. Just before observing a star transit the instrument was carefully levelled, then pointed on the R.O. and then on the star, and the passage over the wires observed; the level was then read, and the telescope again pointed to the R.O. to see that no movement had taken place in the interval.

On the 24th of October, 1887, I observed the following prime vertical transits of stars east and west of the meridian: η Draconis, west transit, circle south; η Cephei, east transit, circle north; 36 Draconis, west transit, circle north. The chronometer error was determined by a few star transits. When clouds prevented further observations that night, the latitude deduced from the several transits stood as follows:—

η Draconis	64° 40′ 57″·2
η Cephei	64° 40′ 57″·4
36 Draconis	64° 40′ 58″·4
Mean of all	64° 40′ 57″·7

Using as a basis the longitude of his observatory as computed in the field, he ran a micrometer traverse on the ice down the Yukon, and located the boundary, which was marked temporarily by blazing a couple of trees.

J. E. McGrath and J. H. Turner, 1889–91. [2]

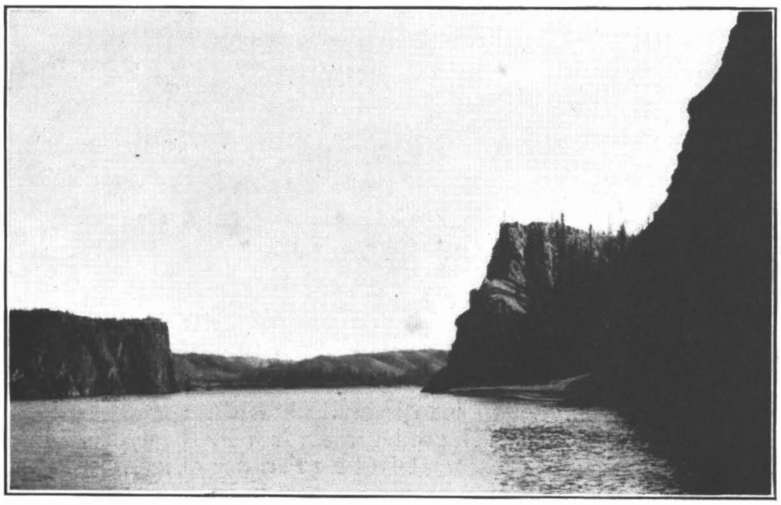
The United States, in 1889, decided to make an independent location of the 141st Meridian at the Yukon River, and also to make a preliminary location of the boundary at the Porcupine River.

Accordingly, Assistant J. E. McGrath and Sub-Assistant J. H. Turner, of the United States Coast and Geodetic Survey, were assigned in charge of the work on the Yukon and the Porcupine, respectively. From San Francisco they went in by way of St. Michael, where they arrived in June, 1889, and were informed that the Alaska Commercial Company would be unable to transport the combined parties and equipment on the first steamboat to be dispatched up the Yukon River, but that the "knock-down" parts of the new steamer which, with a party of ship carpenters and machinists, had arrived on the vessel on which the survey parties had

[1] "Annual Report of the Department of the Interior for the year 1889." Ottawa: Queen's Printer, 1890. Part viii, page 15.

[2] "Report of the Superintendent of the United States Coast and Geodetic Survey for the year ending June, 1890." Washington: Government Printing Office, 1891.

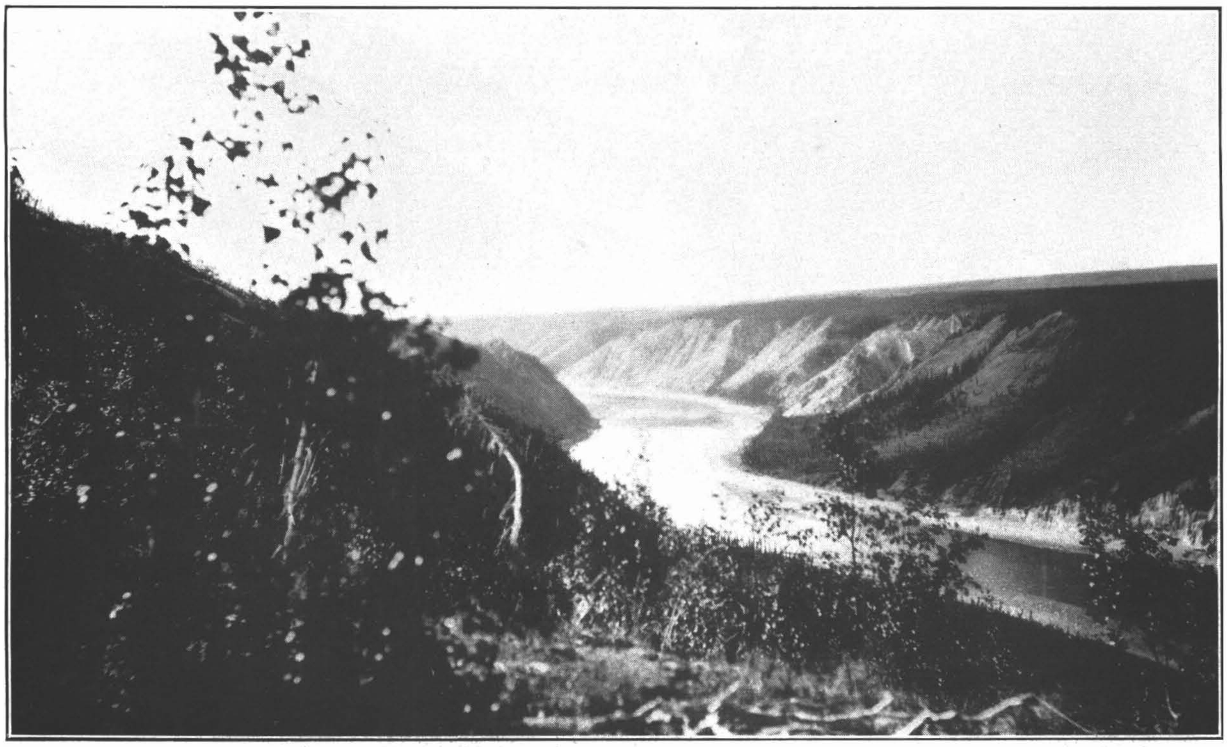
[2] "Report of the Superintendent of the United States Coast and Geodetic Survey for the year ending June, 1891." Washington: Government Printing Office, 1892.



Howling Dog Rock, Porcupine River.

travelled from San Francisco, would be assembled in the course of three or four weeks, and would have plenty of time to transport supplies as far as the mouth of Fortymile River before navigation would be in any danger of closing.

In view of the fact that the Porcupine River was navigable for steamboats only for a few weeks in the summer, it was agreed to put all the Porcupine River party supplies and equipment on board an old steamer which was available, and then to take on board the personnel of the Yukon River party and all that was practicable of their outfit, this comprising all the instruments, tools, and about three months' full supply of provisions. The combined parties travelled together to the site of Old Fort Yukon, where Mr. McGrath's party and outfit were disembarked to await the return of the steamer which carried Mr. Turner's party up the Porcupine. Mr. Turner and his party proceeded up the Porcupine on the *Yukon* until August 6, when Capt. Peterson



The Porcupine River below Rampart House, looking down stream.

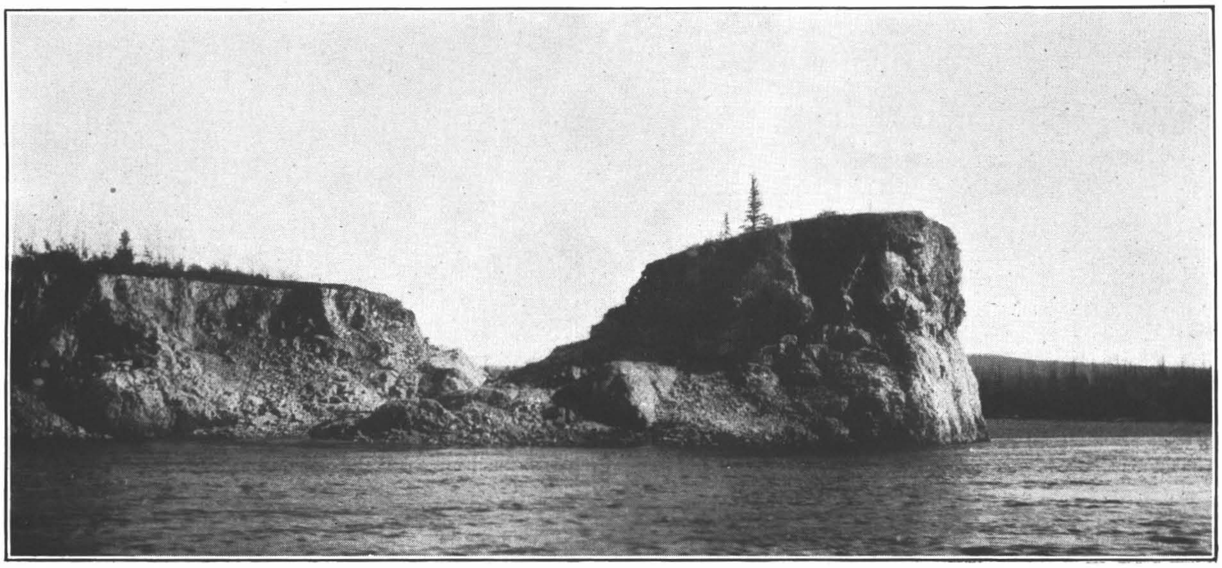
decided that he would be unable to take the boat any farther, and the party was landed some fifty miles below the boundary. From this point the supplies were laboriously " tracked " up the river in a whaleboat and a lighter, with the assistance of some Indians, and it was October 4 before the supplies were landed at the present Rampart House, which had been selected as the site for the winter quarters, and the buildings erected and prepared for occupation.

The old Hudson's Bay Company post of Rampart House has a very interesting history. The post was originally established after the abandonment of Fort Yukon to prevent the encroachment of traders from the west. The site first chosen was near Howling Dog Rock, about forty-five miles below the crossing of the 141st Meridian, although it was thought at the time to be well within British territory. In 1887 some doubt seems to have arisen as to this and, to make doubly sure, the buildings were burned and the post was built farther up opposite the mouth of Salmontrout River. The buildings were allowed to remain here, however, only one winter, until Turner had located the boundary, when they were carefully taken down and transported to their present site only a few yards east of the Meridian, where they were re-set. A few years later the post was abandoned by the Company, since when it has been first a Church of England mission and subsequently the post of an independent trader, Dan. Cadzow, as will appear later. It was also the Boundary Survey base in 1889-90 and in 1910, 1911, and 1912, and curiously enough Turner's building was again used as boundary survey headquarters during the winter of 1911–12.

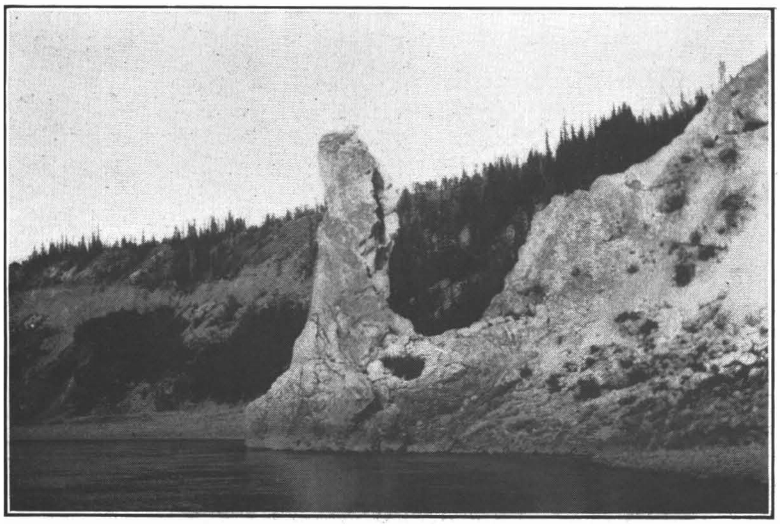
In his report of his trip down the Porcupine, McConnell says:

> The Porcupine[1] in passing through the Ramparts contracts considerably, and in places does not exceeds 75 yards in width. The current is more rapid than in the upper part, and was estimated to run at the rate of about three or four miles and a half an hour. Short riffles, with a much greater velocity than this, occur occasionally, but no rapids or other obstructions were met with which would prevent the navigation of the stream by small steamers.

[1] " Report of an Exploration in the Yukon and Mackenzie Basins, N.W.T.," by R. G. McConnell, B.A. Montreal: William Foster Brown & Co., 1891.



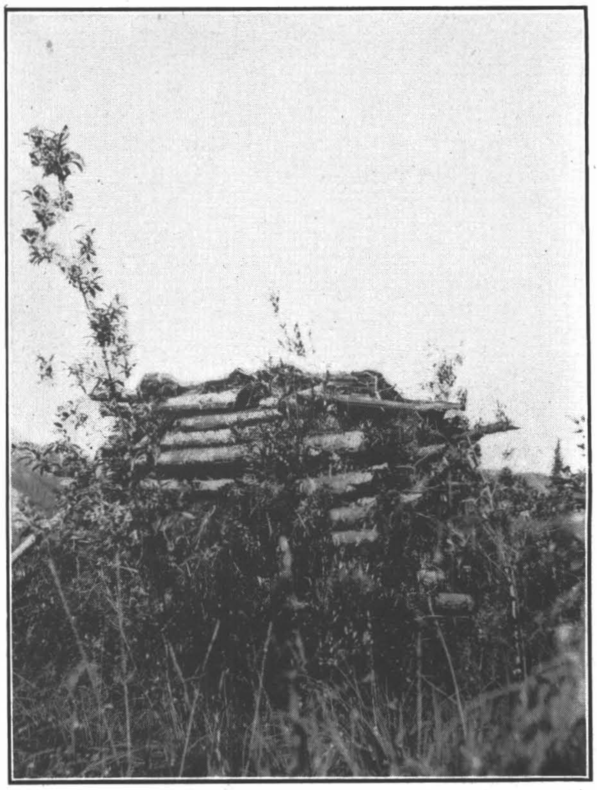
In the Lower Ramparts of the Porcupine River.



The Half-way Pillar, an old Hudson's Bay Company landmark. (Porcupine River.)

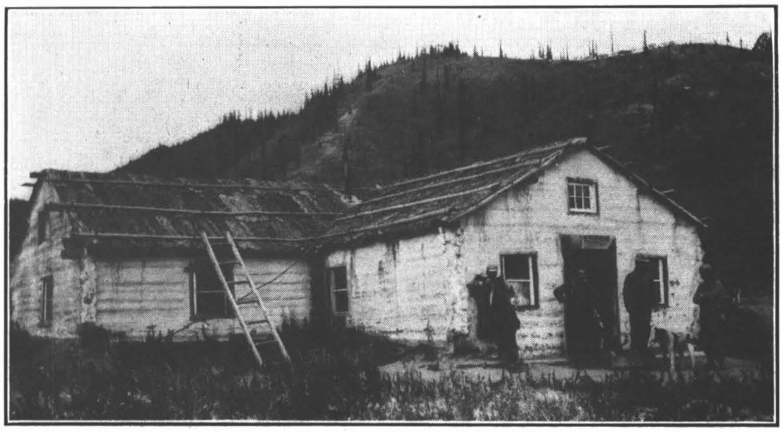
The Ramparts is a local name employed by the traders to designate a contracted, walled valley or canyon. The portion of the valley of the Porcupine which passes under this name is exceedingly picturesque. In the upper part, the banks rise steeply from the water's edge on both sides to heights of from three to five hundred feet, and their green slopes are everywhere broken by shattered pinnacles and bold crags and cliffs of brilliantly tinted dolomites and quartzites standing almost on edge. As we descend, the enclosing walls become higher and steeper, and the lighter shades are replaced by more sombre hues. Some miles above Rapid River a band of basalt, edged with vertical cliffs, appears above and gradually descends in the banks of the canyon until it reaches the bottom, and from this on, the gorge is bounded by even, precipitous walls carved out of this rock. The uniformity of this part of the valley is interrupted at intervals by deep gashes cut by tributary streams through the basalt covering. Of these the principal one is Rapid River, which enters the Porcupine about seven miles above the post.[1] A mile below Rapid River is the Half-way Pillar, a projecting column of rock, which was supposed by the traders to be equi-distant from Lapierre House and Fort Yukon.

During the winter, Turner kept up meteorological and magnetic observations, executed some triangulation in the vicinity of the camp, and began a topographical survey of the country in the immediate neighbourhood of the boundary, this map being completed in June; and in addition, observed for latitude and longitude and marked the boundary line by three temporary monuments. In March he organized a sledge expedition to the Arctic Ocean. He wished to make a preliminary survey of the line to the coast, but owing to the poor behaviour of his chronometers, he was able to make only a geographical reconnaissance of the route travelled. He appears to have gone north until he struck the Firth Valley, which he descended to the coast nearly opposite Herschel Island. After obtaining observations for azimuth and latitude, he



Temporary boundary mark on the south bank of the Porcupine River, set by Turner in 1889–90. Photographed 1909.

[1] Old Rampart House at the mouth of Salmontrout River.



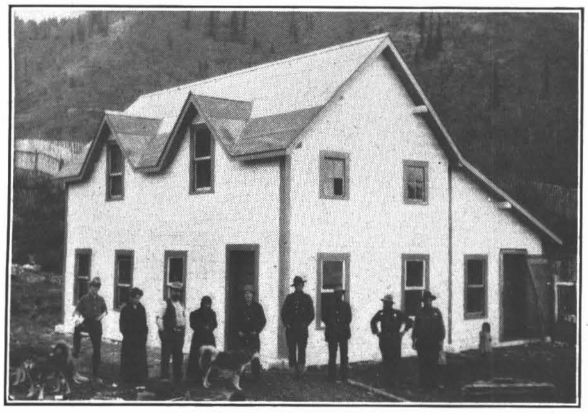
Turner's winter quarters, 1889–90. Photographed 1909.

immediately turned south again, reaching Rampart House after an absence of eighteen days, during which he had travelled approximately four hundred miles. A temperature of $-50°$ Fahrenheit was recorded on the eighth day out. Shortly after this he organized another expedition, under Assistant Astronomer Edmonds, to attempt to get south to join Mr. McGrath on the Yukon, but early spring thaws prevented, and the party was forced to turn back after getting south only 40 miles. Having finished his work in connection with the temporary demarcation of the boundary, Turner left Rampart House on July 15, 1890, with his supplies in two lighters, and, making a plane-table-telemeter survey of the river as he went, reached Fort Yukon in twenty-two days, the distance being 210 miles. Reaching St. Michael too late to get a boat south that season, he went into winter quarters there and carried on general astronomical and survey work during the winter and spring, and sailed for San Francisco in July, 1891.

At Rampart House, or, as he called his winter quarters, Camp Colonna, Turner, like Ogilvie, adopted the methods of moon culminations and occultations, the corresponding observations for the moon culminations being made at San Francisco by Assistant Fremont Morse.

His station[1] was located on the north bank of the Porcupine River, a short distance above its intersection with the boundary, and at an elevation of 98 feet above the river.

The observations for latitude were made with meridian telescope No. 13, focal length 66 cm., aperture $5 \cdot 3$ cm., magnifying power with diagonal eyepiece about 72. One division of the latitude level was found to equal $2'' \cdot 36 \pm 0'' \cdot 01$ as determined at Camp Colonna, October 30, 1889, at a temperature of $-10° \cdot 9$ Centigrade. The value of one turn of the micrometer was found from observations of α Ursae Minoris at eastern elongation, 1890, July 5, 6, 8, viz., $77'' \cdot 609 \pm 0'' \cdot 007$, the separate results being very consistent. Local time was obtained by means of the same instrument, and kept by sidereal chronometer Hutton No. 223.



The trader's new house at Rampart House, said to be the finest residence in America north of the Arctic Circle.

Numbers of pairs of stars observed, 24; average number of observations upon a

[1] "Report of the Superintendent of the U. S. Coast and Geodetic Survey for the year ending June, 1895." Washington: Government Printing Office. Appendix No. 2, page 321.

pair, 4; the probable error of an observation for latitude is $e_0 = \pm 1''.03$, a very large value, and it is supposed to be due to the difficulty of operating at very low temperatures. The micrometer, as well as the level values, as given above, were found to satisfy the latitude work very well. The probable error of the resulting latitude is $\pm 0''.14$.

RECAPITULATION OF RESULTS FOR LATITUDE, CAMP COLONNA, PORCUPINE RIVER, ALASKA.

Pairs of Stars. B. A. C.		n	w[1]	Latitude.	Δ
				° ′ ″	″
2819 and	2852	3	2·6	67 25 05·59	−0·48
2943	3049	1	0·9	03·90	+1·21
3087	3099	3	2·6	04·37	+0·74
7493	3366	3	2·4	05·83	−0·72
3496	3514	2	1·7	04·25	+0·86
3531	3645	2	1·7	04·52	+0·59
8026	3856	4	2·8	05·03	+0·08
3864	3914	5	4·0	02·79	+2·32
4033	(1028)	6	3·8	05·09	+0·02
4143	4216	6	4·4	04·70	+0·41
154	(1076)	4	2·9	06·35	−1·24
[2] 262	4433	5	4·0	05·43	−0·32
262	4467	4	2·7	03·82	+1·29
4484	4527 [2]	4	3·2	05·87	−0·76
4493	4527	1	0·9	06·21	−1·10
4540	4614	5	3·6	04·70	+0·41
4696	4732	5	3·8	05·35	−0·24
777	4864	4	3·2	04·94	+0·17
908	4961	5	3·2	05·87	−0·76
5079	(1270)	4	2·7	03·37	+1·74
5122	1061 [2]	5	4·2	05·27	−0·16
5150	1061	5	4·0	05·86	−0·75
5348	5462	5	4·0	06·57	−1·46
5502	5592	5	3·3	06·16	−1·05
				° ′ ″	″
Indiscriminate mean				67 25 05·11	
Weighted mean				67 25 05·11	±0·14

[1] For probable error of a star's place the value $\pm 0''.2$ was used in the computation for the weight w.
[2] N.B.—For the combination, two-thirds of the tabular weights are to be used.

The longitude[1] of his station rests wholly upon 13 moon culminations and 1 occultation. For its approximate location close to the boundary, the longitude of Fort Yukon, 210 miles distant, as determined in 1869 by Capt. C. W. Raymond, was made use of. In consequence of cloudy and foggy weather, no chronometric connection was made between the two places on the ascent of the river in 1889, but it succeeded on the descent in the following year.

Although the number of astronomic observations for longitude was small, owing to fog during the winter, clouds during the summer, and the continuous twilight about the beginning of May, rendering observations of stars difficult, sufficient data were obtained to make the determination of the boundary satisfactory for all practical purposes at that time. Faint stars such as many of the moon culminations stars, could only be observed with difficulty, or not at all, and the probable error of a time determination by a single star which in middle latitudes would be nearly $\pm 0^s.04$, rises to $\pm 0^s.08$ within the Arctic Circle.

[1] *Ibid:* Appendix No. 3, page 334.

SUMMARY OF RESULTS FOR LONGITUDE[1] AT CAMP COLONNA, PORCUPINE RIVER, FROM OBSERVATIONS OF MOON CULMINATIONS BETWEEN NOVEMBER, 1889, AND APRIL, 1890.

Date.	Corresponding observations at	Longitude $9^h\ 23^m$ + from ☾ I		Longitude $9^h\ 23^m$ + from ☾ II	△ (II–I)	$\lambda = 9^h\ 23^m$ + from I + 9^s	$\lambda = 9^h\ 23^m$ + from I & II	Weight p	v
		s.	*s.*	*s.*		*s.*	*s.*		*s.*
1889, Nov. 6	Washington	38·8	39·8	(52·8)	+14·0	....	45·8	½	−11·1
" 6	Greenwich	40·8		(54·7)	+13·9	....	47·8	½	− 9·1
" 9	"	(36·4)	....	71·5	+35·1	....	54·0	1	− 2·9
" 30	"	37·7	....	....	....	46·7	....	½	−10·2
Dec. 2	Washington	39·8	38·9	....	....	....	....		
" 2	Greenwich	38·0		....	....	47·9	....	½	− 9·0
" 8	Ephemeris corrected	(52·6)	....	69·0	+16·4	....	60·8	1	+ 3·9
" 9	"	(45·6)	....	71·1	+25·5	....	58·4	1	+ 1·5
" 27	Washington	35·3	36·5	....	....	....	....		
" 27	Greenwich	37·7		....	....	45·5	....	½	−11·4
" 28	San Francisco	40·8							
" 28	Washington	44·4	42·0	....	....	51·0	....	½	− 5·9
" 28	Greenwich	42·1							
" 29	"	52·7	....	....	....	61·7	....	½	+ 4·8
1890, Jan. 29	"	48·0	....	....	....	57·0	....	½	+ 0·1
Mar. 2	"	49·1	....	....	....	58·1	....	½	+ 1·2
" 7	Ephemeris corrected	(60·3)	....	67·2	+ 6·9	....	63·8	1	+ 6·9
April 3	San Francisco	47·4	49·6	....	....	56·4	....	¼	− 0·5
" 3	Greenwich	51·9		(66·6)	+14·7	....	59·2	¾	+ 2·3
	Means	....		....	+18·1	53·0	55·7		

[1] *Ibid:* page 335, *et seq.*

Values inclosed in brackets were obtained from the moon's defective (in illumination) limb, as corrected. The result of December 28 from corresponding observation at San Francisco has been given double weight on account of the known personal equation.

From $\Sigma\, p\, \lambda = 526 \cdot 3$ and $\Sigma\, p = 9 \cdot 5$ we have the weighted mean value for the longitude of the observatory $9^h\ 23^m\ 55^s \cdot 4$ as far as this depends on the observed moon culminations. Forming $\Sigma p v^2 = 367 \cdot 5$ and putting $n = 13$ we get the probable error of a single determination for longitude from moon culminations $0 \cdot 675 \sqrt{\frac{\Sigma p v^2}{n-1}} = \pm\ 3^s \cdot 7$.

Combining with the preceding result that deduced from the occultation of η Geminorum on November 10, 1889, both immersion and emersion being observed, and with a revised chronometer correction and a corrected lunar ephemeris from Greenwich observations, the resulting longitude from the immersion is $9^h\ 24^m\ 05^s \cdot 9$, and from the emersion $9^h\ 24^m\ 01^s \cdot 4$, with a mean of $9^h\ 24^m\ 03^s \cdot 6$.

Results from occultations being of superior value in comparison with moon culminations, the weight 2 was assigned to it in connection with tabular weights p. The final value then was

$\Sigma p \lambda = 653 \cdot 7$ and $\Sigma p = 11 \cdot 5$ $\qquad \lambda = 9^h\ 23^m\ 56^s \cdot 9$ or $140^\circ\ 59'\ 13'' \cdot 5$

with a probable error, $0 \cdot 675 \sqrt{\frac{\Sigma\ \ p v^2}{\Sigma\ (p)\ (n-1)}} = \qquad \pm 1 \cdot 2 \qquad \pm 17 \cdot 7.$

Mr. McGrath's stay at Fort Yukon was utilized by making sextant time observations at Captain Raymond's longitude station of 1869, in observing latitude by circummeridian observations on the sun, and in obtaining an azimuth and full sets of magnetic observations. On the return of the steamer, the Yukon party was taken on board and transported to the site of the station occupied by Mr. Ogilvie and his party in 1887–8. The first work undertaken was the extension of the buildings used for living purposes, the repair and putting in order of the magnetic and astronomical observatories, and the mounting and adjusting of the instruments to be used in these buildings.

Early in October, a canoe arrived at Camp Davidson (the name given the station), with a note from the Alaska Commercial Company's manager in St. Michael, containing notification that the new steamboat had been wrecked while en route to the mouth of the Yukon, and that while the greater portion of the cargo had been salvaged and the steamer raised, the necessary repairs made it impracticable for the company to get any supplies, in this year, farther up the river than the Shaman's village, a point about 600 miles down the river from the boundary; and advising that the party immediately repair to that point. A similar letter was addressed to the company's representative at the mouth of Fortymile River, notifying him that no supplies could be hoped for from St. Michael in this season, and directing him to so notify all the miners in his district who did not have sufficient food on hand.

These communications were read to all the members of the party, who were also notified that the Chief of the Party proposed to remain at Camp Davidson, but that no other man need feel under any obligation to stay; nevertheless, for all who remained an equal share of what provisions were on hand was assured. The answer to this was the declaration from each man in the party of his intention to remain, and at once an exact inventory was made of the remaining provisions, which disclosed what was equivalent to a full two months' supply, except of kerosene, of which unfortunately only a very limited stock remained—a most distressing lack in high latitudes, with winter coming on —and the party was at once put on the ration which its prospects made imperative.

In about ten days a flotilla of boats and canoes brought 100 miners to camp whose destitute condition forced them to abandon their work. These, taking a 10-ton barge which had been left at the camp by the steamer *Yukon*, proceeded to the lower river, accompanied by two men of the party, who were directed to take charge of all the United States property which had been saved and carried to the Shaman's village. About a week after the miners departed, an Indian messenger from Mr. McQuesten, the trader at the mouth of Fortymile River, brought word that the Indians on that river had just sent him word of their phenomenal success in hunting, and that they had slaughtered the greatest number of moose and caribou in the record of many years, and Mr. McGrath was told he could have whatever quantity of fresh meat he desired. He was also informed that an experimental attempt at cultivating turnips had proven so successful that a supply of this vegetable also could be had. Acting on this cheering information, men were despatched to McQuesten's post, and on their return brought 3,500 pounds of venison and nearly half a ton of turnips.

James McLarty and James French, who had accompanied the miners down the Yukon, taking into account the condition of the supplies at Camp Davidson on their departure, started out from the Shaman's village early in March with two dog sleds loaded mainly with flour, and for nearly two and a half months struggled through an unbroken stretch of ice and snow along the Yukon. Much of the way had to be travelled over twice and some three times to get their loads over the irregularly heaped-up ice which covered the route they were following, and, with only one sack of flour left out of the stock with which they had started, they arrived at Camp Davidson at the end of May, just one day before the ice broke for the season.

These were the first white men to make a journey in winter over the 600 miles which measures the distance from the Shaman's village to the boundary. The stock of flour at Camp Davidson during the winter was sufficient to allow about two ounces of bread per day per man, and the diet of the party was almost a uniform one of venison and turnips from October, 1889, to June, 1890, when the first steamer bringing supplies from St. Michael reached the camp.

In addition to the astronomical observations, the routine included making meteorological observations, which were made three times daily, and magnetic observations for declination, dip, and horizontal intensity, which were made on three days in every month. The meteorological instruments were the set used by the Greeley party at Lady Franklin Bay, and the lowest temperature recorded was −60·4 Fahrenheit. A small triangulation was extended from the astronomical observatory to the mark left by Mr. Ogilvie near the intersection of the Yukon River and the 141st Meridian; a traverse line was measured in April, 1891, from Camp Davidson to the mouth of Fortymile River; and a chronometer expedition was made between the mouth of Fortymile River and a point above the canyon on that river which Mr. Ogilvie had marked as being at the intersection of the river and the Boundary.

At the close of the occupation of Camp Davidson the party started for St. Michael on a barge left for this purpose by the Alaska Commercial Company, and maintained a running survey of the river from Camp Davidson to the Holy Cross mission, just below Anvik, which was checked by astronomical observations at Fort Yukon, St. James mission, and Nulato. This survey was discontinued to enable the party to catch the last boat that would enable them to get back to civilization in that year.

The results of Mr. McGrath's two seasons on the Yukon so far confirmed the position of the Ogilvie line that it was accepted as the temporary boundary until the final determination of the meridian was undertaken under the provisions of the Convention signed at Washington, April 21, 1906.

His observations of 1889[1] were made with meridian telescope No. 16; value of one division of level 1″·86 and of one turn of micrometer 67″·50, as determined from observations of Polaris at eastern elongation on October 10. Twenty-one pairs of stars were observed, and the average number of observations of each was less than three. The measures were comparatively rough, and yet of sufficient accuracy for the purpose intended. Probable error of a single observation ± 1″·3, and of the final result ± 0″·3. The individual values follow:—

No. of Pairs of Stars.	Stars from B.A.C.		n	Weight.	Latitude.
					° ′ ″
1	7621 and	7658	2	1·1	64 40 51·89
2	7686	7778	1	0·6	52·57
3	7799	7896	1	0·6	51·93
4	7967	8068	2	1·2	52·45
5	8124	8162	3	1·8	48·37
6	8188	8204	3	1·8	51·04
7	8238	8252	2	1·2	47·88
8	86	180	2	1·2	51·80
9	219	320	3	1·8	50·93
10	416	438	4	2·4	51·22
11	605	705	3	1·7	52·67
12	863	955	4	2·4	48·22
13	1062	1137	3	1·8	52·85
14	1211	1282	3	1·7	49·94
15	1382	1428	3	1·8	50·54
16	1448	1477	3	1·8	48·21
17	2083	2107	1	0·6	56·13
18	2223	2157	3	1·8	52·01
19	2410	6650	4	2·4	50·95
20	2722	2792	4	2·3	53·80
21	7124	2937	3	1·8	52·34
			57		64 40 51·09

Weighted mean 64° 40′ 51″·08 ± 0″·28.

The observations of 1891 were made with an 8-inch (20 cm.) Gambey vertical circle No. 57, with four verniers reading to the nearest 5″. Polaris was observed direct and reflected in mercury, and altogether 116 sets were obtained in ten nights, as shown in the following table of results, according to the office computation:—

Date.	No. of sets circle		Mean latitude from sets with		R–L	Mean latitude.	Δ
	R	L	Circle R.	Circle L.		φ	
1891			″	″		° ′ ″	″
April 4	11	0	59·2	....	....	64 40 57·4	−4·8
" 5	10	0	57·9	....	....	56·2	−3·6
" 25	6	6	56·7	49·7	+7·0	53·2	−0·6
May 1	6	6	54·7	50·8	+3·9	52·8	−0·2
" 2	6	6	53·9	47·9	+6·0	50·9	+1·7
" 3	6	6	55·5	49·6	+5·9	52·6	0·0
" 4	6	6	53·7	49·5	+4·2	51·6	+1·0
" 5	6	6	52·0	54·5	−2·5	53·2	−0·6
" 7	6	6	53·2	50·2	+3·0	51·7	+0·9
" 9	5	6	50·7	50·2	+0·5	50·4	+2·2
Weighted mean	......	......	....	....	+3·5	64 40 52·6	±0·5

For the 4th and 5th of April the results are reduced to mean of Circle R and L by application of half of the mean difference 3″·5 with weight ½ to each result.

Combining the results for the latitude gives:—

From observations of Polaris with vertical circle............. 64° 40′ 52″·6 ± 0″·5
From micrometric differences of stars N. and S. of the zenith
by meridian telescope................................ 51″·1 ± 0″·3
Weighted mean..........φ = 64° 40′ 51″·5 ± 0″·3

Mr. McGrath's observations for longitude[1] comprised two occultations in January, 1891; a transit of Mercury, May, 1891; a solar eclipse, June, 1891; and a series of moon culminations between November, 1889, and April, 1891. In the office computations and corrections to the lunar ephemerides were taken from the Greenwich observations, and corresponding observations made at San Francisco, Cal., in connection with the moon culminations were utilized. Transits of Mercury are phenomena not favourable for exact longitude determinations, and as but one phase was observed, no use was made of the observations, nor of twelve photographs secured while the planet was *in transitu*. The computations gave for the longitude of Camp Davidson, Yukon River:—

From Immersion of 30 Piscium, Jan. 14, 1891[2] .... $9^h\ 23^m\ 35^s{\cdot}5$ W. of Greenwich.
From Immersion of 33 Piscium, Jan. 14, 1891...................... 37·2
From first and last contact, solar eclipse, June 6, 1891.............. 32·2

Weighted mean (the last result having weight ½) with a probable error of about ±1 sec...................................... $9^h\ 23^m\ 35^s.5$ W. of Greenwich.

[1] *Ibid:* Appendix No. 3, page 333.
[2] On this day the temperature of the air was noted, −51°·5 F. or −46°·4 C.

The moon was observed on twenty-three days, on nineteen of which satisfactory results were obtained. The results marked with an asterisk in the following table were obtained by comparing the Camp Davidson observations with the Greenwich Ephemeris, corrected by interpolation; in all other cases there were corresponding observations either at San Francisco or at Greenwich, or at both places. The weights assigned to the mean value for each day depended upon whether there were corresponding observations at one or both stations, and whether one or both limbs were observed.

SUMMARY OF RESULTS FOR LONGITUDE[1] OF CAMP DAVIDSON, FROM OBSERVATIONS OF MOON CULMINATIONS.

Date.	$9^h\ 23^m$ + TABULAR QUANTITY. From Corresponding Observations. At Greenwich. ☾ I	☾ II	At San Francisco. ☾ I	☾ II	Means. ☾ I	☾ II	Mean referred to ½ (I & II)	Weights.
1889.	s.	s.	s.	s.	s.	s.	s.	
Nov. 3	(65·7)	Rejected			Time?			
" 10		35·7*				35·7	35·5	1·0
1890.								
Mar. 8		40·9				40·9	40·7	1·4
" 27	30·6*		28·9		29·8		30·0	1·8
" 28	37·6				37·6		37·8	1·4
" 29	42·9		44·3		43·6		43·8	2·0
" 30	35·3		39·8		37·5		37·7	2·0
April 2	34·7				34·7		34·9	1·4
" 6		35·7*				35.6	35·5	1·0
" 7		40·6		43·3		42·0	41·8	2·0
Aug. 29	32·7	32·9			32·8	32·9	32·9	2·0
" 30		49·1				49·1	48·9	1·4
Nov. 24	(50·3)	(57·0)	Rejected		Time?			
" 27		38·1*		39·4		38·8	38·6	1·8
1891.								
Jan. 24	(59·0)	(62·3)	Rejected	(64·9)	Time?			
Feb. 25		(59·9)	Rejected	(64·2)	Time?			
" 27		30·5				30·5	30·3	1·4
" 28		34·4*				34·4	34·2	1·0
Mar. 24	37·3*	37·3*	37·8	38·5	37·5	37·9	37·7	2·5
" 25	43·0*	42·1*			43·0	42·1	42·5	1·4
April 20	42·2				42·2		42·4	1·4
" 21	36·6*	34·0*			36·6	34·0	35·3	1·4
" 23	44·6	48·2			44·6	48·2	46·4	2·0
Means.	37·9	38·4	37·7	40·4	38·2	38·6	38·3	

$\Sigma p = 30\cdot3$ and weighted mean $38''\cdot5$, hence the resulting longitude from the moon culminations, $9^h\ 23^m\ 38^s\cdot5 \pm 0\cdot675 \sqrt{\frac{\Sigma\ (pvv)}{\Sigma(p)\ \ (n-1)}} = \pm\cdot0^s\cdot8$, and it should be noted that the separate results from the two limbs of the moon show no decided specific difference.

[1] *Ibid:* page 334.

In combining the results for longitude from occultations, the eclipse, and the moon culminations, the probable error ±1 sec. assigned to the former result is too weak for use in combination, and, assigning the weight 2 to each occultation result, and the weight 1 to the eclipse result, we have:—

	h.	m.	sec.	
From occultations and eclipse	9	23	35·5	weight 5
From moon culminations			38·5	weight 30
Resulting longitude of Camp Davidson	9	23	38·1	± $0^s·7$
or	140°	54′	31·5″	± 10·5″

The conditions under which the astronomical observations were made were most trying because of the arctic temperatures of the season between the months of November and April, which furnished the best period for observing so far as seeing was concerned. During these months the losing rate of the chronometers attained a maximum of between five and six minutes per day, and constant surveillance was required for the level vials in which tiny spicules of ice formed occasionally, and sometimes so minute as not to be visible, although suspected because of erratic movements of the bubbles in the vials. The observations in connection with the determination of the longitude at Camp Davidson from occultations of 30 and 33 Piscium were made at a temperature of −50° Fahrenheit.

WM. OGILVIE, D.L.S., 1895–6.

In the summer of 1895, Mr. Ogilvie was again sent out to produce the meridian, from the point established by him in 1887–8, north and south as far as necessary to furnish a conventional line of jurisdiction throughout the region occupied by the miners, who were in considerable numbers in some districts, notably in the vicinity of the Fortymile.

In order to determine the exact position of the boundary as referred to his observatory of 1887–8, he made a careful triangulation and chained traverse survey westward from the observatory, the result being that the original location, which had been established from the observatory by micrometer measurements only, was found to be 109 feet too far to the eastward. From this new point, he moved 42·5 feet farther west in order to have the line cross the Yukon at the mouth of a small creek, thus securing a permanent natural mark for the line, and from there, during the summer and late fall, he produced the line north about five miles, opening out a good wide vista in the vicinity of the river, but placing no permanent marks. During the ensuing winter he also succeeded in getting ten new determinations of longitude to be later combined with his observations of 1887–8. In February he resumed work on the line, and by the middle of April he had opened out the line as far south as the Sixtymile River, where the work was abandoned. The line, as far as run, was marked by cairns of stones wherever it was possible to procure them with reasonable time and labour, and it was cut and blazed so as to be easily recognizable.[1]

During this winter he used the same instrument as in 1887–8, again employing the method of moon culminations. The value of one division of his level was, at 28° F., 2″·03, and at −41° F., 2″·41, and the result of his field computation of his observations differed from his 1887–8 results by $1^s·052$.

[1] "Annual Report of the Department of the Interior for the year 1896." Ottawa: Queen's Printer 1897. Part ii, page 40 *et seq.*

A complete office re-computation of all his work gave the following results[1]:—

SUMMARY OF RESULTS OF OFFICE RE-COMPUTATION OF OGILVIE'S 1887-8 OBSERVATIONS.

9h. 23m. + tabulated seconds.

Date.	Moon's Limb. I.	Moon's Limb. II.
1887.	*sec.*	*sec.*
Sept. 29	37·23	.....
Nov. 23	28·46	.....
25	26·87	.....
Dec. 1	....	49·48
2	....	53·28
3	....	48·40
6	....	38·83
7	....	44·31
21	27·76	.....
22	14·04	.....
23	19·61	.....
27	22·15	.....
29	31·95	38·60
1888.		
Jan. 18	17·43	.....
20	12·49	.....
21	25·10	.....
23	37·52	.....
26	29·27	.....
31	....	42·15
Feb. 23	26·68	.....
Means	25·47	45·01
Probable error of means	± 1·38	± 1·42

Weighted mean of means ... 9h. 23m. 35·24 sec.
Probable error ... ± 1 sec.

SUMMARY OF RESULTS OF OFFICE RE-COMPUTATION OF OGILVIE'S 1895–6 OBSERVATIONS.
9h. 23m. + tabulated seconds.

Date.	Moon's Limb. I.	Moon's Limb. II.	
1895.	*sec.*	*sec.*	
Nov. 29	36·65	....	
30	42·72	....	
Dec. 1	22·58	52·11	Rejected, moon clouded.
2	....	43·57	
6	....	40·09	
7	....	42·51	
1896.			
Jan. 29	37·85	48·25	
30	....	37·48	
Means	39·07	42·38	
Probable error of means	± 1·24	± 1·21	

Weighted mean of means ... *9h. 23m.* 40·72 *sec.*
Probable error ... ± 0·8 *sec.*

[1] Re-computations by (Dr.) Otto J. Klotz on file at Dominion Observatory, Ottawa.

A comparison of the results of all observations by Messrs. McGrath and Ogilvie follows:—

	h.	m.	sec.	sec.
McGrath, 1889–91, office computation	9	23	38·1	± 0·7
Ogilvie, 1887–8, field computation			36·79	± 2·0
" 1887–8, office computation			35·24	± 1·0
" 1895–6, field computation			37·842	
" 1895–6, office computation			40·72	± 0·8

UNRATIFIED CONVENTION OF 1897.

The boundary question then, at least as far as the 141st Meridian was concerned, remained quiescent until 1897, when a Convention was drawn up by which the Commissioners to be appointed were to survey and mark " so much of the 141st Meridian of west longitude as is necessary to be defined for the purpose of determining the exact limits of the territory ceded to the United States by the Treaty between the United States and Russia of March 30, 1867." The chief reason given in the preamble for the necessity of this demarcation was stated thus: " Whereas such determination has not hitherto been made by a joint survey as is requisite in order to give complete effect to the said Treaties, although independent observations and surveys have been conducted from time to time and are now being conducted by expert officers in the services of their respective Governments along the said Meridian of the 141st degree of west longitude." The Convention, however, failed to be ratified by the Senate of the United States.

The full text of this Convention follows:—

CONVENTION[1] BETWEEN HER MAJESTY THE QUEEN OF THE UNITED KINGDOM OF GREAT BRITAIN AND IRELAND AND THE UNITED STATES OF AMERICA, FOR THE DEMARCATION OF SO MUCH OF THE 141ST MERIDIAN OF WEST LONGITUDE AS MAY BE NECESSARY FOR THE DETERMINATION OF THE BOUNDARY BETWEEN THEIR RESPECTIVE POSSESSIONS IN NORTH AMERICA.—SIGNED AT WASHINGTON, 30TH JANUARY, 1897.

Whereas by a Treaty between the United States of America and His Majesty the Emperor of all the Russias, for the cession of the Russian possessions in North America to the United States, concluded 30th March, 1867, the most northerly part of the boundary line between the said Russian possessions and those of Her Britannic Majesty, as established by the prior Convention between Russia and Great Britain, of 28–16 February, 1825, is defined as following the 141st degree of longitude west from Greenwich, beginning at the point of intersection of the said 141st degree of west longitude with a certain line drawn parallel with the coast, and thence continuing from the said point of intersection upon the said meridian of the 141st degree in its prolongation as far as the Frozen Ocean;

And whereas the location of said meridian of the 141st degree of west longitude between the terminal points thereof defined in said Treaties is dependent upon the scientific ascertainment of convenient points along the said meridian and the survey of the country intermediate between such points, involving no question of interpretation of the aforesaid Treaties, but merely the determination of such points and their connecting lines by the ordinary process of observation and survey conducted by competent astronomers, engineers and surveyors;

And whereas such determination has not hitherto been made by a joint survey as is requisite in order to give complete effect to the said Treaties, although independent observations and surveys have been conducted from time to time and are now being conducted by expert officers in the services of their respective Governments along the said meridian of the 141st degree of west longitude; resulting in the collection of scientific data and the establishment of stations on or near said meridian, of which

[1] This Convention failed to be ratified by the Senate of the United States.

the two Governments may avail themselves for the purpose of accomplishing the object of this Convention;

Her Majesty the Queen of the United Kingdom of Great Britain and Ireland, and the United States of America being equally desirous to provide for the removal of any possible cause of difference between their respective Governments in regard to the location of the said 141st meridian of west longitude, have resolved to conclude a Convention to that end, and for that purpose have appointed as their respective Plenipotentiaries:

Her Majesty the Queen of the United Kingdom of Great Britain and Ireland, His Excellency Sir Julian Pauncefote, G.C.B., G.C.M.G., Ambassador Extraordinary and Plenipotentiary of Great Britain; and

The President of the United States, Richard Olney, Secretary of State of the United States;

Who, after having communicated to each other their respective full powers, which were found to be in due and proper form, have agreed to, and concluded the following Articles:—

ARTICLE I.

Each Government shall appoint one Commissioner with whom may be associated such surveyors, astronomers, and other assistants as each Government may elect.

The Commissioners shall at as early a period as practicable proceed to trace and mark under their joint direction, and by joint operations in the field, so much of the 141st meridian of west longitude as is necessary to be defined for the purpose of determining the exact limits of the territory ceded to the United States by the Treaty between the United States and Russia of March 30, 1867.

Inasmuch as the summit of Mount St. Elias, although not ascertained to lie in fact upon said 141st Meridian, is so nearly coincident therewith that it may conveniently be taken as a visible landmark whereby the initial part of said meridian shall be established, it is agreed that the Commissioners, should they conclude that it is advisable to do so, may deflect the most southerly portion of said line so as to make the same range with the summit of Mount St. Elias, such deflection not to extend more than twenty geographical miles northwardly from the initial point.

ARTICLE II.

The data relating to the determinations already made at this time by either of the two Governments concerned, of points on or near the 141st meridian for the purpose of fixing its position, shall be submitted by each Government to the Commissioners, who shall decide which of the results of the determinations shall be adopted by them.

In case of disagreement between the Commissioners as to the correct geographical co-ordinates of one and the same point, determined by either of the two Governments separately, a position midway between the two locations in question, of the 141st meridian shall be adopted, provided the discrepancy between them shall not exceed one thousand feet.

In case of a greater discrepancy a new joint determination shall be made by the Commissioners.

ARTICLE III.

The location of the 141st meridian as determined hereunder shall be marked by intervisible objects natural or artificial, at such distances apart as the Commissioners shall agree upon, and by such additional marks as they shall deem necessary, and the line when and where thus marked, in whole or in part, shall be deemed to permanently define for all international purposes the 141st meridian mentioned in the Treaty of 30th March, 1867, between the United States and Russia and in the Treaty of February 28–16, 1825, between Great Britain and Russia.

The location of the marks shall be described by such views, maps and other means as the Commissioners shall decide upon, and duplicate records of these descriptions shall be attested by the Commissioners jointly and be by them deposited with their respective Governments, together with their final report hereinafter mentioned.

ARTICLE IV.

Each Government shall bear the expenses incident to the employment of its own appointees and of the operations conducted by them, but the cost of material used in permanently marking the meridian, and of its transportation, shall be born jointly and equally by the two Governments.

ARTICLE V.

The Commissioners shall diligently prosecute the work to its completion, and they shall submit to their respective Governments from time to time, and at least once in every calendar year, a joint report of progress, and a final comprehensive report upon the completion of the whole work.

The present Convention shall be duly ratified by Her Britannic Majesty and by the President of the United States of America, by and with the advice and consent of the Senate thereof, and the ratifications shall be exchanged at Washington or in London as soon as possible within twelve months from the date thereof.

In faith whereof, we the respective Plenipotentiaries have signed this Convention and have hereunto affixed our Seals.

Done in duplicate in Washington, the thirtieth day of January, one thousand eight hundred and ninety-seven.

[L.S.] JULIAN PAUNCEFOTE.
[L.S.] RICHARD OLNEY.

J. J. McArthur, D.L.S., 1902,

In 1902, owing to rumours of mining activity in the supposed vicinity of the boundary line farther south, the Ogilvie line was extended from the Sixtymile River to the flats at the head of Scottie Creek, a distance of about sixty miles by J. J. McArthur, Dominion Land Surveyor.

Convention of 1906.

The question of marking the boundary again remained *in statu quo* for some years, when the necessity of having the work done again impressed itself upon the two Governments, and a Convention was signed at Washington on April 26, 1906[1], and the ratifications were duly exchanged, also at Washington, on August 16 of the same year.

This Convention was drawn up on practically the same lines as that of 1897, except that it prescribed the use of the telegraph for determining a point on the 141st Meridian, and the extension of a north and south line through the point thus determined. It differed, however, from the Convention of 1897 in that no provision was made for the deflection of the southerly portion of the boundary to strike the summit of Mount St. Elias.

The Commissioners[2] appointed by virtue of Article I were: for the United States, Mr. O. H. Tittmann, Superintendent of the United States Coast and Geodetic Survey, and for His Britannic Majesty, Dr. W. F. King, Chief Astronomer for the Dominion of Canada.

An important matter to be noted here is the establishment of a "neutral strip" along the boundary line by concurrent action of the Governments of Canada and the United States, although it can hardly be said to be the result of a Treaty or Convention between the two countries.

The matter first came up in a despatch from His Majesty's Ambassador at Washington, dated 30th October, 1907, submitting for the consideration of the Dominion Government a proposal by the United States Government that joint action be taken for the reservation of a strip of land 60 feet wide on each side of the Canada-Alaska Boundary Line under conditions similar to those resulting in the establishment of the

[1] For full text see page 15.
[2] See appointments, page 17, *et seq.*

reservation along the Mexican Boundary Line by Proclamation of the President of the United States.

After considerable correspondence an Order in Council[1] was passed on April 14, 1908, reserving from sale, lease, and entry, a strip 60 feet wide along the International Boundary in Yukon Territory, and making certain suggestions as to other parts of the boundary.

Also, on June 15, 1908, the President of the United States, by Proclamation,[2] set apart as a public reservation, " all unpatented public lands of the United States lying within 60 feet of the boundary line."

As a reason for making this reservation, the Order in Council sets forth that " The Minister of the Interior submits that in his opinion such a reservation will be of great service in the protection of the revenue and in the enforcement of the law generally, and he therefore recommends that with a view to the prevention of the erection of buildings or permanent structures or works on or close to the boundary line, except railways, aqueducts, bridges, canals, ditches, and other works of a public character, and except buildings or permanent structures or works properly connected with such railways, aqueducts, bridges, canals, and other works of public character, he be authorized to reserve the land . . .", etc.

[1] For text see page 20.
[2] For text see page 22.

APPENDIX III.

DESCRIPTIONS OF TRIANGULATION STATIONS, AND SKETCHES OF THE TRIANGULATION, ALONG THE 141ST MERIDIAN FROM THE ARCTIC OCEAN TO MOUNT ST. ELIAS.

BETWEEN THE ARCTIC OCEAN AND THE PORCUPINE RIVER:

DEMARCATION. *W. B. Gilmore, 1912.*

On a low flat knoll 5 miles west of the Boundary, one-half mile east of the landward end of Demarcation Point, and one-quarter mile inland from the Arctic Beach. Numerous small ponds and waterholes surround on the east, south, and west the slight rise of ground on which the station is situated. This is the northernmost signal erected in connection with the survey of the Boundary.

Station Mark: Shallow drill hole in small rock set flush with the ground. Elevation 30 feet (approx.).

POLAR. *W. B. Gilmore, 1912.*

By the coast line the station is 1¾ miles west of the Boundary and 3¾ miles east of the landward end of Demarcation Point, and is on the edge and at the top of the tundra bank, which breaks off abruptly above the Arctic beach, less than 100 feet from tidewater. About one-tenth of a mile inland lie several water holes, and one-third of a mile southeast a deep gully in the bank above the beach drains several other ponds.

Station Mark: Shallow drill hole in small stone set flush with ground. Elevation 30 feet (approx.).

OCEAN. *J. D. Craig, 1912.*

On a spit of land between Clarence Bay and the Ocean, on the west side of the Bay. A narrow spit runs across the mouth of the Bay for about 1½ miles, and is broken in one place only, about 350 feet east of the signal. Opening is about 40 feet wide. About 150 feet from opening on bay side is an Eskimo igloo. A little beach is between the igloo and the opening, and between the igloo and the ocean. Station is on a moss knoll about 20 feet higher than water and 50 feet from the ocean.

Station Mark: Drill hole in rock about 9 by 12 inches, set flush with the surface of the ground.

ICE. *T. Riggs, Jr., 1912.*

On the Arctic coast, about 8½ miles east of station Ocean. The station is on the highest ground in the vicinity of a landlocked bay, with a very narrow entrance, and about 500 feet from the beach.

Station Mark: Drill hole in rock set flush with the ground. Tripod signal with targets.

PASS. *W. B. Gilmore, 1912.*

In the British Mountains on one of the northerly ridges, which is 2½ miles east of the Line, and runs in a general north-to-south direction. About 1½ miles to the south is a pass used by the survey parties as the main trail to the head of Clarence River. The station is on the northernmost of a series of knobs which rise from the backbone of the ridge.

Station Mark: Drill hole in triangle cut in solid rock. Signal: Cairn without pole. Elevation, 4,200 feet (approx.). About one hour's gradual climb from a camp at the south foot of the ridge, and on the east side of the pass mentioned above. The willow used for firewood at this camp had to be packed from Malcolm River, several miles distant.

BOREALIS. *W. B. Gilmore, 1912.*

On one of the highest peaks among the northerly ridges of the British Mountains. This mountain stands 4½ miles west of Line, between Clarence River on the east and a branch of Turner River on the west. The sides are bare, steep, and covered with slide rock. The station is located on the summit, which is a sharp edge of disintegrating rock. Looking north from the point there is a splendid panoramic view of the Arctic Ocean and coast line, including the mouth of Turner River, Icy Reef, Demarcation Point and Bay, Clarence Bay, and Herschel Island.

Station Mark: Drill hole in shallow triangle cut in a small rock. Signal: Cairn without pole. Elevation, 5,620 feet (approx.). About three hours' climb from a willow camping ground at a fork of the Clarence River, directly east of the mountain. Follow the branch stream to the head in a kettle on the northeast slopes of the mountains.

AURORA. *W. B. Gilmore, 1912.*

At the summit of a high, bare, round-top hill among the northerly ridges of the British Mountains. It is 4 miles east of the Line, a few miles below the forks at the head of Malcolm River, and just east of that stream. Looking northeast in clear weather, Herschel Island is plainly visible from the station.

Station Mark: Drill hole in a triangle cut in a large rock. Signal: Cairn without pole. Elevation, 4,750 feet (approx.). About two hours' walk, including a gradual climb, from the main-trail camp on Malcolm River.

TUNDRA. *W. B. Gilmore, 1912.*

On the tundra flat between Clarence River and Craig Creek, about one-half mile east of Line, and 4 miles south of the Arctic beach and about the same distance southwest of Clarence Bay. A small lake lies one-half mile directly north of the station, which is on ground slightly higher than the surrounding flat.

Station Mark: Nail hole in large driftwood hub driven almost flush with ground. Elevation, 95 feet (approx.). An easy walk from any of the camps on the beach.

BUG. *T. Riggs, Jr., 1912.*
On the rocky end of the ridge between Craig Creek and the stream which is just east of it. Is approximately 10 miles directly south of Clarence Bay.
Station Mark: Drill hole in rock with triangle. Cairn signal.

MOSQUITO. *W. B. Gilmore, 1912.*
On one of the last low foothills of the British Mountains, about 20 miles north of the main ridge, and on the border of the tundra flat which extends north 15 miles to the seashore. Just east of the station the Clarence River flows out from the hills into the flat. The station is about 5½ miles west of line.
Station Mark: Drill hole in rock set flush with ground. Signal: Cairn without pole. Elevation, 2,415 feet (approx.). About one hour's gradual climb from a willow camping ground on the main trail along Clarence River, where the latter flows past the east foot of the hill.

BACKHOUSE. *W. B. Gilmore, 1912.*
On one of the higher foothills of the British Mountains, 5 miles east of Line. East of the station is a kettle in the hills, which has the appearance of a well-kept park, and from which a stream of considerable size flows off to the north-northeast, emptying into Clarence Bay 20 miles distant. This stream was named Craig Creek.
Station Mark: Drill hole in triangle cut in solid rock. Signal: Cairn with small pole and flag. Elevation, 3,620 feet (approx.). About two hours' gradual climb, from the camp at the east side of the pass at the head of Clarence River.

GRIZZLY. *W. B. Gilmore, 1912.*
On a prominent mountain, 4 miles north of the main ridge of the British Mountains, and 1½ miles west of the line. It is the highest mountain in the range in the immediate vicinity of the Boundary, and is barren, rough, and steep, with many of the slopes covered with slide-rock and snow, and with numerous cliffs at the higher elevations. The station is situated on the backbone of the mountain, but not on its highest peak, the latter rising about 1 mile southeast of the point.
Station Mark: Shallow drill hole in small rock. Signal: Cairn without pole. Elevation, 6,565 feet (approx.). About one hour's walk plus 3½ hours' climb from the main-trail camp on the big willow patch at the forks near the head of Malcolm River. Climb was made up the northeast slopes into a saddle midway between the highest peak and the station, thence along the backbone of the Mountain. However, this route cannot be recommended.

REPUBLIC. *W. B. Gilmore, 1912.*
On the main ridge of the British Mountains. The station is situated north of the head of Cottonwood Creek, and 4 miles west of the Line, on a peak, the character of which is very similar to that on which station Empire is located.
Station Mark: Rough drill hole in small rock. Signal: Cairn without pole. Elevation, 5,820 feet (approx.). About three hours' climb from a willow camping ground on one of the small branches at the head of Cottonwood Creek. Nearest timber about 6 miles east on Cottonwood Creek.

EMPIRE. *W. B. Gilmore, 1912.*
On the main ridge of the British Mountains. This ridge lies just north of Cottonwood Creek, a stream flowing east into the Firth. Crossing the Line in an east-to-west direction the ridge rises bare, steep, and rugged to an average elevation of 5,500 to 6,000 feet, and cliffs are encountered near the summit. The station is situated on a peak about 2 miles north of Cottonwood Creek and 3 miles east of the Line, and about the same distance west of the pass used by the survey parties as the main trail through the Range. The Arctic Ocean, 35 miles distant, is seen from the station over the intervening ridges to the north.
Station mark: Rough drill hole in rock. Signal: Cairn with pole and flags. Elevation, 4,530 feet (approx.). About 2½ hours' climb from a willow camping ground on a small branch of Cottonwood Creek, which heads at the foot of the ridge below the station.

REABURN *W. B. Gilmore, 1912.*
On a mountain which lies just north of Joe Creek, where the latter forks, about 6 miles west of Line. The mountain takes the form of a bare limestone ridge, running in a general northwest-to-southeast direction, and the signal is at the highest elevation near the middle of the ridge. The mountain is steep, and the north-east face bristles with great spires of stone protruding from the slide-rock which covers it. This slide-rock extends for a considerable distance down from the top on the southwest face also. The British Mountains are about 10 or 12 miles north.
Station Mark: Shallow drill hole in rock about 6 by 12 inches, set flush with surface of ground. Signal: Cairn. Elevation, 5,020 feet (approx.). About 2½ hours' walk plus two hours' climb from main trail camp of Joe Creek; climb the southwest side. Dry willow camping ground at foot of mountain on this side. Nearest timber about 4 miles east on Joe Creek.

TUB. *W. B. Gilmore, 1912.*
On the highest knob, and toward west end, of a round-top mountain which stands 1 mile east of line and 2 miles northeast of Station W_1 of the Boundary. The mountain is a series of gradually rising moss and brush-covered benches, capped by several large knobs of disintegrating shale or slate. Past its east end Joe Creek, a large branch of the Firth, flows off to the northeast. The British Mountains lie about 10 or 12 miles to the north.
Station Mark: Drill hole in solid rock. Signal: A cairn with pole and target. Elevation, 4,725 feet (approx.). About 2½ hours' climb via the saddle, 1¼ miles southeast of Station W_1 of the Boundary from the main-trail camp at the forks of Joe Creek and its south branch. Climb the southwest slope.

TURNER. *A. C. Baldwin, 1911.*
On the highest mountain near the Boundary in the vicinity of the Firth River. It is about 12 miles north of the mouth of Mancha Creek, about 6 miles west of the main river, about 1 mile east of the Line, and about 1½ miles northeast of V_1 of the Boundary. The mountain appears dome-shaped from the south and west, and is very rough and rocky on top.
Station Mark: Hole drilled in a rock in place. Cairn signal.

SIWASH. *A. C. Baldwin, 1911.*
On a lone mountain which lies one-half mile west of the second large creek flowing into what is called the West Fork of the Firth River, and about 4 miles north of this fork.
Station Mark: Hole drilled in a rock in place. Cairn signal.

RIGGS. *A. C. Baldwin, 1911.*
On a sharp, high peak, about 5 miles north of Mancha Creek and about three-quarters of a mile west of the Line. From the south the mountain is a very conspicuous landmark, as it appears very sharp and much higher than the surrounding mountains.
Station Mark: A hole drilled in a rock in place. Cairn signal.

INCOG. *A. C. Baldwin, 1911.*
On a low, round-top hill about 3 miles west of the main Firth River, about 7 miles north by east of the mouth of Mancha Creek, and about 3 miles east of the Line.
Station Mark: A hole drilled in a rock in place. Cairn signal.

ALBION. *A. C. Baldwin, 1911.*
On a high, razor-back mountain, about 2 miles north of the north branch of Firth River, and about 8 miles west of the main forks. The east end of the ridge slopes down to a small creek, the first above the forks.
Station Mark: A hole drilled in a rock in place. Cairn signal.

SILVER. *A. C. Baldwin, 1911.*
On a high range of mountains which lies between Mancha Creek and the Firth River. The east end of this range slopes down to the wide flat between the river and the creek. The station is on the highest rise of the east end of the ridge.
Station Mark: A hole drilled in a rock. Cairn signal.

CORAL. *A. C. Baldwin, 1911.*
On a round-top ridge between the east and middle forks of the northwest branch of the Old Crow. About 3 miles northwest of the station is a very low divide between the Old Crow waters and Firth River.
Station Mark: A hole drilled in a rock in place. Cairn signal.

JIM. *A. C. Baldwin, 1911.*
On a table-top ridge at the head of Ammerman Creek, a branch of Old Crow River. A prominent land-mark 3 miles to the southeast is a large lone rock. The station is about 1 mile east of the Line, and 3 miles southeast of T_1 of the Boundary.
Station Mark: A hole drilled in a rock in place. Cairn signal.

WEE. *A. C. Baldwin, 1911.*
In the flats of Old Crow River, about 2 miles above the mouth of Ammerman Creek, about 4 miles northwest of Ammerman Mountain, and about 7 miles above the Ammerman cabin, and about 200 yards from the west bank of the creek, in a small bunch of spruce.
Station Mark: A hole in a 4-foot spruce hub, driven to frost.

LYNX. *A. C. Baldwin, 1911.*
On the highest point of Ammerman Mountain, about 11 miles north of the Old Crow River. The station is on a flat-top prominence and is about three-quarters of a mile southeast of S_1 of the Boundary and of the pass through the range.

WATT. *A. C. Baldwin, 1911.*
On Ammerman Mountain, about 10 miles north of the Old Crow River. The station is on the third prominence from the west end of the mountain, and is about 2 miles southwest of S_1 of the Boundary.
Station Mark: A hole drilled in a rock in place. Cairn Signal.

YANKEE. *A. C. Baldwin, 1911.*
On a low, bare ridge about 1 mile south of Old Crow River, and nearly due west of Ammerman's cabin on the river.
Station mark: A hole drilled in rock in place. Cairn Signal.

DOODLE. *A. C. Baldwin, 1911.*
On the wooded point of a southerly spur leading from the east end of Ammerman Mountain. This point is 8 miles due north of the mouth of Bilwaddy Creek, and is on the north edge of the Flats. The first branch of the Old Crow is about 3 miles east of the station.
Station Mark: A hole drilled in a rock set flush with the ground.

BILLIE. *A. C. Baldwin, 1911.*
On a bald dome ridge about 3 miles north of Bilwaddy Creek and about 6 miles west of the point where Old Crow River crosses the line.
Station Mark: A hole drilled in a rock in place. Cairn signal.

WAD. *A. C. Baldwin, 1911.*
In the Old Crow Flats, about one-half mile east of the river, and about 1½ miles northwest of the mouth of Bilwaddy Creek. There is a small lake just south west of the signal.
Station Mark: A cross cut in a 3-foot hewn piece of spruce.

PASTURE. *A. C. Baldwin, 1911.*
On the northeast end of a plateau ridge that lies about 6 miles west of the Line. The station is about 3 miles south of Bilwaddy Creek.
Station Mark: A hole drilled in a rock in place. Cairn signal.

SPUD. *A. C. Baldwin, 1911.*
On what is known as "Potato Hill," a very conspicuous bare knob rising from the Flats of the Old Crow. This hill is about seven-tenths of a mile west of the Line, and 6 miles south of Bilwaddy Creek.
Station Mark: A hole drilled in a stone set flush with the ground. Cairn signal.

TIP. *A. C. Baldwin, 1911.*
On a rocky plateau ridge, about 2½ miles west of station R_1 of the Boundary. An old Indian grave is on the southwest spur of the ridge, just above timber-line.
Station Mark: A hole drilled in a rock in place. Cairn signal.

CHERRY. *A. C. Baldwin, 1911.*
About 14 miles south of Bilwaddy Creek, on the range bordering the Old Crow Flats on the west, on a high dome about 6 miles west of the Line. This dome is on the same range as station Comb, and is about 10 miles north of it. About 3 miles west of the station are several higher peaks of the ridge.
Station Mark: A hole drilled in a rock in place. Cairn signal.

TRAP. *A. C. Baldwin, 1911.*
On a low, lone ridge about 3 miles east of the Line, and about 10 miles south of Potato Hill. The station is on the highest point of this ridge.
Station Mark: A hole drilled in a stone set in the ground.

OLD CROW. *A. C. Baldwin, 1911.*
On a long, lone ridge included between Surprise and Schaefer Creeks. The station is about 10 miles north of Q_1 of the Boundary, and 1½ miles east of the Line. To the north the ridge slopes down to the Old Crow Flats. Station is one-quarter mile east of the highest point of the ridge.
Station Mark: A hole drilled in a rock in place. Cairn signal.

COMB. *A. C. Baldwin, 1911.*
On a high rocky prominence of the range to the west of the Old Crow Flats. It is the highest point in the vicinity, and is about 5 miles west of the Line.
Station Mark: A hole drilled in a rock in place. Cairn signal.

TINY. *A. C. Baldwin, 1911.*
On a long, flat, low ridge, about 5 miles northwest of Q_1 of the Boundary. To the east the ridge slopes down to a wide creek valley which is south of the Old Crow Flats. Station is a little north of the highest point of the ridge.
Station Mark: A hole drilled in a rock in place. Cairn signal.

DOC. *A. C. Baldwin, 1911.*
On a dome mountain about 2 miles north of Rapid River, and 3½ miles southeast of Q_1 of the Boundary. There is a second dome similar in appearance about 2 miles northeast of Station Doc.
Station Mark: A hole in the center of a triangle cut in rock. Cairn signal.

BARREN *A. C. Baldwin, 1911.*
On a plateau ridge, about 6 miles north of Rapid River, and 6½ miles west of the Line. This plateau forms a divide between the waters of the Old Crow and Rapid Rivers.
Station Mark: A hole drilled in a rock in place. Cairn signal. To reach the signal the best route is to follow the small creek that empties into Rapid River at the cache about two miles below the line-crossing.

GUN. *A. C. Baldwin, 1911.*
On the divide between Sunaghun Creek and Rapid River. It is 1½ miles northeast of two prominent rocky pinnacles, and about 3½ miles northeast of P_1 of the Boundary, and on the same ridge.
Station Mark: A hole drilled in a rock in place. Cairn signal.

ORPHAN. *A. C. Baldwin, 1911.*
On a round-top ridge, about 4 miles west of the Line, and 2 miles south of Rapid River. The ridge connects with the east-and-west ridge forming the divide between Porcupine and Rapid River waters. Station can be reached by taking the spur to the north of station Sun.
Station Mark: A hole drilled in a rock. Cairn signal.

SUN. *A. C. Baldwin, 1911.*
On the ridge which forms the divide between Sunaghun Creek and Rapid River, about 3 miles southeast of P_1 of the Boundary.
Station Mark: On a sharp pinnacle of rock, and is a hole drilled in same. Cairn signal.

Cone. *W. B. Gilmore, 1910.*

On an outcropping ledge of shaly rock, the highest part of a prominent conical knob, which rises from the backbone of a ridge 5 or 6 miles northwest of Rampart House. The ridge runs in a general east-to-west direction, the east spur running down to Sunaghun Creek, the south slope rising from a muskeg swamp which drains into that stream and separates this ridge from Sunset ridge. Reached by taking the trail which leads north from Turner's Northwest Base: at the first fork of the trail on the plateau, keep to the west, thus passing west of the Wan ridge. After proceeding about 3½ miles on the plateau the trail again forks near a small, lone, dead tree. The west fork swings down into the valley of the Sunaghun, crosses that stream and runs up the east point of the ridge directly toward the station.

Station Mark: A very shallow ½ inch hole within a triangle cut in a rather small stone set at the highest point of the above-mentioned ledge. Cairn and pole.

Nassau. *W. B. Gilmore, 1910.*

On a mountain which rises prominently from the plateau, about 5 miles northeast of Rampart House. Except on the lower slopes, the mountain is bare of timber. Its top is a circular flat, about 60 yards in diameter, and the station is about 15 yards north of its center. Reached by taking the trail which leads north from Turner's Northwest Base. At the first fork of the trail on the plateau, keep to the east, thus reaching Wan Ridge. Passing over this, there is a steep descent into a mile-wide valley, somewhat swampy, filled with much brush and considerable timber, and drained by a small stream running south. Crossing this valley the ascent of the west slope of the mountain leads directly to the station.

Station Mark: ½-inch drill hole in a triangle cut in a stone about 10 inches by 20 inches by 10 inches in size, set flush with the ground. Cairn and pole signal.

June. *A. C. Baldwin, 1911.*

On a bare, flat-topped mountain, 3 miles north of Rampart House, and one-half mile east of the Line.

Wan 2. *J. H. Turner, 1891.*
W. B. Gilmore, 1910.

On the south slope of a hill about 2½ miles almost due north of Rampart House. The hill is bare of timber and brush, and rises from the wooded plateau south of it in four knolls of increasing elevation. The station is on the third knoll. At the point, found demolished cairn, the remains of Turner's station. Could find no station mark of 1890. Reached by taking the well-defined Indian trail which leads from Turner's Northwest Base up the steep hill directly north of it. Where the trail forks on the plateau, keep to the east. After leading through the woods it swings still farther to the east directly to the station. Total distance probably 3½ miles.

Station Mark: ½-inch drill hole in small stone set flush with the ground. Cairn.

Porcupine. *F. Lambart, 1911.*

On summit of hill on which is station Sunset 2.

Sunset 2. *J. H. Turner, 1891.*
W. B. Gilmore, 1910.

On the southeast slope of the first ridge west of Sunaghun Creek. In the vicinity the ridge is practically bare of timber and brush. At the point, found demolished cairn and part of a flag pole, the remains of Turner's station. Could find no station mark of 1890. Reached from Rampart House by climbing hill just west of the mouth of Sunaghun Creek, going west about 1 mile through the timber on the plateau, then swinging northwest up the ridge. Total distance, probably 3½ miles.

Station Mark: A ½-inch drill hole in a small rock, set flush with ground. Cairn.

Astronomic Station. *J. H. Turner, 1890.*

On the slope of the hill rising from the north bank of the Porcupine River, and within 100 yards of Rampart House in a northeasterly direction. The station is a concrete pier 3 feet high.

North Monument. *J. H. Turner, 1890.*
W. B. Gilmore, 1910.

At the top of the hill just west of the mouth of Sunaghun Creek, and plainly visible from Rampart House. The monument was originally a crib of logs, which have rotted and fallen apart.

Station Mark: Shallow ½-inch drill hole in small flat stone set about 1 inch below the surface of the ground at the top of the remaining mound.

Northwest Base. *J. H. Turner, 1890.*
W. B. Gilmore, 1910.

On the west bank of the ravine running south into the Porcupine River and separating the Indian village from the post buildings at Rampart House. Is within 50 yards of Turner's old building, in a westerly direction.

Station Mark: A shallow hole in some lead or solder in the centre of a flat reddish stone set flush with the ground.

BETWEEN THE PORCUPINE AND YUKON RIVERS.

Fire Hill. *J. H. Turner, 1890.*
W. B. Gilmore, 1910.

On the top of the bare limestone precipice which rises from the river due south of Rampart House, and Edmonds Island and plainly visible from the former. Just back of the hill is a deep ravine, which separates it from the plateau south of it.

Station Mark: An earthenware jar 6 inches in diameter set flush with ground by Turner in 1890. Reset by Gilmore, 1910. Small cairn.

Flat 2. *J. H. Turner, 1890.*
W. B. Gilmore, 1910.

On the top of the bluff on the south side of Porcupine River, about 1¾ miles southwest from Rampart House. At the point, found remains of Turner's large tripod signal, but no station mark. Reached, after crossing the river, by climbing to the plateau via the first point west of the mouth of Iron Creek, thence keeping about 50 yards back from the break of the cliffs, go west about 450 or 500 yards.

Station Mark: ½-inch drill hole in a small rock set flush with the ground.

Porcupine River, East Base. *D. W. Eaton, 1911.*

Is a concrete block 14 inches by 12 inches by 12 inches, set on concrete foundation in frozen ground (black muck), and the point is marked by cross on copper strip set in block. Top of block flush with surface of ground. It is 1 mile northeast of Canalaska Mountain and one-quarter mile east of the Boundary.

Porcupine River, West Base. *D. W. Eaton, 1911.*

Is a flinty block 12 inches by 11 inches by 14 inches, set flush with the surface. The point is marked by a cross on a copper bolt set in a drill hole, and cemented in. It is surmounted by a flag pole, 16 feet long, and a cairn 4 feet high. It is on the highest part of the hill to the westward of Canalaska Mountain.

Canalaska or Boundary Mountain. *W. B. Gilmore, 1910.*

From Rampart House this mountain shows due south, rising above the ramparts of the river at a distance of 3½ miles. The station is at the highest point of a backbone of rock which slopes abruply to the west. Reached by crossing the river, then climbing to the plateau via either the first point west of Iron Creek or by following up the course of the creek itself, and thence due south to the mountain.

Station Mark: Shallow ½-inch drill hole in the solid rock. Cairn and pole signal.

Rampart. *W. B. Gilmore, 1910.*

On the highest knob of a ridge lying just east of Canalaska Mountain. The knob, which rises in the form of a dome of shattered rock from moss-covered ridge, is about 2 miles east of the summit of Canalaska Mountain, and about 4 miles a little east of south of Rampart House. There is no timber or brush in the immediate vicinity. Reached by crossing the river above the mouth of Bush Creek, climbing to the north end of the ridge and following along the west slope or top to the station.

Station Mark: ½-inch drill hole in a triangle cut in solid rock, which projects just above the surface of the thin soil and moss. Cairn and pole signal.

Chasm. *W. B. Gilmore, 1910.*

About 5 miles southwest of Canalaska Mountain on the top of the higher and more southerly of two knobs which rise from the low ridge just west of Chasm Creek. The hill top is bare, but there is timber about one-quarter mile to the east. Reached after crossing the river, by climbing to the plateau via the point west of and about 100 yards upstream from the mouth of Lignite Creek. Thence the trail leads about 2 miles through the saddle between Canalaska Mountain and the knob west of it; thence southwest about 3 miles, thus crossing Chasm Creek well above its mouth, and leading into the saddle between the knobs on the ridge on which the station is located; and thence south to the higher knob. Keep away from the mouth of Chasm Creek.

Station Mark: Shallow ½-inch drill hole within a triangle cut in a stone about 1 foot square and 4 or 5 inches thick. This is set flush with the ground. Tripod and pole signal.

Lake. *W. B. Reaburn, 1910.*

About 4½ miles east of the Line on the top of the southwest point of a ridge 7½ miles from Canalaska Mountain, from which it bears about southeast. The ridge is timbered, but is bare in the vicinity of the station, with outcroppings of limestone. About 1 mile southeast of the point is a large lake, with a chain of small lake to the northeast of it.

Station Mark: ½-inch drill hole within a triangle cut in a rock about 1 foot square and half as thick; this was set flush with the ground. Cairn and pole signal.

Junction 2. *W. B. Reaburn, 1910.*

About 4 miles west of the Line on the highest point of the rather flat top of a bare ridge about 8 miles from Canalaska Mountain, from which it bears about south-southwest. To the south is quite an extensive valley, which apparently drains northwest.

Station Mark: ½-inch drill hole within a triangle cut in a stone of triangular shape, about 1 foot on a side and 1 foot in thickness. This was set nearly flush with the ground.

Tit. *W. B. Reaburn, 1910.*

On a small rocky ledge on a grassy hill, about 2½ miles east of the Line, and 4 miles northeast of station N_1 on the same ridge.

Station Mark: ½-inch drill hole in a triangle cut in solid rock.

Kite. *W. B. Reaburn, 1910.*

On a limestone ledge on an east-and-west ridge, which has several outcroppings to the west and around the station. It is about 7 miles east of station N_1 of the Boundary, and 2 miles east of a large stream which flows into the Porcupine east of the Line.

Station Mark: ½-inch drill hole in a triangle cut on stone set in ground by the side of a rotten ledge. Cairn signal. Good feed on west side of stream, 2 miles west of signal.

ARCH. 2. *W. B. Reaburn, 1910.*
On the highest point on a limestone ridge, about 3 miles north of Salmontrout River, 3½ miles west of the Line, about 4 miles south of west of station N_1 of the Boundary and on the same ridge, and about ½ mile north of some limestone dykes, one of which has an arch in it.
Station Mark: ½-inch drill hole in a triangle cut on a stone set in ground flush with surface. Cairn signal.

LONE. *W. B. Reaburn, 1910.*
On a lone hill rising from a flat country, about 4½ miles west of the Line, and 1 mile west of Salmontrout River. There are small tributaries to the north and south, both flowing east into the Salmontrout. There are several limestone ledges cropping out on the north side and near the top of hill.
Station Mark: ½-inch drill hole in solid rock, 2 or 3 inches under the surface. Cairn.

SALMON. *T. Riggs, jr., 1910.*
On the highest point of the flat white limestone ridge running across the country between Black and Salmontrout Rivers, about 3½ miles east of Line. Drainage on the southeast flows towards Black River, and on the west into the Salmontrout, which is plainly visible. Directly north the hills run out some distance, while on the west they drop off more quickly into the valley. Hill is precipitous on all sides except the west, where it slopes down to a low, rocky saddle connecting with the rolling high lime plateau. On the south side is a creek running southeast, whose bed at a distance looks like snow, on account of whiteness of rock.
Station Mark: drill hole in triangle in solid limestone cropping through the broken top, and slightly raised above it. Cairn and pole signal.

STORM. *T. Riggs, jr., 1910.*
On a high, flat-top limestone ridge about 4 miles west of the Line. The same ridge connects with station Fort. The drainage to the north and west flows into the Salmontrout, to the east and southeast into the Black River, and to the southwest into Rat River (?). Top of hill is covered with grass and large limestone rocks.
Station Mark: Drill hole in triangle on large limestone rock, about 4½ feet square. Cairn signal.

MESA. *T. Riggs, jr., 1910.*
On a broad, bare plateau, about 6 miles east of Line. Plateau has three humps on it, and the station is on the center and highest, a broken rock summit. On center of ridge to west and southwest is a peak like the Matterhorn. Northeast a broad river from lakes flows southwest. Southeast of station another small lake feeds a creek. Probably all Black River water.
Station Mark: Drill hole in exposed boulder. Cairn signal.

FORT. *T. Riggs, jr., 1910.*
On a high, bare, broken-rock butte, superimposed on a white limestone ridge, about 3 miles west of the Line and 6 miles southwest of M_1 of the Boundary. On the west the waters seem to drain into Rat River, while on east the water flows into Black River. At a distance the hill has the appearance of a black, terraced fort.
Station Mark: Drill hole in triangle in large slab of quartz, nearly flush with the ground. Cairn signal.

TROUBLE. *T. Riggs, jr., 1910.*
About 4½ miles east of the Boundary on Black River, on the ridge east of the first creek coming in from northeast of creek near the Boundary. The point of the ridge has knobs separated by a low saddle. Station is on northern and higher knob, which is bare of trees and covered with moss and grass. Fine slab slate underlying moss.
Station Mark: Drill hole in triangle in slab set flush with the ground. Cairn and pole signal.

WHITE. *T. Riggs, jr., 1910.*
On a prominent castellated knob on white limestone spur-ridge of the main north-and-south ridge. Spur is the first white limestone ridge north of Black River. Station is about 4½ miles west of the Line, and there is a higher flat-top part of the spur to the southeast of station. Water seems to drain north from near station.
Station:Mark: Drill hole in triangle in rock.

CIRCLE. *T. Riggs, jr., 1910.*
About 5 miles west of the Boundary, on the bare summit of a hill between the forks of Black River and a large tributary coming in from northwest. Timber on east side of hill is burnt.
Station Mark: Drill hole in triangle in slab of stone one foot square, set flush with the ground. Cairn and pole signal.

ARCTIC. *T. Riggs, jr., 1910.*
About 3 miles east of the Line on a high, bare, rocky mountain, east of flats passed by two main forks of Black River. Peak is one of the two most prominent in this part of the country. To north is the wide Black River valley. A little north of east of J_1 of the Boundary; the summit is badly shattered lime rock covered with lichen.
Station Mark: Drill hole and triangle in large slab of rock. Cairn signal.

IGLOO. *T. Riggs, jr., 1910.*
About 5 miles west of the Line on the summit of a low timbered ridge, running northeast and southwest on the last knob before running out into Black River flats. A spur ridge runs north for about one-quarter mile from station. It is the last ridge to be noticed between the higher bare ridges and the main fork of the Black. A small creek heads directly north of the station, following contour of ridge. Directly west lie the big flats.
Station Mark: Drill hole within triangle in exposed piece of schist.

CURVE. *T. Riggs, jr., 1910.*
About 2 miles north of the mountain at the head of Racquet Creek on a bare, rounding hogback, about 2½ miles east of the Line. Forks of Black River run from it in all directions. Cannot be further described without names of creeks.
Station Mark: Drill hole and triangle in flat rock about a foot square, sunk in flush with ground. Cairn signal.

FISHING. *A. I. Oliver, 1910.*
Two miles north of Teecan Creek, and three-quarters of a mile west of the Line near the north end of the more southerly of two high hogbacks 1 mile apart; the country drops off precipitously to west. The north hogback is considerably higher than the other. Good feed in valley 1 mile to south.
Station Mark: ½-inch drill hole surrounded by chiselled triangle in rock 14 inches by 10 inches by 10 inches, set flush with surface. Signal is 5.3 foot cairn, with center pole.

LOW. *A. I. Oliver, 1910.*
About 5½ miles west of the Line and 3 miles north of Orange Creek, on the summit of the low end-point of a low burnt ridge, which drops off rapidly from the station to the west into a broad point about 1 mile east of station on the same burnt ridge. Orange Creek is about 3 miles south of the station.
Station Mark: ½-inch drill hole in rock in place, which is 16 inches by 18 inches by 36 inches, and protrudes about 10 inches above the ground. The drill hole is shattered on the west side and is surrounded by a triangle. Tripod and pole signal.

STRIPE. *A. I. Oliver, 1910.*
On the summit of a high loose-rock mountain. It is the highest peak within several miles, and is about 2 miles north-east of I1 of the Boundary, and 1 mile east of the Line. There is excellent feed in canyon immediately south of station.
Station mark: ½-inch drill hole in rock in place. Signal: 6-foot cairn with center pole.

TOM. *A. I. Oliver, 1910.*
About 5½ miles west of the Line, on the summit of the end point of a ridge running west from higher group of hills. Hill is smooth and open, and descends to main creek 4 miles west. Two miles south, on the creek running west, there is good feed.
Station Mark: ½-inch drill hole in stone 12 inches by 12 inches by 16 inches. Drill hole is surrounded by a triangle cut in stone. Signal is a 6-foot cairn, with center pole.

BLUE. *A. I. Oliver, 1910.*
About 2½ miles west of the Line, and 5 miles north of Siwash Creek on a sharp, open peak, which is one of a number of about the same height.
Station Mark: ½-inch drill hole in stone 8 inches by 14 inches by 12 inches, set flush with the ground. Signal is 3.6 foot cairn with center pole.

BENCH. *A. I. Oliver, 1910.*
About 7 miles west of the Line on the end point of a ridge running north from the main divide between Kandik River and Siwash Creek. The point is open and rises 800 feet above creek to east. It is easily reached from either side. Good feed on creek, 2 miles east of station.
Station Mark: ½-inch drill hole in stone 16 inches by 12 inches by 12 inches, which is set flush with surface of ground.

KANDIK. *A. I. Oliver, 1910.*
About 2½ miles east of the Line on a small knob of a long, open ridge, about 6 miles north of Kandik River. There is a deep saddle directly north of station, about one-half mile distant. There are higher points on the ridge, about 2 miles south.
Station Mark: ½-inch drill hole in slab of stone 15 inches by 15 inches by 10 inches. Signal is 5·7 foot cairn, with center pole.

FIRE. *A. I. Oliver, 1910.*
About 6 miles west of the Line on a low, bare knob, about 2 miles north of Kandik River. It is the only bare knob in the vicinity. There are higher timbered hills about 2 miles southeast of the station.
Station Mark: ½-inch drill hole in stone 15 inches by 15 inches by 12 inches.

SEAL. *A. I. Oliver, 1910.*
On a high, isolated rocky butte about 5 miles south of Kandik River, and 5 miles east of the Line. Peak is the most northerly point of a group of hills. The country to the west is low, smooth, and timbered.
Station Mark: ½-inch drill hole in stone 15 inches by 18 inches by 18 inches. Signal is cairn, 4.9 feet high, with pole. Good camping place in meadow 2 miles southwest of station.

CHANGE. *A. I. Oliver, 1910.*
About 4½ miles west of the Line on an open, flat-top hill, which is the highest within 5 miles. The hill drops off to the north to Big Sitdown Creek, a fork of Kandik River.
Station Mark: ½-inch drill hole in stone 12 by 12 by 12 inches. Drill hole is surrounded by triangle.

SCRATCH. *A. I. Oliver, 1910.*
On the summit of one of a group of low hills, about 8 miles northeast of Indian Grave Mountain. The hill is covered with moss and grass, giving it a yellow appearance. It is about one mile north of the divide between Kandik River and Nation River drainage. Good camping place in meadow one-half mile south of station.
Station Mark: ½-inch drill hole in a rock in place. Drill hole is surrounded by triangle cut in the rock. Cairn, 4·7 feet high.

UNION. *A. I. Oliver, 1910.*
On the summit of a high, prominent peak about 5½ miles south of Big Sitdown Creek, and 1¼ miles north of Indian Grave Mountain, which is slightly higher. The peak is of loose-rock formation, and comes to a narrow ridge at the top and runs east and west for 200 yards. There is a deep canyon between the two peaks. Station G_1 of the Boundary is 1·3 miles east of south of station. The main boundary trail runs around the base of mountain on the west side.
Station Mark: ½-inch hole in slab of rock in place. Drill hole is surrounded by triangle.

HALLEY. *A. I. Oliver, 1910.*
About 2 miles west of the Line on an isolated, open, rather high mountain, 2 miles southwest of Indian Grave Mountain. Peak is about 3½ miles north of Nation River. The Boundary pack-trail traverses the west slope nearly half way up. Easily reached with pack-animals. Good feed in valleys to north and east.
Station Mark: A small hole in stone 12 by 16 by 10 inches, set flush with ground. Signal is a pole in a stone cairn.

COMET. *A. I. Oliver, 1910.*
About 8 miles east of the Line on the more southerly of two open points, which rise about 1,000 feet above the immediately adjacent drainage. It is due west of the center of a long, dark hogback, which runs north and south and is one mile to the east and much higher than station. The point is 3½ miles north of Nation River. It is easily reached with pack-animals. Fine grass and good camp in head of draw, 1 mile to southeast.
Station Mark: A round hole drilled half-inch deep in a stone 10 by 14 by 12 inches set flush with the ground, with a triangle cut around the hole. Signal is a pole in a cairn.

LOST. *A. I. Oliver, 1910.*
About 6 miles east of the Line on a high open, dark, rocky point between Jungle and Ettrain Creeks. There is a prominent higher yellow point 1½ miles to east, across a deep saddle.
Station Mark: Cross cut on rock in place. Cairn and pole signal.

YELLOW. *A. I. Oliver, 1910.*
On a low knob of an east-and-west ridge, between Jungle and Ettrain Creeks, and about 1½ miles west of the Boundary. There is abundant feed and good camp on south side of ridge. Timber has been burned on south side of ridge, which is visible from Station F_1 of the Boundary.
Station Mark: A cross on rock in place, and surrounded by a small triangle cut in rock.

CASCA. *A. I. Oliver, 1910.*
About 1½ miles west of the Line and 1¾ miles north of Tindir Creek on the summit of a badly shattered rock mountain. On the same ridge as, and about 1½ miles west of, F_1 of the Boundary.
Station Mark: ½-inch drill hole in a triangle cut on a large slab of rock. Slab is about 6 feet by 3 feet by 1 foot. Cairn and pole signal.

LIME. *A. I. Oliver, 1910.*
On the summit of a loose-rock mountain about 3 miles east of Monument No. 98. The mountain is rounding at the top, and has a very dark appearance. Tindir Creek, a fork of the Nation River, heads about 3 miles southeast of station, and runs in a northwest direction. Another fork flows past the foot of the mountain on the north side, and also flows northwesterly.
Station Mark: ½-inch drill hole in a triangle cut on a rock 2 feet by 1 foot by 1½ feet. Cairn and pole signal.

NATION. *G. Clyde Baldwin, 1909.*
On a lone ridge about 4 miles west of E_1 of the Boundary; the ridge has two rocky prominences on east slope.
Station Mark: A cross in rock in place over which is a short pole set in a 3-foot cairn.

VIEW, N.E. *G. Clyde Baldwin, 1909.*
Located on the south end of the eastern part of a high ridge, 2½ miles east of E_1 of the Boundary.
Station Mark: Cross in rock in place, and cairn.

MUSH. *G. Clyde Baldwin, 1909.*
About 4 miles west of the Line on a long, bare ridge, about 1 mile north of Cathedral Creek, the second large creek north from Tatonduk River (Sheep Creek).
Station Mark: A cross in rock.

GRUB. *G. Clyde Baldwin, 1909.*
On a summit of the first hill north of Cathedral Creek and east of the second creek emptying into that stream from the north, reckoning eastward from the Boundary.
Station Mark: A cross on a rock.

SLIDE. *G. Clyde Baldwin, 1909.*
On a round, bare-top hill northeast of station Back, and 1½ miles south of Cathedral Creek. The station is only a few meters west of the Boundary.
Station Mark: A cross cut in rock. Small rock cairn.

BACK. *G. Clyde Baldwin, 1909.*
About 1 mile east of the Line on the summit of the highest of a group of very rocky hills forming a divide between the waters of Cathedral and Hard Luck Creeks.
Station Mark: A cross cut in rock. The signal is a pole set in a good-sized cairn.

PACK. *G. Clyde Baldwin, 1909.*
Two miles west of the Line on a rocky peak at the northwest end of a high divide separating the waters of Hard Luck and Cathedral Creeks.
Station Mark: A cross cut in rock. The signal is a pole set in a good-sized cairn.

GAME. *G. Clyde Baldwin, 1909.*
Located about 1 mile east of the Line and $2\frac{1}{4}$ miles north of Hard Luck Creek near the southern end of a long saw-tooth ridge which lies between two forks of the creek which empties at Monument No. 102 into Hard Luck Creek. A deep narrow canyon is another distinctive feature of this smaller creek, and is about 1 mile south of the station.
Station Mark: A drill hole surrounded by three arrows.

BARNEY. *G. Clyde Baldwin, 1909.*
Located about $3\frac{1}{2}$ miles east of the Line on the highest knoll of the long ridge, which is included between the upper forks of Hard Luck Creek.
Station Mark: A cross in a rock set flush with the ground.

HI-YU. *G. Clyde Baldwin, 1909.*
On the summit of the first peak northwest of station Skook. This peak is also very high and rocky, but is somewhat lower than Skook.
Station Mark: Single pole with a cairn.

SQUAW. *G. Clyde Baldwin, 1909.*
About one-quarter mile west of the Line, and $4\frac{1}{2}$ miles north of Tatonduk River, on the highest point of the divide between the east and west forks of Limestone Creek, and about one-quarter mile southwest of C_1 of the Boundary.
Station Mark: A roughly cut cross in the rock. Signal is a single pole set in a cairn.

RED. *G. Clyde Baldwin, 1909,*
On the summit of a hill on the north side of Tatonduk River, about $2\frac{1}{2}$ miles west of the Boundary. On the south face of this hill are numerous red cliffs.
Station Mark: A cross cut in rock. To reach it, take the pack-trail from the elevated cache on the north bank of the Tatonduk, almost to the top of the saddle; then turn to the left (west) and follow the crest of the divide to the signal.

CASTLE. *G. Clyde Baldwin, 1909.*
On a high mountain about 3 miles north of the forks of Tatonduk River. The mountain may easily be recognized by its rocky appearance, and also by a large natural archway in a pinnacle of rock on the west slope. To reach the station the best route is to follow an old prospector's trail along the bank of Tatonduk River, as far as the first small creek above the canyon; then follow this creek to the base of the station. The highest point of the mountain is a mass of unstable rock, and for this reason the station was not placed there, but about 200 feet south-southwest.
Station Mark: A cross in a rock in place.

CROW. *G. Clyde Baldwin, 1909.*
Located on high knob on the north side of the river at the bend toward Twentymile. Station Mark: Cross on rock.

CHIEF. *G. Clyde Baldwin, 1909.*
About $1\frac{3}{4}$ miles west of the Line on the divide between Tatonduk and Yukon Rivers, about 3 miles northwest of B_1 of the Boundary.
Station Mark: Cut in a soft conglomerate rock in place. This rock chips and wears so easily that in future the reference marks should be used in recovering this station provided the signal cairn is not standing.

HUG. *G. Clyde Baldwin, 1909.*
Located on a high mountain between Tatonduk and Yukon Rivers, and about 200 feet from the point where the Line crosses the ridge. To reach this station follow the trail from the mouth of Shade Creek.
Station Mark: Small cairn, centered over a cross in rock.

STRATA. *G. Clyde Baldwin, 1909.*
About 11 miles below Eagle, Alaska, on the summit of Calico Bluff, on the west side of Yukon River.
Station Mark: Cross cut in rock.

BUSH. *G. Clyde Baldwin, 1909.*
About 3 miles below Eagle, Alaska, on the highest ridge north of Eagle Peak, and west of the mouth of Last Chance Creek on west side of Yukon River. To reach station, go up Boulder Creek to base of hill on its northwest bank.
Station Mark: Hole in rock in place.

BLOW. *G. Clyde Baldwin, 1909.*
About $1\frac{1}{2}$ miles east of the Line on the ridge between the headwaters of Last Chance and Shade Creeks. Is on high peak, which has a sharp drop-off on the east side.
Station Mark: Cross in rock.

LONE. *G. Clyde Baldwin, 1909.*
About $1\frac{1}{2}$ miles east of the Line on the highest conical peak just north of Eagle Creek. Take wood trail from near the mouth of Eagle Creek to wood camp, and then go up small creek bottom.
Station Mark: Cross in rock.

EAGLE PEAK. *G. Clyde Baldwin, 1909.*
On the summit of Eagle Peak at Eagle, Alaska. Take trail starting from near the mouth of Mission Creek.
Station Mark: Five-inch hole in native rock, center being a small cross cut in sloping side of hole. Tripod signal.

HOG. *G. Clyde Baldwin, 1909.*
About 1 mile east of the Line and 5 miles north of Yukon River, on the west end of a hogback ridge about 1 mile southeast of station A_1 of the Boundary, and south of Eagle Creek.
Station Mark: Cross in rock.

NUT. *G. Clyde Baldwin, 1909.*
About 5½ miles of the Line and about due south from the Indian village on the west side of Castalia Creek. Take old Steel Creek trail past United States Military Wireless Station at Eagle, Alaska. Trail goes within about 100 yards of station.
Station Mark: Cross in rock.

YUKON. *T. Riggs, jr., 1907.*
On high ridge about 2 miles west of the Boundary Line, and about 3 miles below the point where the Boundary crosses the Yukon on south side of river, near brow of ridge.
Station Mark: ½-inch drill hole in boulder set 1½ feet in ground. Tripod signal.

PETE. *G. Clyde Baldwin, 1909.*
On the summit of the first ridge north of Yukon River, and about 1 mile east of the Boundary.
Station Mark: A nail in 4-inch birch hub, driven flush with the ground. It is 20.91 feet east-southeast, 31.38 feet southwest, and 25.97 feet north-northwest from nails in sides of blazed spruce stumps.

GEORGE. *G. Clyde Baldwin, 1909.*
About 1 mile southwest of station Yukon and on the same ridge and about 3½ miles west of the Boundary.
Station Mark: Rough cross chiselled in large rock in place. Pole signal, with four supports, cut off about 5 feet from ground.

KNOLL. *T. Riggs, jr., 1907.*
On the north side of Yukon River, about one-half mile east of the Line, a small, bare, rocky knoll on first ridge north of river.
Station Mark: 22-caliber brass shell set in solid rock. Signal is pole and cairn 1.4 meters high.

BETWEEN THE YUKON RIVER AND MOUNT NATAZHAT.

YUKON RIVER WEST BASE. *T. Riggs, jr., 1907.*
On the hillside on the south side of Yukon River, about three-quarters of a mile west of the Line, and about 50 feet from the bank.
Station Mark: Concrete pier one foot above ground, with copper rivet not quite in center of pier. Pier marked A.B.S.—W.B.—1907.

BOUNDARY (YUKON) LATITUDE, LONGITUDE, AND AZIMUTH STATION.
A concrete pier about 30 feet south of the south bank of the Yukon River, and 17.62 feet west of the 141st Meridian. The longitude station is marked by a screw set in the concrete of the pier. For the other observations the center of the instrument was 0·022 meters farther west on the pier, no permanent additional marking being made.

YUKON RIVER EAST BASE. *T. Riggs, jr., 1907.*
On a small knoll on the south side of Yukon River, on river bank about 150 meters east of the Line.
Station Mark: Cross cut in copper and set in concrete pier. Pier sets about 8 inches above ground, and is marked A.B.S. E.B.—1907.

LOOP. *T. Riggs, jr., 1907.*
On main boundary trail from Yukon River, about 2 miles east of the Line and 2 miles south of the river, on the highest brushy knoll on the ridge. Trail runs within 100 yards of station.
Station Mark: Cut on rock, with signal pole and tripod.

PLATEAU. *T. Riggs, jr., 1907.*
On a wooded brushy knoll on the east-and-west ridge at the head of Boundary Creek, and 3 miles west of the Line.
Station Mark: Cross on rock set in ground. Tripod signal.

TRAIL. *T. Riggs, Jr., 1907.*
On bare, round hill about three-quarters of a mile west of the Line, and about 1 mile southwest of Monument No. 114. Trail runs a little to east of station.
Station Mark: A depression battered in small boulder set in ground. The station is not in the main scheme of triangulation. Tripod signal.

SLOPE. *T. Riggs, jr., 1907.*
About 3 miles west of the Line on highest bare hill, west of trail 1 mile, and north of Liberty Fork about 1½ miles.
Station Mark: On rock, 6-foot cairn.

TABLE. *T. Riggs, jr., 1907.*
On a mossy butte, 2½ miles east of the Line and three-quarters of a mile northwest of the east branch of Liberty Fork.
Station Mark: 6-foot cairn over cut in a rock.

WOODY. *T. Riggs, jr., 1907.*
About 3½ miles east of the Line on the highest part of the continuation of the Liberty Ridge. A good deal of timber surrounded the station, and was cut out.
Station Mark: ¾-inch drill hole in rock sunk in ground. Tripod signal.

LIBERTY. *T. Riggs, jr., 1907.*
About 1½ miles west of the Line on a bare knoll, 2½ miles north of Fortymile Dome and 2½ miles south of Liberty Fork. Trail runs around base of knoll.
Station Mark: ¾-inch drill hole in rock sunk in ground. Tripod signal.

FORTYMILE DOME. *T. Riggs, jr., 1907.*
On the most prominent rocky knoll between Yukon and Fortymile Rivers, and about 1 mile west of the Line. At the head of the south fork of Clinton Creek.
Station Mark: U. S. G. S. aluminum tablet set in large flat rock, about 3 by 4 feet; 8-foot cairn.

BARE. *T. Riggs, jr., 1907.*
On the summit of a high, bare ridge between Clinton Creek and the heads of South Boundary and Marten Creeks. The trail from Steel Creek to Fortymile runs within a few feet of station.
Station Mark: ½-inch drill hole in rock set in ground. Triangle cut around hole. Tripod signal.

UNCLE SAM. *T. Riggs, jr., 1907.*
On a knob on the trail to Steel Creek, between two forks of Sam Patch Creek on the east, and a fork of Dome Creek on the west. About 5 miles west of south of Fortymile Dome, and three miles west of the Line.
Station Mark: ½-inch drill hole in a stone sunk in ground. Tripod signal.

JOHN BULL. *T. Riggs, jr., 1907.*
About 2 miles east of the Line on the highest point of the ridge between station Bare and Fortymile River. Some dry timber had to be cut near signal. Trail runs within 100 feet of the station.
Station Mark: ½-inch drill hole in rock sunk in ground. Tripod signal.

RIVER. *T. Riggs, jr., 1907.*
On high cut bank of Fortymile River, about one-half mile north of the river and 2½ miles west of the Boundary. An old trail runs up the ridge from the point opposite the United States Custom House, and can be traced in places to the station.
Station Mark: ½-inch drill hole in boulder set in ground. Tripod signal.

MOOSE. *T. Riggs, jr., 1907.*
About 3½ miles east of the Line, and 4 miles south of Fortymile River on the north point of the highest ridge northeast of Moose Creek. Best route is up Moose Creek for about 4 miles, and then up point of ridge. Dense timber all the way. Top of ridge has some timber on it, and considerable cutting had to be done in vicinity of station.
Station Mark: ¾-inch drill hole in stone set in ground. Tripod signal.

CANYON. *T. Riggs, jr., 1917.*
About 4½ miles west of Baldy Mountain on the ridge between Smith Creek and Canyon Creek. Smith Creek forks at the foot of the hill on which the station stands, the left-hand fork running up to the saddle south of Baldy Mountain. The station is on the highest knob on the ridge. A large spruce tree, stubby at the top, with a foliage about the same spread up to the top, stands about 75 feet from the station a little east of north.
Station Mark: A large granite boulder set in the ground; ¾-inch drill hole with surrounding triangle. Tripod pole signal.

BALDY. *T. Riggs, jr., 1907.*
On Baldy Mountain, a high, bare hill, very flat on top, about 1 mile east of the Line, and west of Moose Creek and about 7 miles south of Fortymile River. Alma Creek heads northwest of it. The main trail from Moose Creek to Glacier passes over a bench near the top on the west side.
Station Mark: A platform about 1½ feet high built from loose rock and gravel, to make station high enough to observe from; ¾-inch drill hole in boulder in center of platform. Tripod signal.

BABY. *T. Riggs, jr., 1907.*
About 4½ miles west of the Line, and 9 miles southwest of Baldy Mountain, on a spur of the divide between Canyon Creek and Walkers Fork. Spur runs out between Baby and Woods Creeks. Station is on the highest brushy knob on ridge. Considerable timber had to be cleared off to make sights.
Station Mark: ¾-inch drill hole in rock set in ground. Triangle cut around hole. Tripod signal.

MARMOT. *T. Riggs, jr., 1907.*
About 1½ miles east of the Line on the highest part of a blackish piece of slaty ledge. At the head of south fork of Hall Creek, and west of the head of Moose Creek. Trail from Glacier to Moose Creek passes near station.
Station Mark: ¾-inch drill hole in solid rock.

GOLD. *T. Riggs, jr., 1907.*
On a high, bald plateau, the highest point on an east-and-west ridge immediately north of Gold Creek. The most southerly fork of Moose Creek heads in the knob on which is the station. Trail to Dawson, over which a few wagons have been driven, runs along the side of the knob. Station is on the western edge of highest part.
Station Mark: ¾-inch drill hole in triangle cut in rock. Cairn around pole.

WALKER. *T. Riggs, jr., 1907.*
Unoccupied triangulation point on a bare hill on the trail between Glacier Creek and Walkers Fork, and about 1½ miles southwest of Monument No. 126. Trail runs near signal.
Station Mark: Drill hole in rock. Cairn signal.

MINNESOTA. *T. Riggs, jr., 1907.*
Unoccupied point between two forks of Cherry Creek on a high bald ridge.
Station Mark: Drill hole in rock. Cairn signal.

MILLER. *T. Riggs, jr., 1907.*
Unoccupied point, on a high, broken-rock ridge between Miller Creek and Bedrock Creek, and at the head of a fork of Walkers Fork and about three-quarters of a mile east of Boundary.
Station Mark: ½-inch drill hole in rock. Cairn signal.

PTARMIGAN. *T. Riggs, jr., 1907.*
On a high, black, shattered-rock knoll on the ridge at the head of Walkers Fork, and north of Bedrock Creek. About one-half mile west of the Line, where it crosses about the middle of a deep saddle.
Station Mark: ¾-inch drill hole in stone set in ground. Triangle cut around hole. Cairn and flagpole.

BEDROCK. *T. Riggs, jr., 1907.*
On the south edge of the highest bare knob between Bedrock and Pat Murphy Creeks about one mile east of the Line.
Station Mark: ¾-inch drill hole in rock set in ground. Triangle cut around hole. Cairn and flagpole.

WITHERSPOON. *T. Riggs, jr., 1907.*
On a rock sticking out of a smooth, mossy knob on the main divide between the waters of Fortymile and Sixtymile Rivers, at the head of the middle fork of Cherry Creek, and about 6½ miles west of the Boundary Line.
Station Mark: ¾-inch drill hole in stone set in ground. Triangle cut around hole. Cairn and flagpole.

MOSS. *T. Riggs, jr., 1907.*
Unoccupied point, about 1¾ miles west of the Line on a flat rise on the main ridge running through from Fortymile River to Sixtymile River, and about 2 miles from where the ridge drops off into the Sixtymile. A trail runs around the hill on which the station is placed, and signal is visible from trail.
Station Mark: Drill hole in rock with cairn.

SIXTYMILE RIVER EAST BASE. *T. Riggs, jr., 1907.*
On a rocky hogback about 1½ miles west of the Line on top of the ridge between the Sixtymile and a creek flowing into it. At south end of hogback is a cairn with a stick in it, which has been identified as one of McArthur's camera stations.
Station Mark: Cross cut in lead plug poured into a ¾-inch drill hole in solid but rather crumbly rock. Mark was covered up with dirt to the depth of a few inches but the knob on which it is can readily be identified by the base-line vista. Tripod signal.

SIXTYMILE RIVER WEST BASE. *T. Riggs, jr., 1907.*
About 1·6 miles west of East Base on the edge of the ridge dropping off into the north fork of the Sixtymile.
Station Mark: Cross cut on a steel set-screw hammered into a drill hole sunk into a large boulder set about 2 feet into the ground. Tripod signal.

LODE. *T. Riggs, jr., 1907.*
Unoccupied point on the highest point on the bare top of a mountain between the north and south forks of Sixtymile River, and about 6 miles west of the Line. This point is easily recognizable from all sides and, while not as high as the ridges to the south, on account of its isolation it is very prominent.
Station Mark: Drill hole in rock. A quartz vein was being prospected a few hundred feet below the signal.

CRAG. *T. Riggs, jr., 1907.*
On the main divide between the waters of Sixtymile River and Ladue River. About 1 mile east of the Line, and on same ridge as Monument No. 133. Station is on the highest one of a jumbled-up bunch of granite boulders. A large rock of nearly the same height is 15 feet to the northwest, with a loose rock on top of it.
Station Mark: ¾-inch drill hole in solid rock, triangle cut around hole. Cairn.

SPUR. *T. Riggs, jr., 1907.*
About 2½ miles west of the Line on a shaly rounding hill, the second from the main divide between Sixtymile and Ladue Rivers. The spur runs down from station Divide between two forks of the Sixtymile, and is the first large spur west of the Line.
Station Mark: ¾-inch drill hole in shale rock. Triangle cut around hole. 3-foot cairn and center pole.

DIVIDE. *T. Riggs, jr., 1907-8.*
On a broken, rocky knoll on the highest point of the divide between the waters of Sixtymile River and Ladue River. Sixtymile River heads about two miles southwest of the station, and flows, in a great bend known as the Fishhook Bend, around the west end of ridge. The head of one of the forks of Ladue River is separated from the head of the Sixtymile by a low divide.
Station Mark: A small hole made with a nail 0·15 foot west of a ¾-inch drill hole in large flat rock. Triangle cut around hole. Cairn and flagpole.

ODELL. *T. Riggs, jr., 1908.*
About 10 miles south of Sixtymile River, and 2½ miles east of the Line on the break of the ridge running from station Crag, the first ridge east of the Line.
Station Mark: ½-inch drill hole in triangle cut on stone in ground. 5-foot cairn, with a flagpole.

FRED. *T. Riggs, jr., 1908.*
On the first high point south of station Divide, which is on the highest point on the watershed between the waters of Sixtymile River and McArthur Creek. Station is on a north-and-south spur.
Station Mark: ½-inch drill hole in triangle cut on stone in ground; 5½-foot cairn, with flagpole.

INTERIOR. *T. Riggs, jr., 1908.*
On a projecting ledge of shale rock on a knob on the main ridge running down from the main divide between McElfish Creek and North Fork of Ladue River, and about 1 mile west of the Line.
Station Mark: ½-inch drill hole in triangle cut on rock about 6 inches below surface of ground. 4-foot cairn.

LADUE. *T. Riggs, jr., 1908.*
On a wooded knoll about 5 miles east of the Line, on third ridge from the ridge heading at Monument No. 133, and second ridge from station Odell, and about 7 miles northeast of the mouth of McArthur Creek. Ridge runs about southeast-northwest. Station is on highest and last knob on ridge.
Station Mark: ½-inch drill hole in triangle cut in large quartz boulder set in ground. Tripod signal.

TIMBER. *T. Riggs, jr., 1908.*
A rocky point, 5 miles west of the Line, on a timbered ridge running about east and west. The ridge runs up from the North Fork of Ladue River opposite a timbered knoll called "Junction" standing well out in the flat, and almost opposite the mouth of McElfish Creek. The first summit on the ridge west of Ladue River is broad and timbered heavily. Between the two points is a saddle with two humps in it.
Station Mark: ½-inch drill hole in triangle on projecting piece of gneiss. Tripod signal.

RIDGE. *T. Riggs, jr., 1908.*
A brushy knob, about 4 miles east of the Line on a long ridge running east and west. The knob is a continuation of the ridge, the end of which, "Junction," is a point for topographic control. "Junction" at a distance looks like a lone knoll in the valley of the North Fork of Ladue River. The knob on which station is located is a small mound with stringers of quartz.
Station Mark: ½-inch drill hole in triangle cut on stone set in ground. Tripod signal.

POINT. *T. Riggs, jr., 1908.*
About 7 miles east of the Line on a timbered knob on a narrow, heavily timbered ridge running northwest from the bend in the valley of the North Fork of Ladue River. The ridge on which Monument No. 142 stands comes into the valley one ridge south of this ridge, and on the opposite side of the river. The knob is not on the main summit but on the highest part of the spur from the north-and-south ridge.
Station Mark: ½-inch drill hole in ledge of rock in place. Tripod signal.

SUMMIT. *T. Riggs, jr., 1908.*
About 4½ miles west of the Line on the first high ridge to be seen from the north, and between two tributaries of the North Fork of Ladue River. The station is on the same ridge as Monument No. 142, on a round rocky, dome-like knob, rather flat on top, the highest on the ridge where it divides, one part running south and the other northwest.
Station Mark: ½-inch drill hole in triangle cut on large rock set in ground. 6-foot cairn.

FRA-WA-PE. *T. Riggs, jr., 1908.*
About 7 miles east of the Line, and 4 miles northeast of junction of North Fork and Ladue River on rock outcrop on the highest part of a thickly timbered ridge. Near the top of the station ridge are two knobs with saddles between; the station is on the more easterly. A good three hours' walk from the creek up the ridge. Fra-wa-pe Creek lies to the south, with a ridge between the station and Ladue River.
Station Mark: ½-inch drill hole in triangle cut on rock. The moss had to be scraped off to expose the rock. There is just room on top of the rock to work comfortably. Tripod signal.

OH-TI. *T. Riggs, jr., 1908.*
About 3 miles west of the Line on a ledge of exposed rock on a high conical hill on the main ridge between Ladue River and its North Fork. The hill is at the point in the ridge where it bends to the southeast. The boundary trail runs 300 yards from the station.
Station Mark: ½-inch drill hole in triangle cut on rock in place, about 6 feet east of a number of rocks sticking up about 6 feet higher than station. Tripod signal.

BUMP. *T. Riggs, jr., 1908.*
On the second knob on ridge west of McArthur Creek. The timber has been burnt off the knob, except a small bunch of spruce on the south side. The point of the ridge runs down to a bench in the creek.
Station Mark: ½-inch drill hole in triangle cut on rock set in ground. Tripod signal.

BROWN. *T. Riggs, jr., 1908.*
On the first rise northeast of the three knobs west of which the Line runs, about 7 miles south of Ladue River. Is on the boundary trail. Some aspen brush.
Station Mark: ½-inch drill hole in triangle cut on stone 1-foot square sunk in ground. Tripod signal.

BLACK. *T. Riggs, jr., 1908.*
On a knob of a heavily timbered ridge, about 7 miles east of the Line and 6 miles south of Ladue River, and east of small tributary which heads in the Moosehorn Mountains.
Station Mark: ½-inch drill hole in triangle cut on rock. Tripod signal.

MISSOU. *T. Riggs, jr., 1908.*
On the highest point of the third rise on the main ridge of the Moosehorn Mountains, about 8½ miles south of Ladue River. The bump is bare and rocky.
Station Mark: ½-inch drill hole in triangle cut on flat rock sticking up about 2 inches above ground; 4·5-foot cairn and flagpole.

MOOSEHORN. *T. Riggs, jr., 1908.*
On the second rocky dome south from station Missou, and on same ridge, being about the southern end of Moosehorn Mountains.
Station Mark: ½-inch drill hole in triangle cut on boulder about 4 feet square, and deeply imbedded in ground; 6.7-foot cairn, with pole.

FLAT. *T. Riggs, jr., 1908.*
About 6 miles west of the Line, and almost due west of station Moosehorn, on the highest point of the heavily timbered ridge west of McArthur Creek. Station is on a large outcrop of granite.
Station Mark: ½-inch drill hole in triangle cut on rock in place. Tripod signal.

SAUERKRAUT. *T. Riggs, jr., 1908.*
About 7½ miles west of the Line on a heavily timbered spur ridge west of McArthur Creek, the second ridge from the end of long ridge running down to a lake on the Line. The spur reaches out into a large flat country, which is tributary to the Tanana River. Much chopping for lines of sight.
Station Mark: A drill hole in triangle on granite outcrop. Tripod signal.

WIENERWURST. *T. Riggs, jr., 1908.*
About 1¾ miles east of the Line, a on heavily timbered lone hill at the end of a long ridge running down from Moosehorn Mountains. There is a lake to the northwest, and a number of them to northeast, these latter draining through Scottie Creek, which runs around the north side of the hill. The station is the highest knob where a great deal of cutting had to be done to open lines of sight.
Station Mark: A drill hole in triangle on granite outcrop, about 4 inches under moss. Tripod signal.

SCOTTIE. T. *Riggs, jr., 1908*
On the highest rocky point on the ridge, and about 1 mile southwest of Monument No. 158.
Station Mark: ½-inch drill hole in solid rock, and on south side of highest rocks. 5-foot cairn, with pole.

TANANA. *T. Riggs, jr., 1908.*
About 7½ miles west of the Line on a lone, rounding hill rising out of a flat country dotted with lakes, to the west of hill on which station Scottie and Monument No. 158 are situated. There are two lakes to east of hill, in a niggerhead swamp, and a large swamp to the west and north. The hill has been burnt over and has new growth of aspen and birch; blueberry bushes cover the whole hill.
Station Mark: ½-inch drill hole in triangle cut on projecting point of huge boulder. Tripod signal.

STARVATION. *W. B. Reaburn, 1908.*
On the first bench, and about one-quarter mile east of Monument No. 160, in scattered spruce and brush. Some cutting to open up vistas.
Station Mark: ⅜-inch drill hole in a large rock in place. The rock stands up about 1 foot above surface of ground.

RUPE. *W. B. Reaburn, 1909.*
About 1½ miles east of the Line, on the western end of a long east-and-west ridge, connected by a high saddle with the ridge Monumnet No. 160 is on. The station is about 1¼ miles east of station Starvation.
Station Mark: ⅜-inch drill hole in a triangle cut on a large stone set in ground in the north end of a bare spot.

MIRROR. *W. B. Reaburn, 1909.*
On a densely timbered ridge, about 6 miles west of the Line, 1½ miles northeast of Scottie Creek, and about 7 miles southwest of Monument No. 160. Timber cut around signal with vistas to see other signals.
Station Mark: ⅜-inch drill hole in a triangle cut on a stone set in ground flush with the surface.

AIRS. *W. B. Reaburn, 1909.*
On the highest point on a flat-top hill, known as "Airs Hill," which is the highest point on the divide between Scottie and Mirror Creeks. Station in on the same ridge, and about 3½ miles a little north of west from Monument No. 164.
Station Mark: ⅜-inch drill hole in a triangle cut on a large flat rock set flush with the surface of ground. There are three large rocks set below the surface of ground to set instrument on.

DAVE. *W. B. Reaburn, 1909.*
On the highest point on a densely timbered hill, about 4½ miles east of the Line, and 1½ miles north of a lake, which is the head of southerly branch of Scottie Creek. The timber is cut for the north and west vistas, and backgrounds cut for the other sights.
Station Mark: ⅜-inch drill hole in a triangle cut on a stone set flush with the surface of the ground.

SNIDER. *D. W. Eaton, 1909.*
About one-half mile west of the Line on a timbered hill on the same ridge as, and about 1 mile northwest of Monument No. 166. Timber is cut around the signal.
Station Mark: $\frac{3}{8}$-inch drill hole in a triangle cut on an outcropping ledge of rock.

WELLESLEY. *D. W. Eaton, 1909.*
On the highest point of the eastern end of Wellesley range of hills. A wall of rock, having a vertical face of about 20 feet on its southern side, extends east and west across the summit, and the station is on the eastern end of this wall.

SNAG. *D. W. Eaton, 1909.*
About $6\frac{1}{2}$ miles east of the Line on a wooded knoll about 500 feet above, and on the right bank of Beaver Creek. The knoll is the western end of a series of hills between Beaver Creek and White River, and south of Snag River. East about $3\frac{1}{2}$ miles is an isolated cluster of hills extending in an east-and-west direction, having the appearance of being partly submerged in the surrounding flats or muskeg. About one-half mile southeast is a small isolated knoll, about 300 feet above the flat. The top of the knoll around the station is cleared of trees, and a vista is cut to the stations surrounding.
Station Mark: $\frac{3}{8}$-inch drill hole in a triangle cut on a basaltic stone set in the ground, with top flush with the surface.

NIGGERHEAD. *D. W. Eaton, 1909.*
Five and a half miles east of the point where Beaver Creek crosses the Line for the third time; on a solid rock, which is the highest point of a group of hills called Niggerhead Hills.
Station mark: $\frac{3}{8}$-inch drill hole in a rock in place, about 3 feet in diameter, surmounted by a cairn with pole.

BAULTOFF. *D. W. Eaton, 1909.*
On the eastern rim of a flat-top mountain, about 4 miles south of west of Baultoff cabin. It is not on the highest part of the mountain, but on the rim overlooking the valley to the eastward, the summit, one-quarter mile east, being approximately 100 feet higher. It is easily reached from Baultoff cabin.
Station Mark: $\frac{3}{8}$-inch drill hole in triangle on a stone about 16 by 15 by 8 inches which is set flush with the ground.

ED. *D. W. Eaton, 1909.*
About $4\frac{1}{2}$ miles east of the Line on an isolated ridge to the east of Beaver Creek, about midway between the first and second crossings of the Line. It overlooks a flat country with numerous small lakes, toward the White River to the eastward. It is not on the highest part of the ridge, which is a few feet higher along the summit south of the station. It is easily found by following the top of ridge from the north end.
Station Mark: $\frac{3}{8}$-inch drill hole in a stone set with top fairly level with surface, surmounted by a cairn and pole.

JOE. *D. W. Eaton, 1909.*
About 6 miles west of the Line on a mountain $1\frac{1}{2}$ miles northwest of Brays Pass. It is not on the highest point, as a small peak one-quarter mile south of station is higher. It is easily reached from the small lakes in Brays Pass by following the stream emptying into them, or from the stream in the valley north of station Joe.
Station Mark: $\frac{3}{8}$-inch drill hole in triangle on a stone 8 by 8 by 8 inches set nearly level with surrounding stones on summit. A cairn with pole.

BEAVER. *D. W. Eaton. 1909.*
About three-quarters of a mile east of the Line on the highest point of the ridge running eastward from Monument No. 175, which is on a ridge to the westward of station Beaver and is connected with the ridge on which Monument No. 174 is situated by a comparatively low saddle at the head of a stream flowing by Lamb and Benson's cabin (Bullion Creek).
Station Mark: $\frac{3}{8}$-inch drill hole in a stone surmounted by a cairn with pole.

HUMP. *D. W. Eaton, 1909.*
About 5 miles east of the Line on a hump on a ridge leading out from the first mountains north of Rabbit Creek between Beaver Creek and White River. The station is northward from the outlet of "Lake Tosmona," which drains into Beaver Creek. The station is easily reached from the outlet of the lake.
Station Mark: $\frac{3}{8}$-inch drill hole in a basaltic stone 12 by 12 by 8 inches, set in the summit gravel, surmounted by a cairn with pole.

WI-KI. *D. W. Eaton, 1909.*
About 6 miles west-southwest of the mouth of Ptarmigan Creek. On the eastern point of a ridge which froms the eastern end of a short chain of mountains to the south of Beaver Creek. The station overlooks Beaver and Ptarmigan Creek valleys, and from the junction of these valleys the station appears to occupy the highest point of the end of the ridge. There are several rock projections to the west, which are 8 or 10 feet higher.
Station Mark: $\frac{1}{2}$-inch drill hole in a basaltic stone 18 by 12 by 7 inches, set level with the surface, surmounted by a cairn and pole.

SHEEP. *D. W. Eaton, 1909.*
Three miles west of the Line on the highest point of the ridge at the head of Rocker Creek.
Station Mark: $\frac{3}{8}$-inch drill hole in triangle on rock nearly level with the surface, surmounted by a cairn and pole.

RABBIT. *D. W. Eaton, 1909.*
One quarter mile east of the Line on the highest point near the eastern edge of the flat-top mountain at the head of Lignite Creek.
Station Mark: A drill hole in triangle on a stone set level with the surface, surmounted by a cairn with pole.

CENTER. *T. Riggs, Jr., 1909.*
On a rocky peak one-quarter mile southeast of Monument No. 181, and about 2½ miles northeast of Cache Creek. A fork of Rabbit Creek heads in the mountain just opposite the saddle to the east and north of it. A small fork of Cache Creek heads in the same saddle, but on the southwest side. Mountain is the fourth from White River in the range running northwest just east of the Boundary, and is a mass of slide rocks.
Station Mark: Triangle and ½-inch drill hole in large slab of basalt, with a 3½-foot cairn over it. Pole in center.

CACHE. *D. W. Eaton, 1909.*
About 2¼ miles west of the Line on the edge of a lava flow on the western side of Cache Creek valley, about 4 miles from the mouth of Cache Creek.
Station Mark: ⅜-inch drill hole in a rock, surmounted by a cairn and pole.

FLAT TOP. *D. W. Eaton, 1909.*
About 1¾ miles east of the Line on a flat-top mountain, the highest peak in sight to the northeast from the mouth of Cache Creek. About 100 feet south of the station is a vertical cliff.
Station Mark: ⅜-inch drill hole, surmounted by a cairn and pole.

HARRIS. *Frederick Lambart, 1913.*
On the highest point of a round-top ridge immediately south of the large flat between the White and Jenerk Rivers, at their junction, and about 1,000 feet above the flat.
Station Mark: A 3-inch wire nail in a stump about 18 inches above ground level. A tripod signal was left over the station.

WHITE RIVER, EAST BASE. *D. W. Eaton, 1909.*
On the south side of White River on the flats, about 1¼ miles below the mouth of Kletsan Creek, and about one-half mile above the mouth of Cache Creek, which comes into White River on the opposite side. It is between two streams of clear water, which come together below the station. There is a line of posts in line with West Base, and a tripod signal was left standing in 1909.
Station Mark: A cross on a piece of tin imbedded in the top of a block of concrete 8 by 8 by 24 inches set 18 inches in the ground. The concrete block marked "W.R.E.B. 1909."

WHITE RIVER, WEST BASE. *D. W. Eaton, 1909.*
On the south side of White River, about 400 feet south from its bank, and above the mouth of Kletsan Creek. It is in an open space, about 150 feet from the edge of the timber (spruce). There is a line of posts in line with East Base, and a tripod, 18 feet high, surrounded by an observing scaffold, was left standing over the station in 1909.
Station Mark: A cross on a piece of tin imbedded in the top of a block of concrete 8 by 8 by 24 inches set 18 inches in the ground. The concrete block marked "W.R.W.B. 1909."

KLETSAN. *D. W. Eaton, 1909.*
On the highest point of Kletsan Hills, an isolated cluster of hills between Little Boundary Creek and Kletsan Creek, south of White River.
Station Mark: ⅜-inch drill hole in a triangle on a stone, set flush with the surface.

TRAVER. *D. W. Eaton, 1909.*
About 4½ miles west of the Line on the highest point of an isolated hill between Traver Creek and Cub Creek, and about 1½ miles south of White River.
Station Mark: ⅜-inch drill hole in triangle on a stone, set flush with the surface. A large spruce stump is about 10 feet southwest from station.

JENERK. *Frederick Lambart, 1913.*
On the eastern extremity of a flat which forms the northerly end of the ridge lying between Boulder Creek, which rises on the eastern slopes of Mount Lambart and joins the Jenerk River about 20 miles above its mouth, and the headwaters of Big and Little Boundary Creeks. The station lies about 1¾ miles northwest of the mouth of Boulder Creek, and 1,500 feet above it.
Station Mark: ½-inch drill hole in a triangle cut on a boulder about 25 feet from the eastern edge of the flat. A tripod signal was left over the station.

SCORIA. *T. Riggs, jr., 1909.*
On the highest point of a sand hill, about 3 miles east of the Line and one-half mile east of a gravel flat in Little Boundary Creek, and just east of the largest lake in the neighbourhood. This hill is the only one in vicinity with any trees on it. One stumpy, bushy tree is particularly noticeable from the west.
Station Mark: ½-inch drill hole in triangle on a stone about one foot square, sunk in the ground.

CUB. *D. W. Eaton, 1909.*
About 6 miles west of the Line and 8 miles south of White River, on the highest point on the end of a spur leading out from the mountains west of Cub Creek. Views 48-E, 49-E, 50-E and 52-E of Riggs, 1909, were made from this station.
Station Mark: ⅜-inch drill hole in triangle on a rock in place, surmounted by a cairn and pole.

DALTON. *T. Riggs jr., 1909.*
About one-half mile west of the Line on a shattered, moss-covered knob on the first ridge west of the ridge on which Z of the Boundary is located. The most westerly fork of Kletsan Creek runs just west of the ridge, and the middle fork is between the station and Z of the Boundary. The station is on the next knob up the ridge from two prominent black-rock pinnacles about 150 feet distant. Below the pinnacles the ridge is all brown shale slide.
Station Mark: ½-inch drill hole in a stone 24 by 18 by 8 inches, lying on ground. Surmounted by a cairn and pole.

LAMBART. *Frederick Lambart, 1913.*
On a prominent peak on the Natazhat ridge, three-quarters of a mile east of the Line, and 4 miles east of Mount Natazhat; about 5,000 feet above Natazhat Glacier, and 4 miles north of Klutlan Glacier.
No station mark, on account of snow cap.

KLUTLAN. *Frederick Lambart, 1913.*
On the summit of a cone-shaped peak, the most easterly prominent peak in that portion of the Natazhat Range lying in the bend of the Klutlan Glacier. The station is about 8 miles east of the Line, and 4,000 feet above the glacier, and was climbed from the east, leaving the glacier at a large flat about 10 miles above Boulder Creek.
No station mark, on account of snow cap.

CRAG. *Frederick Lambart, 1913.*
About 1½ miles east of the Line on the highest point of a cone-shaped peak lying immediately south of Klutlan Glacier, and about 3,600 feet above the glacier.
No station mark, on account of snow cap.

BO. *Frederick Lambart, 1913.*
About 6 miles east of the Line of the highest point of a prominent peak, which lies between Klutlan Glacier and Neshan Glacier, which joins it from the south. It is about 1½ miles southeast of the junction of the glaciers, and is about 3,500 feet above them.
No station mark, on account of snow cap.

BETWEEN THE BOUNDARY CROSSING OF WHITE RIVER, AND MOUNT ST. ELIAS.

PING PONG. *D. W. Eaton, 1909.*
A cairn on the highest rocky knob near the western end of the range of hills on the north side of White River directly opposite the mouth of Holmes Creek. There are two small lakes to the northeast.
Station Mark: A ⅜-inch drill hole in a large rock, set in ground.

HOLMES. *D. W. Eaton, 1909.*
A cairn on a rocky ledge on the north end of a north-and-south ridge, which is a foothill, but is detached from the main range by a saddle at the head of the creek. The cairn is on the first ridge west of first creek west of Holmes Creek, and south of White River.
Station Mark: ⅜-inch drill hole in a triangle cut on a stone set in ground.

BURNT HILL. *W. B. Reaburn, 1909.*
On a small, burnt hill, brushy on top, with grass on the southeast slope, rising out of a timbered country about 5 miles west of station Ping Pong, and 1¼ miles north of the flats of White River.
Station Mark: ⅜-inch drill hole in a triangle cut on a stone set in the ground flush with surface.

BLACK EAGLE. *W. B. Reaburn, 1909.*
A cairn on a rocky knob on a grassy hill which is a foothill of the main range south of White River. The cairn is about one-half mile east of a small glacial stream, to the west of which is a long string of grassy hills, which are apparently detached from the main range.
Station Mark: ⅜-inch drill hole in a triangle cut on a large stone set in ground.

SOLO. *W. B. Reaburn, 1909.*
A cairn on a small knoll north of White River, about 1 mile north of a cabin on Solo Creek, and about one-third of a mile east of this creek.
Station Mark: ⅜-inch drill hole in triangle cut on a stone set in ground.

BEND. *W. B. Reaburn, 1909.*
A cairn on a knob of a spur south of, and in the bend of, White River where the valley turns to the southwest (looking up stream) and about 24 miles above the Line and about two miles northeast of the foot of the glacier at the head of river.
Station Mark: A ⅜-inch drill hole in a triangle cut on a stone set in ground.

END. *W. B. Reaburn, 1909.*
A cairn on the middle peak on a spur sloping to the northeast between White River and its middle fork.
Station Mark: ⅜-inch drill hole in a triangle cut on a stone set flush with the ground.

SKOLAI. *W. B. Reaburn, 1909.*
A cairn on a knob of a black spur, the first ridge to the southwest of the second glacier coming in from the southeast, and about two miles north of Russell Glacier. The spur slopes to the northwest, and the slope is gradual on the southwest and very steep on the northeast.
Station Mark: A drill mark in a small triangle cut on solid rock.

RUSSELL. *A. C. Baldwin, 1912.*
On the south end of a high range of mountains which lie immediately north of the White River end of Russell Glacier. Between the station and the largest fork of the range is a saddle, one-half mile below, which is the beginning of timber-line on White River; there is a lone log-cabin here. The station is on the highest point of the south fork of the range.
Station Mark: A hole drilled in rock in place, with a surrounding triangle. The signal is a cairn with a center pole.

LIME. *W. B. Reaburn, 1909.*
A cairn on a high hill to the northeast of Lime Creek and almost opposite the foot of the glacier in that stream. The main fork of Solo Creek heads on the north side of the hill, and a branch of Solo Creek heads on the east side of hill.
Station Mark: ⅜-inch drill hole in a triangle cut on a rock in place.

GLACIER. *A. C. Baldwin, 1912.*
On the first high snow-capped mountain to the north of Skolai Creek, and about 1½ miles west of the western foot of Russell Glacier. The station is on the second or northwest peak of the range, which connects by a low saddle with Skolai Peak, 2 miles to the east. The mountain breaks off precipitously on all sides, and is covered with perpetual snow.
Station Mark: A triangle with sides about 1 inch in length, cut in native rock. It is located on a small shelf about 18 feet from the top of the peak, and about 2 feet from the wall of the shelf.

PASS. *A. C. Baldwin, 1912.*
On a low divide at the west end of Russell Glacier between Skolai Creek and Chitistone River. This divide is known as Chitistone Pass. The station is on the highest point of the second bench above Skolai Creek. Two miles to the east and west are high glaciated mountains.
Station Mark: Hole drilled in rock with surrounding triangle. Cairn, with center pole.

FREDERIKA. *A. C. Baldwin, 1912.*
On the southeast end of the long spur leading southeasterly from Frederika Mountain. It is about 3 miles northeast of the foot of Frederika Glacier, and is at the head of the second creek coming in from the east. The station is about 100 feet below the first top of the spur, and on the eastern end of a shelf which breaks off precipitously on the east side.
Station Mark: Hole, with a surrounding triangle, drilled in stone set flush with ground. Cairn signal.

GOFER. *A. C. Baldwin, 1912.*
On a low glacial bench south of Skolai Creek, and below peak " C. " The station is about one mile south of the mouth of the second or upper canyon of Skolai Creek. A small lake is 100 feet to the southwest. The station is on a large flat rock 12 by 10 by 3 feet. There are numerous other rocks of all shapes and sizes in the immediate vicinity.
Station Mark: A hole, with surrounding triangle. Cairn signal.

COAL. *A. C. Baldwin, 1912.*
On a high mountain 3 miles west of Fredericka Creek, 2 miles north of Skolai Creek, and about 1½ miles north of east of the sharp red pinnacle of rock on the side of Station Creek.
Station Mark: ⅜-inch hole, with surrounding triangle, drilled in stone set flush with the ground. Cairn signal.

ROHN. *A. C. Baldwin, 1912.*
On a high mountain about 5 miles north of Skolai Creek, and about 4 miles east of the junction of Rohn Glacier with Nizina Glacier; on a rocky prominence, the rest of the mountain being covered with snow and ice.
Station Mark: Hole, with surrounding triangle, drilled in a rock in place. Cairn signal.

FOOTHILL. *A. C. Baldwin, 1912.*
On the highest part of the ridge just south of the head of Skolai Lake, and about 1½ miles southeast of station Fulcrum. About one mile east of the station is a high glaciated mountain.
Station Mark: A hole, with surrounding triangle, drilled in stone set flush with the ground. Cairn signal.

FULCRUM. *A. C. Baldwin, 1912.*
On a low knob about two miles south of the head of Skolai Lake. To the west of the station the hill breaks off abruptly o r about 1,000 feet, where there is a gradual slope to the Nizina Glacier.
Station Mark: ⅜-inch hole, with surrounding triangle, drilled in rock. Cairn signal.

GOAT. *A. C. Baldwin, 1912.*
On what is known as Chimney Mountain, which lies between Regal and Rohn Glaciers. The station is on the second bench above Regal Glacier, and about 2,000 feet below a prominent chimney-like tower on the summit of the mountain. Just east of the station the mountain breaks off precipitously to Nizina Glacier.
Station Mark: A hole, with triangle, drilled in a rock. Cairn signal.

SENTINEL. *A. C. Baldwin, 1912.*
On a spur leading to the northeast from Nizina Mountain. On the east end of the spur is a prominent rock, resembling a man in appearance. The station is about one-half mile west of this rock.
Station Mark: A ⅜-inch hole, with surrounding triangle, drilled in rock in place. Cairn signal.

NIZINA. *A. C. Baldwin, 1912.*
On the high mountain between the main Nizina River and its west branch. It is nearly due west 3 miles from the foot of Nizina Glacier. The station is on the east peak of the mountain.
Station Mark: A ⅜-inch hole drilled in a rock. Cairn signal.

NIKOLAI. *A. C. Baldwin, 1912.*
About 7½ miles east of north of Sourdough Peak on the highest point of the ridge between the Nizina River and McCarthy Creek. It is about 3 miles west of the junction of Nizina River with its west branch. The station overlooks the west branch of the Nizina.
Station Mark: A hole, with surrounding triangle, drilled in a rock in place. Cairn signal.

CHITISTONE. *A. C. Baldwin, 1912.*
On a high mountain just north of Chitistone River. The station is located on a flat top, about 1½ miles from west end of the range, or about 4 miles east of the island in the Nizina bar at the junction of Chitistone and Nizina Rivers.
Station Mark: ⅜-inch hole, with surrounding triangle drilled in rock. Cairn signal.

BOULDER. *A. C. Baldwin, 1912.*
On the ragged ridge east of Nizina River, south of Chitistone River, north of Dan Creek and west of Boulder Creek. The station is on a bluff, which breaks off precipitously toward the Nizina, and is about one-quarter mile north of the highest point of the ridge.
Station Mark: ⅜-inch hole in rock in place. Cairn signal.

EAST SOURDOUGH. *A. C. Baldwin, 1912.*
On the peak 1½ miles northeast of Sourdough Peak. The station is about 100 feet below the summit. It overlooks Nizina River to the south, and breaks off abruptly to the north.
Station Mark: ⅜-inch hole, with a triangle around it, drilled in a rock in place. Cairn signal.

NIZINA RIVER, SOUTHWEST BASE. *A. C. Baldwin, 1913.*
NIZINA RIVER, NORTHEAST BASE.
The Nizina River base is located on the north side of Nizina River, directly opposite the mouth of Dan Creek, and on a flat peavine bar. The northeast end is near the timbered point, from which the river swings in a large bend toward Dan Creek, and is about one-quarter mile from the river and about 100 yards from the rocky cliff of the point. The southwest end is near the point where the river again strikes the north bluff, and about 100 yards from the river, with a landslide from the mountain just north of it.
Station Mark: Both bases are marked by copper discs set in 18 inches of concrete. Each has three reference discs of copper set in concrete. Target signal.

GROVE. *A. C. Baldwin, 1912.*
On a wooded knob, 2 miles south of Dan Creek and 1 mile west of Williams Peak.
Station Mark: Cross cut in stump of 6-inch birch, with nail driven in center. Target signal.

YOUNG CREEK. *A. C. Baldwin, 1912.*
Is located at the mouth of Young Creek, on the west bluff. It is due west from the Sourdough cabins about one-eighth of a mile.
Station Mark: A cross cut in a root of an 18-inch spruce; spike driven in the center of cross. Roots extend from east side of tree. Target signal.

WILLIAMS. *A. C. Baldwin, 1912.*
On the west spur of Williams Peak, about 1,000 feet from the summit. It is about one mile south of Dan Creek, and about 500 feet above Khrums lode claim.
Station Mark: A hole, with surrounding triangle, drilled in rock in place. Cairn signal.

MAY CREEK. *A. C. Baldwin, 1912.*
On a small hill, thickly covered with tall alders, at the head of the east branch of May Creek. It is about 2 miles west of the old saw-mill on Chititu Creek.
Station Mark: A spike driven in a 6-inch spruce stump. Target signal.

GEOLOG. *A. C. Baldwin, 1912.*
On the ridge on the northwest side of Rex Creek, on the extreme southwest end of the ridge, 500 feet above timberline. This ridge is a spur leading from Williams Peak.
Station Mark: ⅜-inch hole, with triangle, drilled in rock in place. Cairn signal.

REX. *A. C.Baldwin, 1912.*
On a high mountain between Rex Creek and White Gulch, about 3 miles from the forks of these two streams, and about 200 feet from the summit of the mountain.
Station Mark: ⅜-inch hole, with a triangle, drilled in a rock in place. Cairn signal.

CALAMITY. *A. C. Baldwin, 1912.*
On the high, sharp peak at the head of White Gulch and Calamity Creek. This peak is at the extreme east end of the divide between Young Creek and Chitina Creek.
Station Mark: ⅜-inch hole, in triangle, drilled in large flat rock. Cairn signal.

CHITITU. *A. C. Baldwin, 1912.*
On the divide between Chititu and Young Creeks, on the second peak from the west, and about 1,000 feet above timberline. It is about 3 miles south of the Nizina Post Office.
Station Mark: ⅜-inch hole, in a triangle, drilled in a rock in place. Tripod signal.

BRIGHAM. *A. C. Baldwin, 1912.*
On the ridge between Canyon Creek and Young Creek, where the latter swings sharply to the north looking upstream. This ridge is north of the low saddle between the creeks and about 3 miles north of the lake in this saddle. The signal is on a flat knob, which has a conspicuous rock slide on its south and west sides. The highest point of the ridge is about 1½ miles northeast.
Station Mark: ⅜-inch hole drilled in rock in place; surrounding triangle. Cairn signal.

PATTY. *A. C. Baldwin, 1912.*
On the highest peak of the divide between Young Creek and Chitina River, and about 4 miles due south from the mouth of Calamity Creek.
Station Mark: Hole, in triangle, drilled in a rock. Cairn signal.

BULB. *A. C. Baldwin, 1912.*
On a dome knob, about 2½ miles west of the highest peak on the divide between Young Creek and Chitina River, and about 4 miles south and west of the mouth of Calamity Creek.
Station Mark: ⅜-inch hole drilled in rock in place; triangle around it. Cairn signal.

EATON. *A. C. Baldwin. 1912.*
About 1½ miles southeast of the highest peak on the divide between Young Creek and Chitina River, on a prominence which breaks off precipitously toward Chitina River.
Station Mark: A hole, in triangle, drilled in a stone set flush with the ground. Cairn of sod.

HEAD. *A. C. Baldwin, 1912.*
On the high ridge 3 miles north of Chitina River, about 2 miles west of Canyon Creek and one mile south of the low divide near the head of Young Creek, the divide leading from the bend in Young Creek to Canyon Creek.
Station Mark: A hole, in triangle, drilled in stone set flush with ground. Cairn signal.

BAR. *A. C. Baldwin, 1912.*
On a gravel bar of Chitina River, about 3 miles south of the point where the Young Creek trail comes out of the timber on the Chitina, and about 4 miles west of the mouth of Canyon Creek. The station is on a rise, with a few small cottonwood trees nearby.
Station Mark: A hole, in triangle, drilled in a rock set flush with the ground. Pole signal.

DELTA. *A. C. Baldwin, 1912.*
On a gravel bar of the Chitina River, about one-quarter mile south of point of timber on the delta of Canyon Creek.
Station Mark: ⅜-inch hole drilled in rock set flush with ground; triangle around hole. Target signal.

STREAK. *A. C. Baldwin, 1912.*
On a long, flat ridge about 2 miles east of Canyon Creek, and 3 miles north of Chitina River. There is a white rockslide just south of the signal.
Station Mark: A hole drilled in a stone set flush with the ground; triangle around it. Pole signal.

GIBRALTAR. *A. C. Baldwin, 1912.*
On a high, wooded island in the Chitina Valley, about 4 miles east of Canyon Creek and 2 miles east of the only cabin east of Canyon Creek. The island on the north side presents a precipitous wall of rock. It is about 800 feet above the floor of the valley, and is the highest of the islands.
Station Mark: A cross cut in a 6-inch spruce stump, with a nail driven in the center. Signal.

DELAY. *A. C. Baldwin, 1912.*
On top of the high mountain immediately west of the second glacier flowing into the Chitina Valley west of the foot of Chitina Glacier.
Station Mark: A hole, with triangle, drilled in a stone set flush with ground. Cairn signal.

ISLAND. *A. C. Baldwin, 1912.*
On a small, wooded island in the Chitina Valley, about 3 miles south of the foot of the second glacier below Chitina Glacier flowing in from the north, and about one-half mile south of a long wooded island, in the valley; there is a small island, "Till," about 1 mile southwest, and a high island known as "Gibraltar" about 3 miles west.
Station Mark: A nail driven in a 7-inch spruce stump which is about 14 inches high. Pole signal.

FINIS. *A. C. Baldwin, 1912.*
On the range of mountains between the first and second glaciers below Chitina Glacier flowing into the Chitina Valley from the north. On a knob of a spur running about southwest and about 1,000 feet above timber-line, and 1,500 feet from the western top of the mountain.
Station Mark: ⅜-inch hole drilled in stone set flush with the ground; hole in center of a triangle. Carin signal.

TERMINUS. *A. C. Baldwin, 1912.*
On a terminal moraine of the first glacier flowing into the Chitina Valley west of the foot of Chitina Glacier. It is about one-eighth of a mile east of the main body of water flowing from the glacier and one-quarter mile from the junction of this stream and Chitina River. Mr. Eaton's main tree-cache is about one-quarter mile southeast.
Station Mark: A hole inside a triangle cut in a large rock 24 by 24 inches. Cairn signal.

NIBS. *A. C. Baldwin, 1913.*
On the southwest spur of the mountain east of Short River Glacier, about 500 feet above timber-line.
Station Mark: ⅜-inch drill hole in a stone set flush with ground. Triangle around hole.

CHOP. *A. C. Baldwin, 1913.*
On the small island about 3 miles below the foot of Chitina Glacier, on the south side of the valley.
Station Mark: A deep cross cut in a spruce stump (8 by 12 inches). Nail driven in center of cross.

Don. *A. C. Baldwin, 1913.*
On a low, wooded knob, on the south side of Chitina Valley, about opposite the foot of the glacier, and just east of the first creek flowing from the south into Chitina River.
Station Mark: Nail driven into a spruce stump.

Chitina River, West Base. *A. C. Baldwin, 1913.*
Eighteen hundred meters from East Base. Azimuth of line East Base to West Base, 116° 14′ 57″·5.
Station Mark: Mauser cartridge shell in cement in a stone set flush with ground.

Only. *A. C. Baldwin, 1913.*
On a shouder of a cliffy mountain about half-way between Short River Glacier and Chitina Glacier. It is on the north side of the valley and across a deep canyon from a prominent black dome. Station is about 1,000 feet above timber-line.
Station Mark: $\frac{3}{8}$-inch hole in a triangle drilled in a large native rock.

Chitina River, East Base. *A. C. Baldwin, 1913.*
In the Chitina Valley on the north side near the foot of Chitina Glacier, where the north branch of the Chitina enters the wide valley. The station is on the delta built by the small stream coming into the Chitina from the north, and is about one-quarter mile north of a small wooded island.
Station Mark: Mauser cartridge shell in cement in a stone set flush with the ground.

Shelf. *A. C. Baldwin, 1913.*
On a low bench on the north side of the Chitina Valley, about 3 miles east of the foot of Chitina Glacier.
Station Mark: $\frac{3}{8}$-inch hole, within triangle, drilled in a rock.

Bud. *A. C. Baldwin, 1913.*
On the higher of two rounded knobs on northeast spur of a high mountain on the south side of Chitina Valley, about opposite the two lakes between Logan and Chitina Glaciers, and about 2 miles west of a large river flowing from the south, the main headwater of the Chitina.
Station Mark: $\frac{3}{8}$-inch hole, within a triangle, drilled in a rock in place; signal, cairn with pole.

Eck. *A. C. Baldwin, 1913.*
On a southwest spur of Chitina Mountain, on the first prominence above timber-line. Chitina Mountain is the mountain between Logan and Anderson Glaciers.
Station Mark: $\frac{3}{8}$-inch hole, within triangle, drilled in a stone set flush with the ground.

Fritz. *A. C. Baldwin, 1913.*
On a prominent low knob on the south side of Logan Glacier between Sled Glacier and the valley of the main headwater stream of the Chitina. Station is about 500 feet above the glacier.
Station Mark: $\frac{3}{8}$-inch hole, within a triangle, drilled in a rock. Signal, cairn with pole.

Walsh. *A. C. Baldwin, 1913.*
On a low shelf on south side of Chitina Mountain. It is about half-way between the junction of Walsh Glacier with the Logan, and the west point of Chitina Mountain.
Station Mark: $\frac{3}{8}$-inch hole, within a triangle, drilled in a rock in place. Signal, cairn with pole.

Penn. *A. C. Baldwin, 1913.*
On the first bench of a peninsula-like mountain just east of Sled Glacier.
Station Mark: $\frac{3}{8}$-inch drilled hole, within a triangle, in rock in place. Signal, cairn with pole.

Point. *A. C. Baldwin, 1913.*
On the southwest point of Boundary Mountain, between Logan and Walsh Glaciers. Station is about 200 feet above the glaciers.
Station Mark: $\frac{3}{8}$-inch hole, within a triangle, drilled in a stone set flush with ground. Signal, cairn with pole.

Boundary A. *A. C. Baldwin, 1913.*
On a green bench on the south side of Logan Valley, and about 7 miles east of Sled Glacier. Station is 500 feet west of Monument No. 191.
Station Mark: $\frac{3}{8}$-inch hole, within triangle, drilled in rock in place. Signal, cairn with pole.

Blondie. *A. C. Baldwin, 1913.*
On the west high peak of Boundary Mountain, with deep saddles east and west.
Station Mark: $\frac{3}{8}$-inch hole, within triangle, drilled in rock.

Senator. *A. C. Baldwin, 1913.*
On the more westerly of two high knobs on the east end of Boundary Mountain.
Station Mark: $\frac{3}{8}$-inch hole, within a triangle, drilled in a rock in place. Cairn signal.

Dane. *A. C. Baldwin, 1913.*
On Boundary Mountain on the first high shoulder about 2 miles east of junction of Logan and Walsh Glaciers. There is a saddle to the east of station.
Station Mark: $\frac{3}{8}$-inch hole, within a triangle, drilled in rock in place. Signal cairn with pole.

BOUNDARY. *T. C. Dennis, 1913.*
About midway between station Point and the summit of Boundary Mountain, between Logan and Walsh Glaciers, on the summit of a slight rise, and about 2,500 feet above the glaciers.
Station Mark: A 5-foot cairn.

SLOPE. *T. C. Dennis, 1913.*
About 2½ miles west of the Line, on the ridge west of the first glacier west of the Line on the south side of Logan Valley, near the north edge of a small prominence about 2,250 feet above the glacier.
Station Mark: A 5-foot cairn.

SNOW. *T. C. Dennis, 1913.*
Almost exactly on the Line, about 1¼ miles south of the south edge of Logan Glacier on the summit of a prominent snowy peak, and about 3,000 feet above the glacier.
Station Mark: A 5-foot cairn.

DIVIDE. *T. C. Dennis, 1913.*
On a ridge between two westerly branches of a large glacier joining the Logan Glacier from the south, about 6 miles east of the Line. The point of the ridge is about 4 miles from the Logan Glacier, and the station is on a snow bench about 1½ miles from the point of the ridge, and about 3,000 feet above the glacier.
No station mark, on account of deep snow.

BLACK. *T. C. Dennis, 1913.*
On the summit of the ridge between Logan and Walsh Glaciers, about 4½ miles east of the Line, and about 3,250 feet above the glaciers.
Station Mark: A 4-foot cairn.

ACE. *T. C. Dennis, 1913*
On the ridge immediately west of a very large glacier joining the Logan Glacier from the south about 6 miles east of the Line. The station is on the first prominent point of the ridge running up southwesterly from the bend of the glacier, and about 3,000 feet above it.
No station mark on account of deep snow.

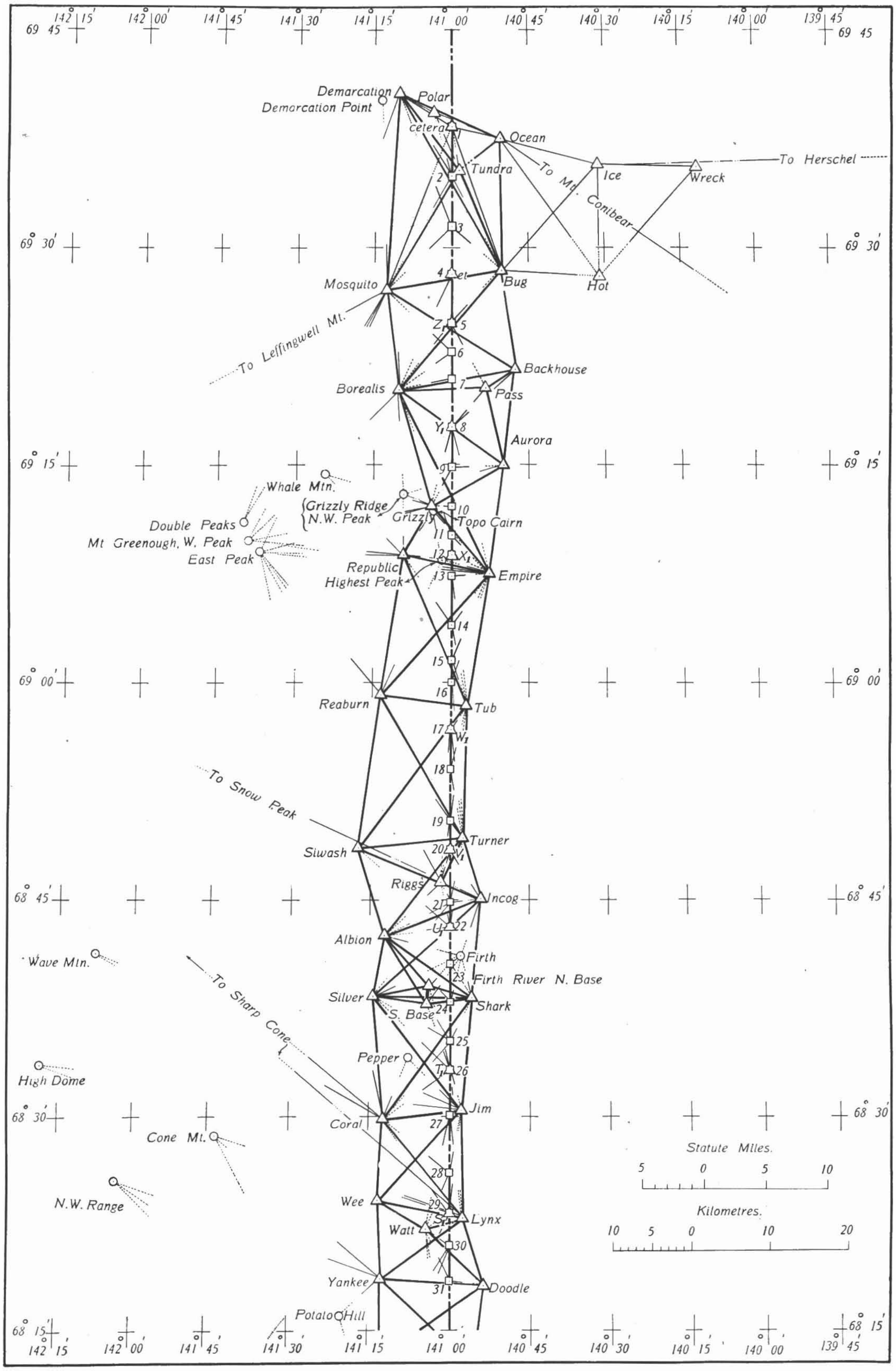
TURN. *T. C. Dennis, 1913.*
On a prominent, low peak on the point between Logan Glacier and a large glacier joining it from the south, about 6 miles east of the Line, and about 1,500 feet above the glacier.
Station Mark: A 9-foot cairn.

DUKE. *T. C. Dennis, 1913.*
About 1¼ miles south of east of station Turn on the summit of the same ridge, and about 2,500 feet above Logan Glacier.
No station mark on account of deep snow.

SHARP. *T. C. Dennis, 1916.*
On the ridge between Logan and Walsh Glaciers, about 9¼ miles east of the Line. On the more easterly of two knobs forming the summit of the peak, and about 3,250 feet above the glacier.
Station mark: A 4½-foot cairn.

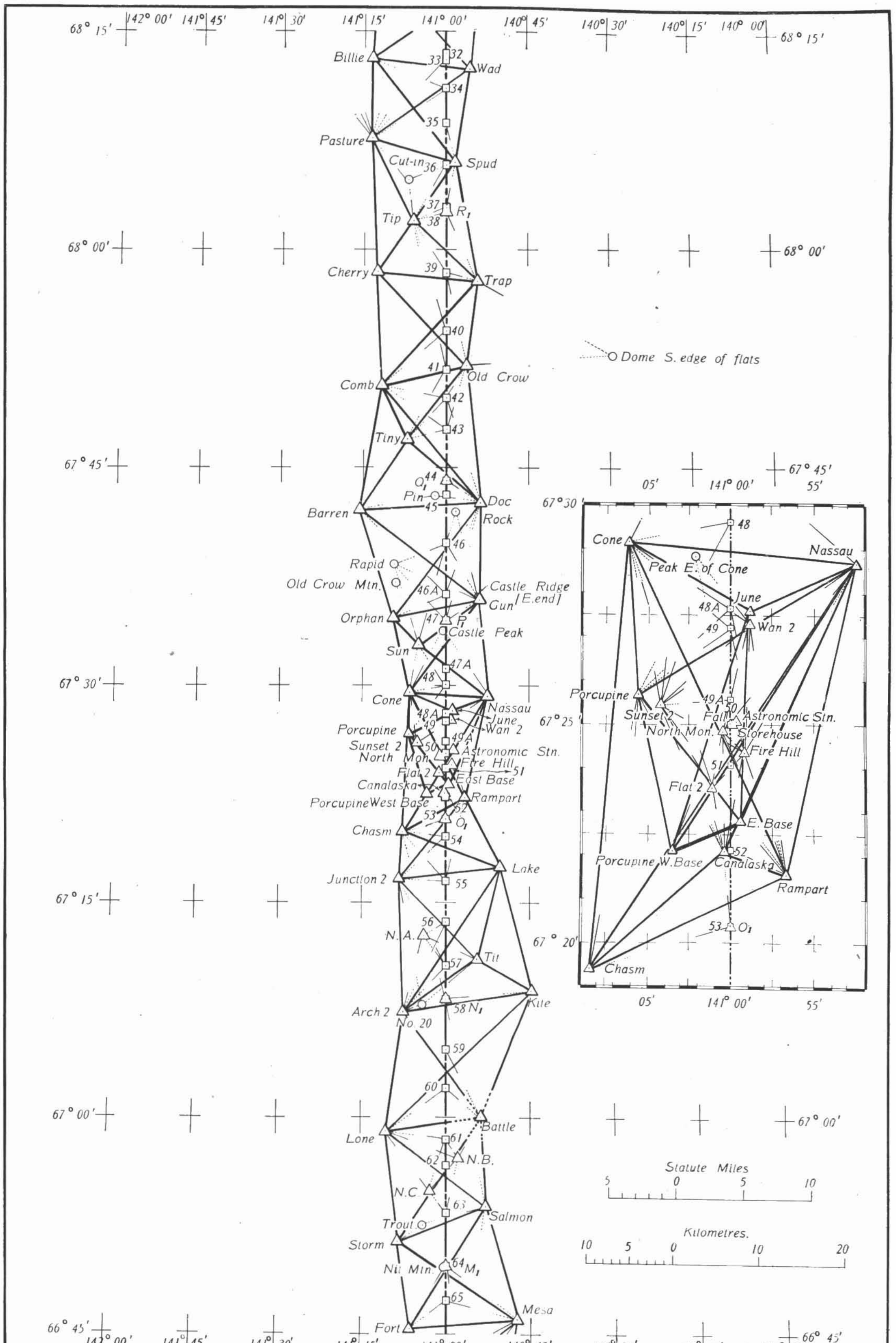
SUB-END. *T. C. Dennis, 1913.*
On a prominent hill on the south side of Logan Glacier, about 15 miles east of the Line. There are four knobs or rises on the summit of the peak, the station being on the second from the south, and about 2,250 feet above the glacier.
Station Mark: A 3½-foot cairn.

LOW. *T. C. Dennis, 1913.*
About 2 miles east of a gap in the ridge between Logan and Walsh Glaciers, 17 miles east of the Line. The station is on the first prominent point on the ridge sloping up easterly from the gap, and is about 2,000 feet above the glacier.
Station Mark: A 3½-foot cairn.

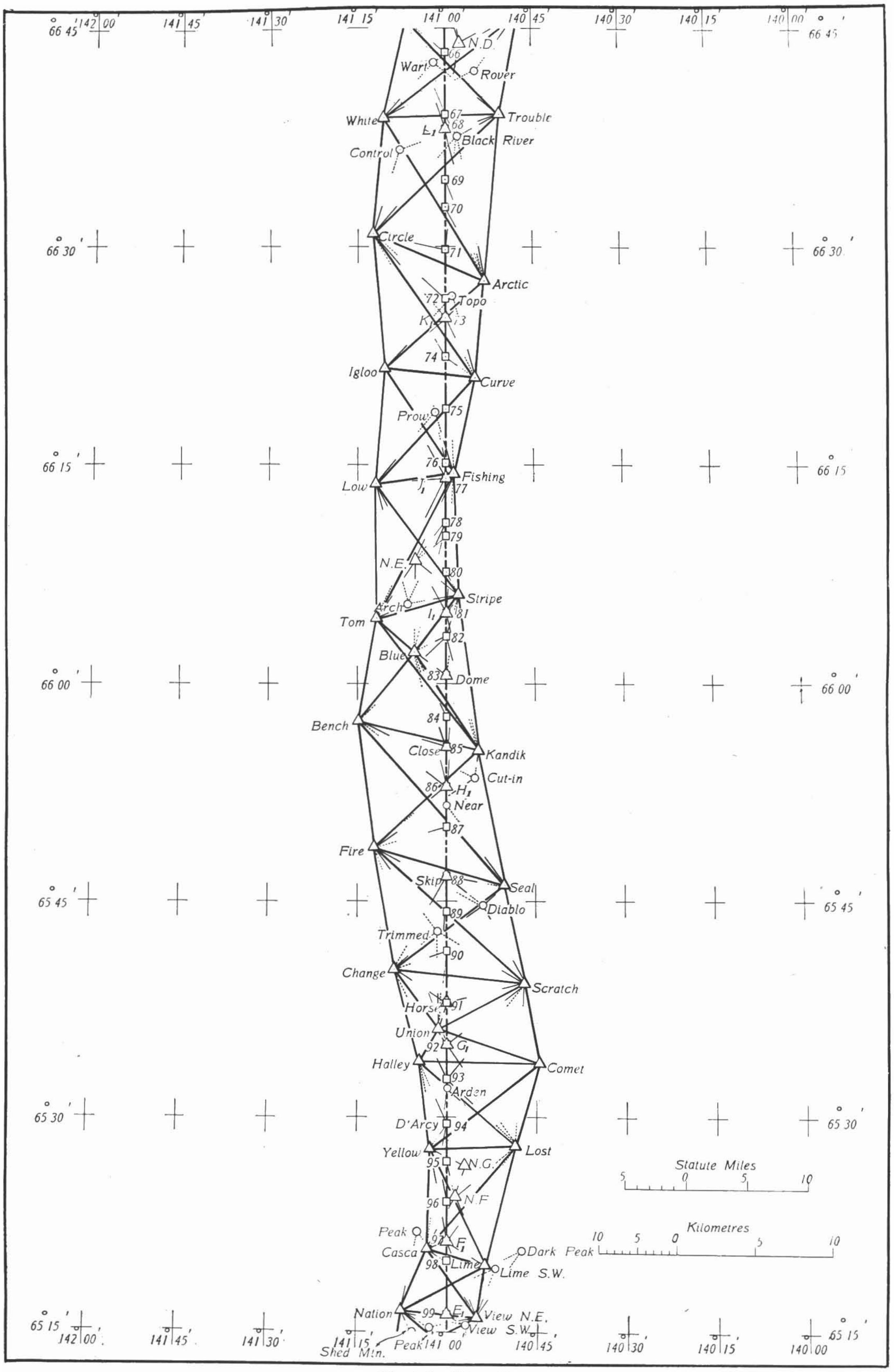


Demarcation
Demarcation Point
Polar
Ocean
Tundra
Ice
Wreck
To Herschel
To Mt. Conibear
Mosquito
Bug
Hot
To Leffingwell Mt.
Backhouse
Borealis
Pass
Aurora
Whale Mtn.
Grizzly Ridge
N.W. Peak
Grizzly
Double Peaks
Topo Cairn
Mt Greenough, W. Peak
East Peak
Republic
Highest Peak
Empire
Reaburn
Tub
To Snow Peak
Siwash
Turner
Riggs
Incog
Albion
Wave Mtn.
Firth
Firth River N. Base
To Sharp Cone
Silver
S. Base
Shark
Pepper
High Dome
Coral
Jim
Cone Mt.
Statute Miles.
Kilometres.
N.W. Range
Wee
Lynx
Watt
Yankee
Doodle
Potato Hill

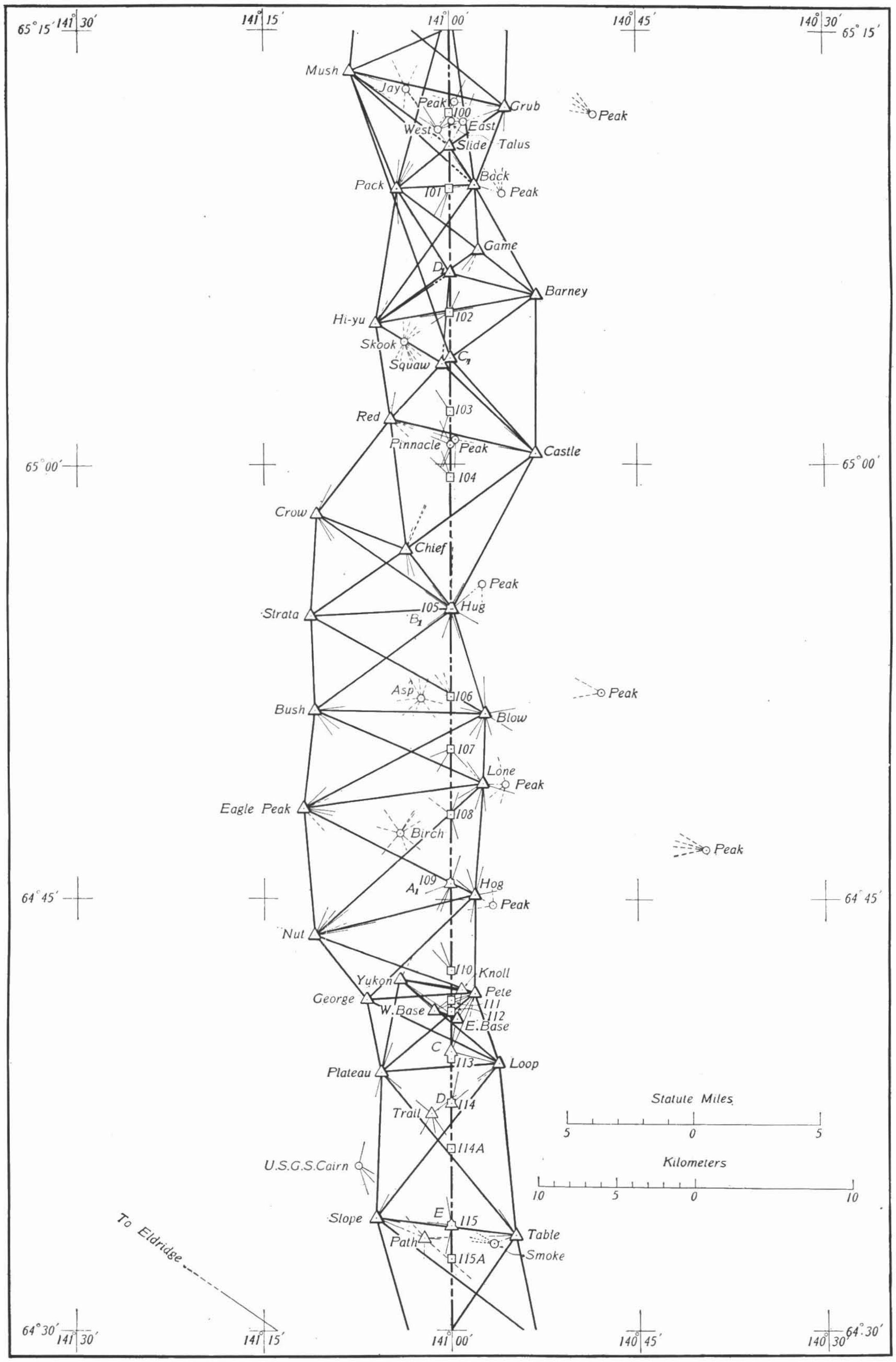
Sketch No. 1.


Billie
Wad
Pasture
Spud
Tip
Cherry
Trap
Comb
Old Crow
Tiny
Barren
Doc
Rock
Rapid
Old Crow Mtn.
Castle Ridge (E. end)
Gun
Orphan
Castle Peak
Sun
Cone
Nassau
June
Wan 2
Porcupine
Sunset 2
North Mon.
Astronomic Stn.
Fire Hill
Flat 2
East Base
Canalaska
Rampart
Porcupine West Base
Chasm
Lake
Junction 2
N. A.
Tit
Arch 2
No. 20
Kite
Lone
Battle
N.B.
N.C
Salmon
Trout
Storm
Mesa
Fort
Dome S. edge of flats
Peak E. of Cone
Fall
Storehouse
E. Base
Porcupine W. Base
Statute Miles
Kilometres.

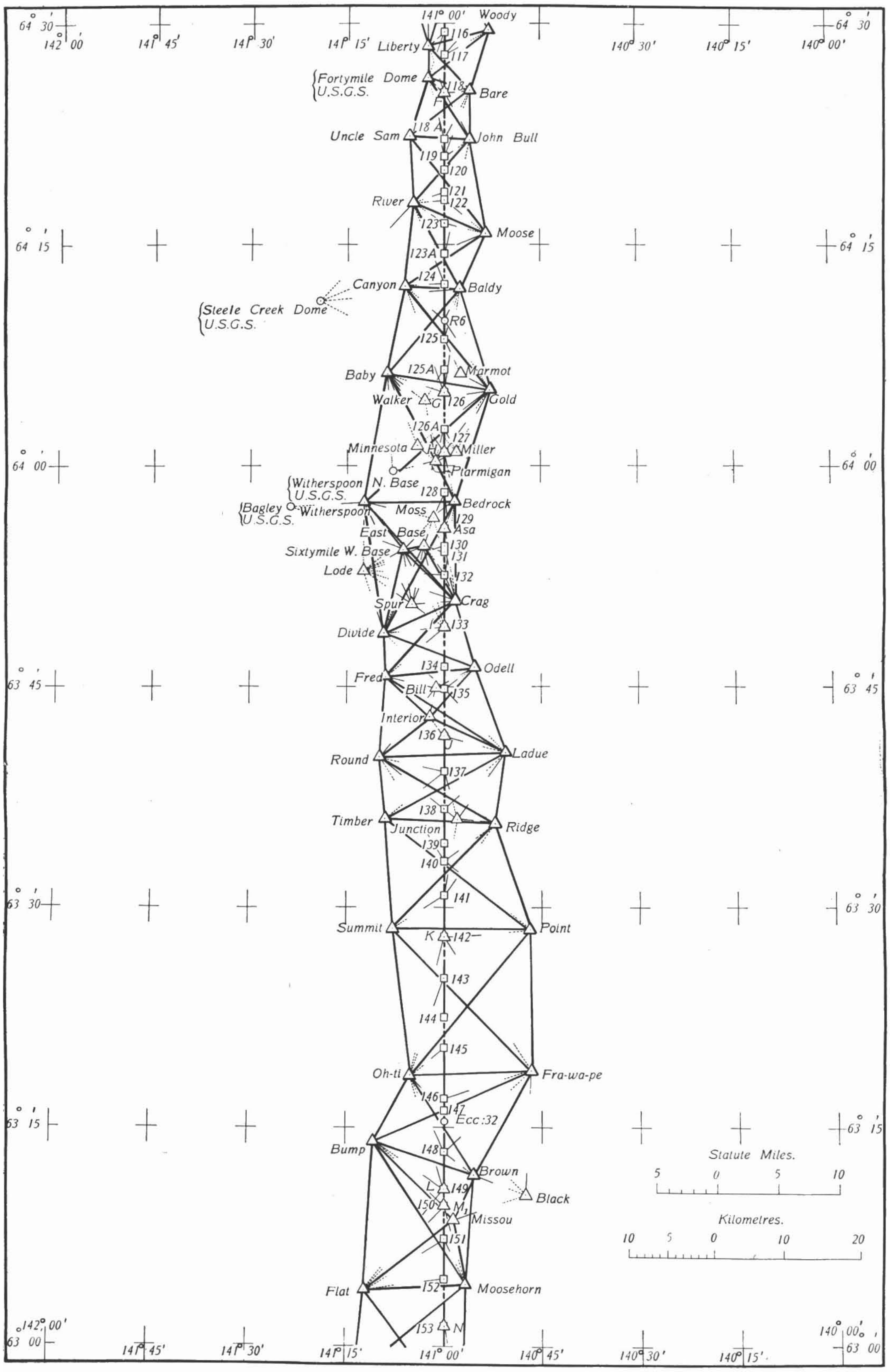
Sketch No. 2.


N.D.
Wart
Rover
White
Trouble
Control
Black River
Circle
Arctic
Topo
Igloo
Curve
Prow
Low
Fishing
N.E.
Stripe
Arch
Tom
Blue
Dome
Bench
Close
Kandik
Cut-in
Near
Fire
Skip
Seal
Diablo
Trimmed
Change
Scratch
Horse
Union
Halley
Comet
Arden
D'Arcy
Yellow
Lost
N.G.
N.F.
Peak
Casca
Lime
Dark Peak
Lime S.W.
Nation
View N.E.
View S.W.
Shed Mtn.
Statute Miles
Kilometres

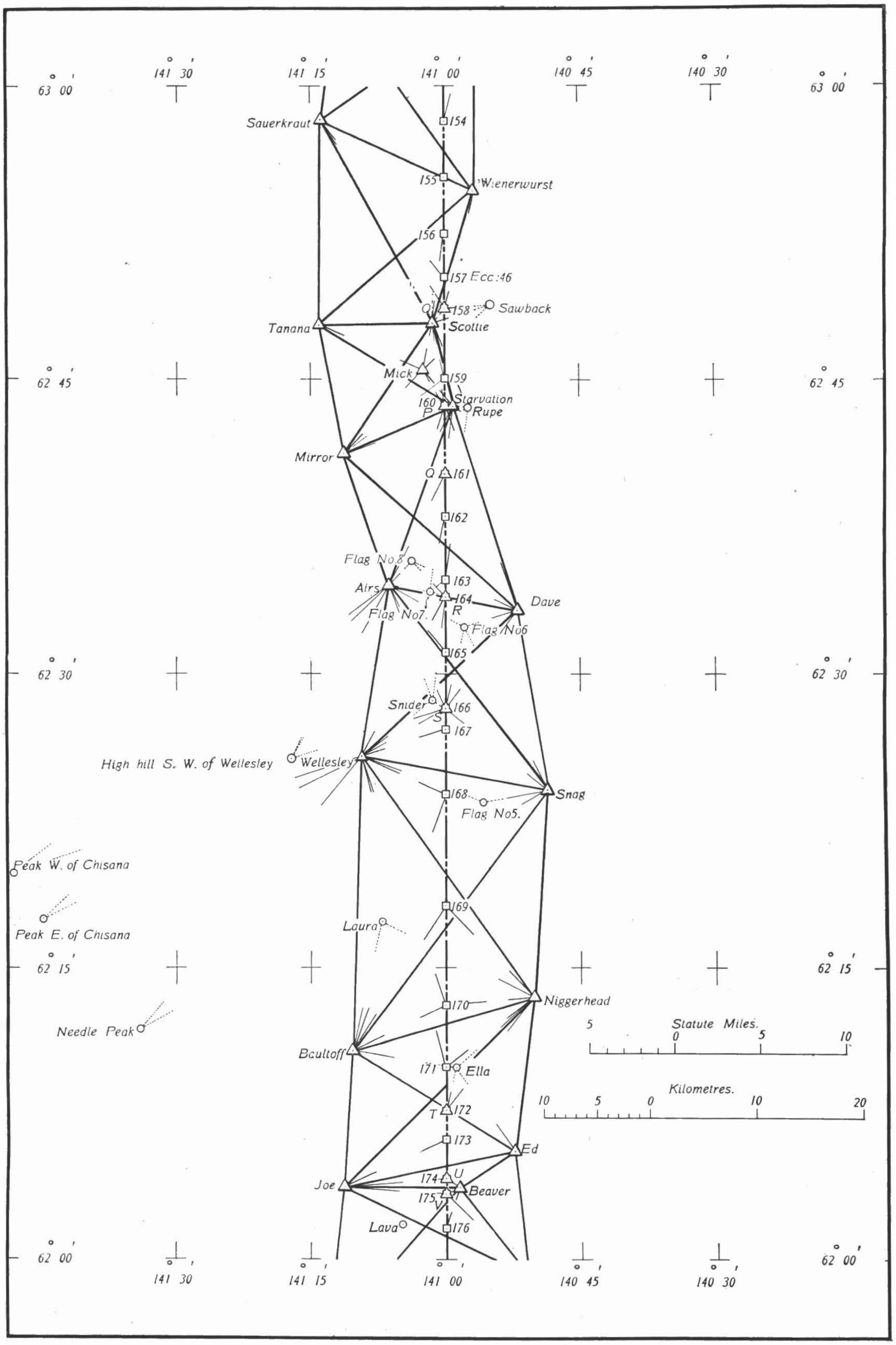
Sketch No. 3.


65° 15′
141° 30′
141° 15′
141° 00′
140° 45′
140° 30′
65° 00′
64° 45′
64° 30′
Mush
Jay
Peak
100
Grub
West
East
Slide
Talus
Pack
101
Back
Game
D
Barney
Hi-yu
102
Skook
Squaw
C_1
Red
103
Pinnacle
Castle
104
Crow
Chief
Strata
105
B_1
Hug
Asp
106
Bush
Blow
107
Lone
Eagle Peak
108
Birch
A_1
109
Hog
Nut
110
Knoll
Yukon
Pete
George
W. Base
111
112
E. Base
C
113
Loop
Plateau
114
Trail
114A
U.S.G.S. Cairn
Slope
E
115
Table
Path
Smoke
115A
To Eldridge
Statute Miles
5
0
5
Kilometers
10
5
0
10

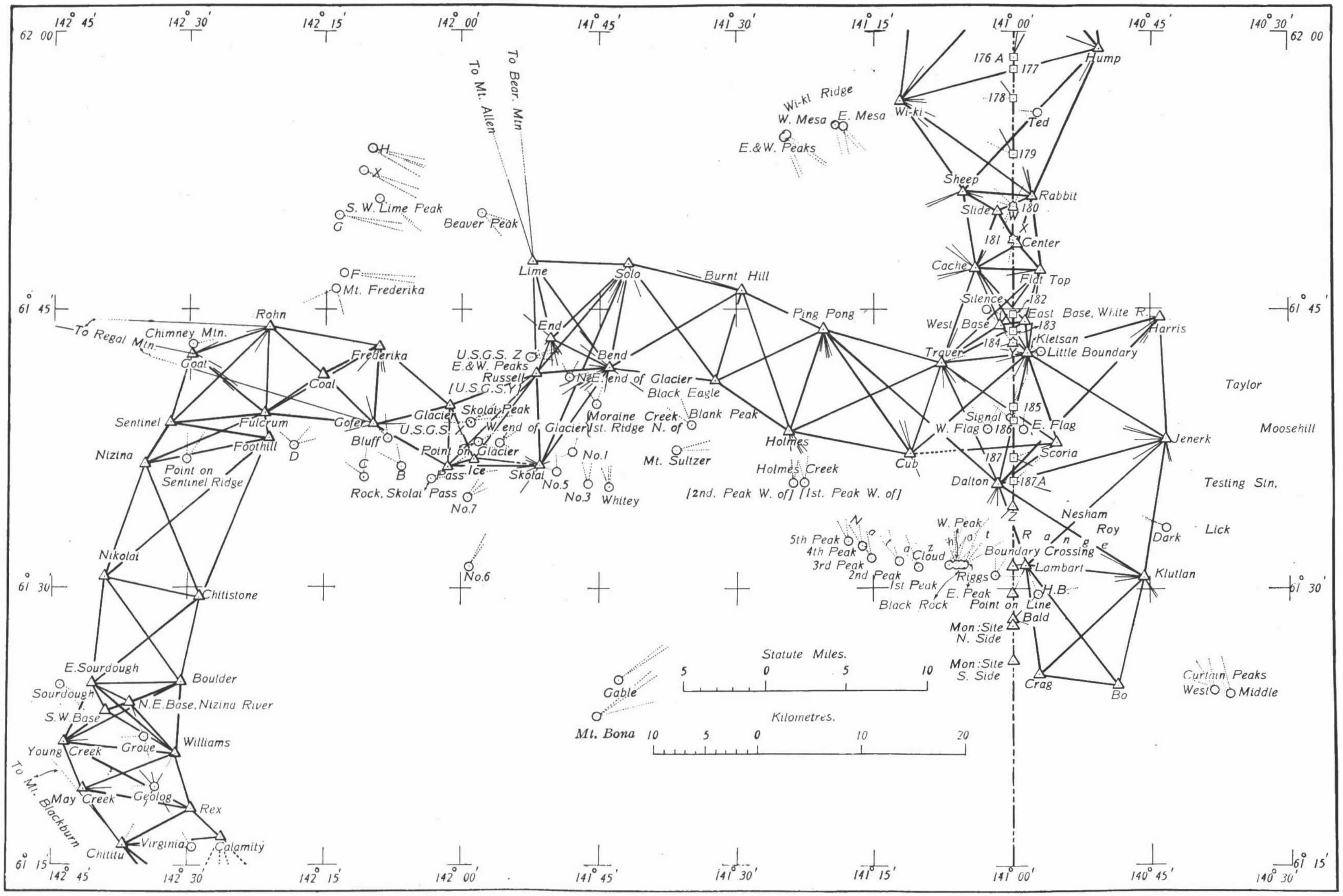
Sketch No. 4.


Woody
Liberty
Fortymile Dome U.S.G.S.
Bare
Uncle Sam
John Bull
River
Moose
Canyon
Baldy
Steele Creek Dome U.S.G.S.
Baby
Marmot
Walker
Gold
Minnesota
Miller
Ptarmigan
Witherspoon U.S.G.S.
N. Base
Bedrock
Bagley U.S.G.S.
Witherspoon
Moss
Asa
East Base
Sixtymile W. Base
Lode
Spur
Crag
Divide
Odell
Fred
Bill
Interior
Round
Ladue
Timber
Junction
Ridge
Summit
Point
Oh-ti
Fra-wa-pe
Ecc:32
Bump
Brown
Black
Missou
Flat
Moosehorn
Statute Miles.
Kilometres.

Sketch No. 5.

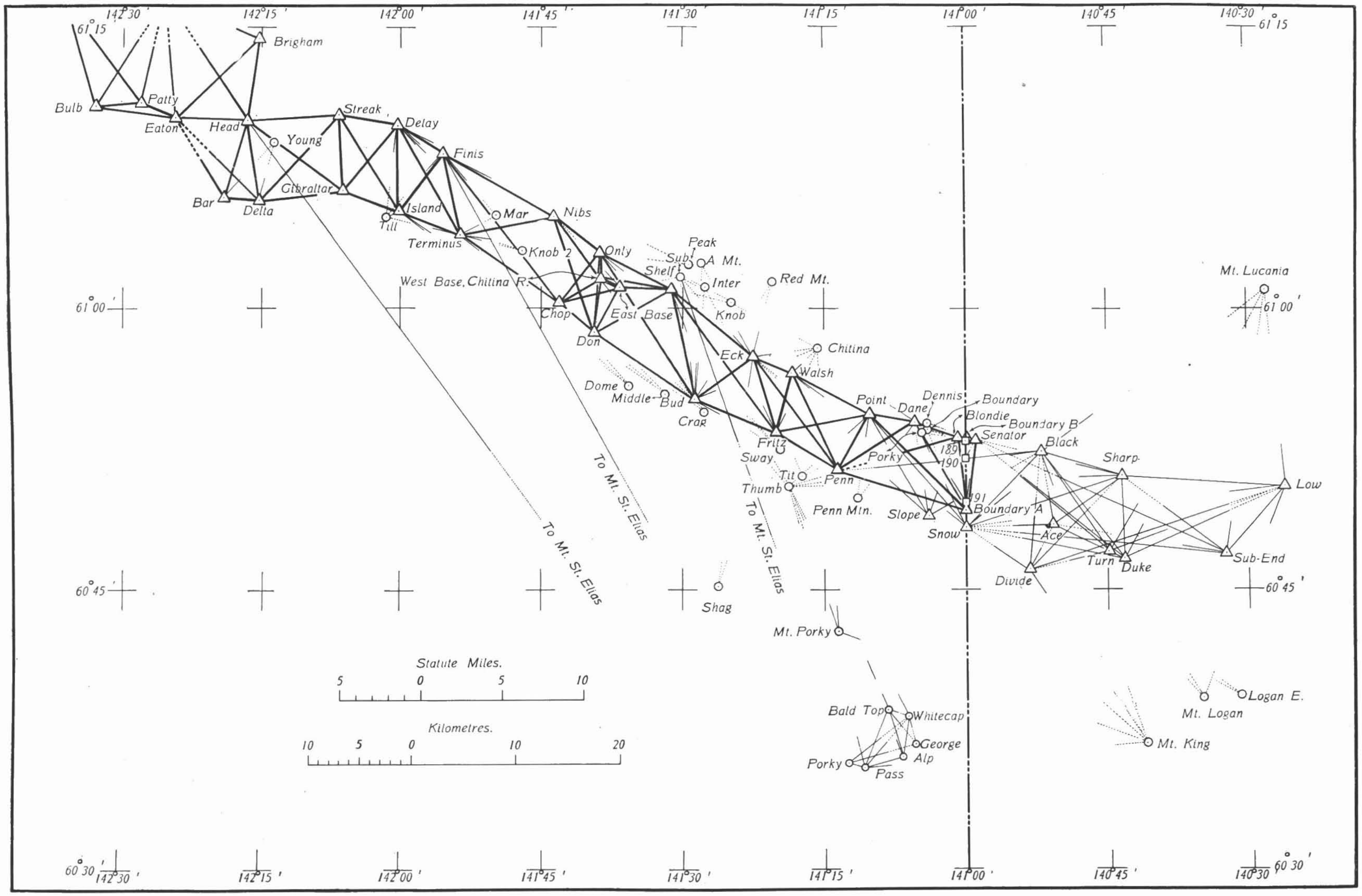

63 00
141 30
141 15
141 00
140 45
140 30
Sauerkraut
154
155
Wienerwurst
156
157 Ecc:46
158
Sawback
Tanana
Scottie
62 45
Mick
159
160
Starvation
Rupe
Mirror
161
162
Flag No.8
163
Airs
164
Dave
Flag No7.
R
Flag No6
62 30
165
Snider
166
S
167
High hill S. W. of Wellesley
Wellesley
Snag
168
Flag No5.
Peak W. of Chisana
169
Laura
Peak E. of Chisana
62 15
170
Niggerhead
Statute Miles.
Needle Peak
Baultoff
171
Ella
Kilometres.
172
T
173
Ed
Joe
174
U
Beaver
175
V
Lava
176
62 00

Sketch No. 6.



142° 45′
142° 30′
142° 15′
142° 00′
141° 45′
141° 30′
141° 15′
141° 00′
140° 45′
140° 30′
62 00
61 45
61 30
61 15
To Bear Mtn
To Mt. Allen
Wi-ki Ridge
W. Mesa
E. Mesa
E.&W. Peaks
Wi-ki
176 A
177
178
179
Hump
Ted
Sheep
Rabbit
Slide
180
181
Center
Cache
Flat Top
Silence
182
East Base, White R.
West Base
183
Kletsan
184
Trover
Little Boundary
Harris
H
X
S. W. Lime Peak
G
Beaver Peak
F
Mt. Frederika
Lime
Solo
Burnt Hill
Ping Pong
To Regal Mtn.
Chimney Mtn.
Rohn
Coal
Frederika
U.S.G.S. Z
E.&W. Peaks
Russell
[U.S.G.S.Y]
End
Bend
N.E. end of Glacier
Black Eagle
Moraine Creek
Blank Peak
Ist. Ridge N. of
Sentinel
Fulcrum
Gofer
Glacier
Skolai Peak
Bluff
U.S.G.S. X
W. end of Glacier
Foothill
D
Point on Glacier
Nizina
Point on Sentinel Ridge
C
B
Pass
Ice
Skolai
No.5
No.1
No.3
Whitey
Rock, Skolai Pass
No.7
Mt. Sultzer
Holmes
Holmes Creek
[2nd. Peak W. of] [Ist. Peak W. of]
Cub
W. Flag
Signal
185
186
E. Flag
187
Scoria
Dalton
187A
Jenerk
Taylor
Moosehill
Testing Stn.
Nesham
Roy
Z
Dark
Lick
Nikolai
No.6
W. Peak
5th Peak
4th Peak
3rd Peak
2nd Peak
1st Peak
Cloud
Boundary Crossing
Lambert
Riggs
E. Peak
H.B.
Black Rock
Point on Line
Bald
Klutlan
Chitistone
Mon: Site N. Side
Mon: Site S. Side
Crag
Bo
Curtain Peaks
West
Middle
Statute Miles.
5 0 5 10
Kilometres.
10 5 0 10 20
Gable
Mt. Bona
E. Sourdough
Boulder
Sourdough
N.E. Base, Nizina River
S.W. Base
Young Creek
Grove
Williams
To Mt. Blackburn
May Creek
Geolog
Rex
Chititu
Virginia
Calamity

Sketch No. 7.



Bulb
Patty
Eaton
Head
Brigham
Young
Streak
Delay
Finis
Bar
Delta
Gibraltar
Island
Till
Mar
Nibs
Terminus
Knob 2
Only
Peak
Sub
A Mt.
Shelf
Inter
Red Mt.
West Base, Chitina R.
Chop
East Base
Knob
Don
Eck
Chitina
Walsh
Dome
Middle
Bud
Crag
Point
Dane
Dennis
Boundary
Blondie
Boundary B
Senator
Black
Fritz
Sway
Porky
Tit
Thumb
Penn
Penn Mtn.
Slope
Boundary A
Snow
Sharp
Low
Ace
Turn
Duke
Sub-End
Divide
Mt. Lucania
To Mt. St. Elias
To Mt. St. Elias
To Mt. St. Elias
Shag
Mt. Porky
Statute Miles.
5 0 5 10
Kilometres.
10 5 0 10 20
Bald Top
Whitecap
George
Alp
Porky
Pass
Mt. Logan
Logan E.
Mt. King
142°30'
142°15'
142°00'
141°45'
141°30'
141°15'
141°00'
140°45'
140°30'
61°15'
61°00'
60°45'
60°30'

Sketch No. 8.

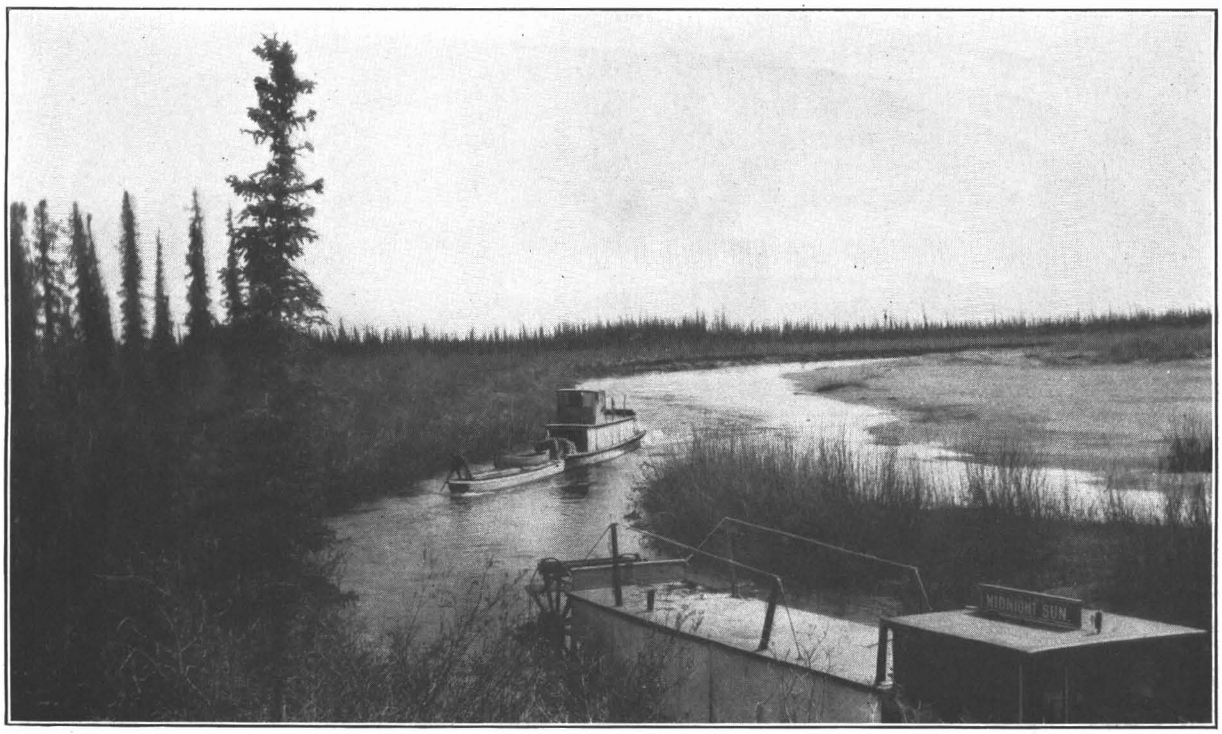
APPENDIX IV.

SPECIAL EQUIPMENT.

The peculiar conditions met with on some portions of the work resulted in the development of special equipment of various kinds, designed to overcome the difficulties due to these conditions and so to facilitate the work of the survey.

Undoubtedly the most important items coming under this head were the launches built for the survey at Whitehorse in the shipyard of the White Pass and Yukon Route. It became apparent in 1910 that as the work progressed northward, it would become more and more difficult to transport all the necessary supplies along the line, particularly north of the Porcupine River. Inquiry revealed the fact that at certain stages of the water it might be possible to take these supplies up the Porcupine and Old Crow Rivers to the point where the latter river crossed the line, about sixty-five miles north of Rampart House.

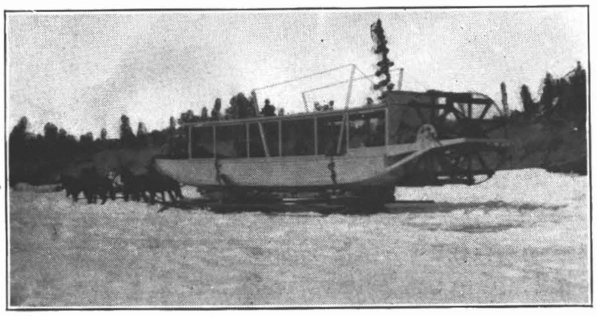
Each Government therefore decided to build a launch for this purpose. These sister boats were of the familiar shallow-water, stern-wheel type, and each had a length of 40 feet with an 8-foot beam, and were designed to draw about 14 inches when light. The Canadian launch was equipped with a 25-horse power motor, manu-



Aurora — Canadian   *Midnight Sun* — United States

23565—18

The survey launches on the Old Crow River.



The United States launch being taken down the Fiftymile River.

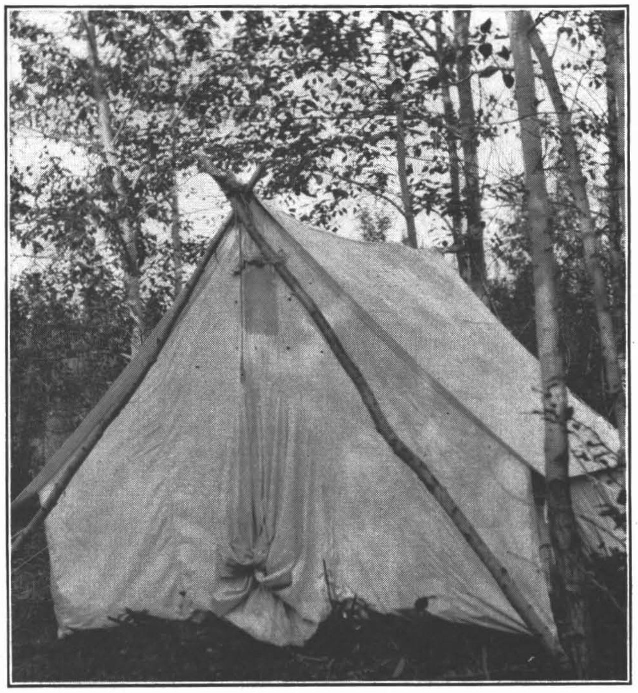
factured by the Union Gas Engine Company of San Francisco. Gasolene was chosen in preference to steam power, not because it would have been impossible to procure wood for fuel, but because of the time necessary to cut the wood. With twenty-four hours of daylight per day throughout most of the season, and with a double crew, the launches were able to run continuously day and night, when necessary, and this would have been impossible had it been necessary to stop to cut wood.

The power was transmitted through bevelled gears, and a counter-shaft with two sprocket wheels and chains, direct to sprocket wheels on the wheel axle. The stern wheel was 10 feet in diameter, and originally had eight buckets, the number being later increased to ten to secure a more uniform impulse, and so reduce the vibration. The United States launch was equipped with a slightly heavier and more powerful Doak motor, and a slightly different arrangement of gearing was employed, a jack-shaft being used between the counter-shaft and the wheel, so that the chains would run over the transom, instead of through it, as on the Canadian launch.

It was found that, in running, both boats settled by the stern so that they drew from 18 to 24 inches, and as this was excessive, during the first season a dead load had to be carried on the bow to counteract it. During the winter of 1911-12 the trim of both boats was improved by moving the motors forward, and by altering the "set" of the fantail and wheel, with the result that the boats drew only from 16 to 18 inches, and the dead loads on the bows were unnecessary. Although these launches could carry but little freight themselves in addition to their supplies and considerable fuel, they were each capable of handling a 35-foot scow, the usual cargo being about eight tons, although under favourable conditions much more than this was often carried. To assist in surmounting swift riffles, and in pulling off bars, each launch had a power capstan connected to the motor by a clutch, and about 1,200 feet of $\frac{3}{8}$-inch steel cable. Another launch of about the same size and style was chartered by the United States party in 1911. She had a 20-horse power motor set across the boat, with long chains leading direct to the

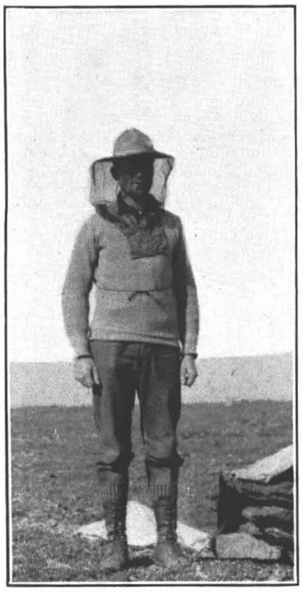
The United States launch *Midnight Sun*."

stern wheel. The Canadians chartered a small launch for carrying mail and for keeping up communications generally, and this was also used for freighting, as it could handle a barge with from one to two tons of supplies. These four launches made a total mileage of about 18,000 in 1911, and the two survey launches and the mail tender travelled over 12,000 miles the following year.



Special type of tent.

On many portions of the work, at certain periods, the mosquitos, gnats, and black flies became so numerous that it was absolutely necessary to devise some form of tent which would protect the members of the various parties while in camp. It was found by experience that, aided by a mosquito bar, and wearing gloves, a man could fight these pests by day, provided he could get a good rest each night. The sleeping tents, therefore, although of the usual wall type, were made insect proof by having a floor of drill sewn in all round, while the door was oval in shape and closed by a "tunnel," with a draw-string. Each tent usually had six windows of double bobinet, one low down in each wall, and one in each end just under the ridge, these windows being furnished with outside "shutters" for use in bad weather. The tent was suspended to the ridge-pole by tapes, and this not only obviated the necessity of having holes or sleeves for the ridge, but permitted almost any pole, no matter how crooked or rough, to be used as a ridge, this latter feature being found specially advantageous in districts where good poles were difficult to procure. To save weight and space, these tents were usually made of sail silk, natural shade, or, in some cases, green, for protection from the sun, the weight of a tent 10 feet by 10 feet, with a 3-foot wall, being about eleven pounds. The packers while on the move used a wedge tent 7 feet square of the same general specifications.



Mosquito Bar.

On the Arctic slope, where no poles could be found, and on the glaciers and snow-fields of the southern portion of the line, specially designed tents, 7 feet square, were used, with one portable sectional pole, for which an alpenstock might be substituted if preferred. These tents were similar to the other as to doors, floors, and windows.

Mosquito blankets of drill were tried for the horses, but were only partially successful, for the horses soon tore them off rubbing against trees, or burned both the blanket and themselves by standing too close to the smudges which were made

Mosquito blankets of drill for the horses.

for their benefit. The men's mosquito bars were of the usual pattern, fitting over the crown of the hat with an elastic, and tying under the arms, and though they were very inconvenient, especially on instrument work, they proved to be at times an absolute necessity.

The flies also caused a reversal of working hours on some parts of the line, as they proved to be most active during the comparative cool of the night hours. As this kept the horses continually on the move in an attempt to get relief, camp was often moved at night, allowing the horses to rest and feed during the heat of the day, when the flies were less active. Of course this would have been impossible in a more southerly latitude, where night means also darkness.

Although the ordinary " saw-buck " pack saddle was most generally used, the McLennan and Abercrombie trees each proved to have their special advantages, and were popular with some of the packers. While blankets, tents, oats, flour, cement, and other similar articles were simply slung on the saddles by the ordinary packers' methods before being made fast by the diamond hitch, smaller articles, provisions, and sundries were first packed into " alforjas " of canvas, usually with leather ends, which were easily hung on the horns of the saddles. To protect the contents from crushing, the alforjas were sometimes lined with wood procured from old packing boxes.

The usual dining-table top was made of canvas, across which ordinary laths had been tacked about one-half inch apart. This rolled up compactly for transportation and made a very serviceable table when stretched over a light frame, which was easily and quickly erected at each camp.

Light sheet-iron cook-stoves were used generally throughout the work, the rigid pattern being found more durable than the folding or collapsible type, especially when entrusted to the tender mercies of the packers. For fly- or side-camps, or on other occasions when it was necessary to cook over an open fire, the "Arizona" camp grate, though at first scorned as a "kid glove" accessory by the old-timers in the country, proved to be a great saver of time and fuel. It consists essentially of a light galvanized-iron grid, with folding

A " smudge " near the Arctic Coast.

legs which could be driven into the ground, the whole forming a light but rigid support for cooking utensils over the fire, and when not in use, folding flat so that it could be easily slipped into an alforja, generally between the canvas and the wood lining. On the glacier trips, where no wood was available, stoves burning kerosene or alcohol vapour were used, the stove being made doubly efficient by a protecting shield of aluminum or tin lined with asbestos. This shield both protected the flame from the wind and acted as a reflector, concentrating the heat where most needed.

As to provisions, dry or dried foods were used[1] wherever possible, and to save weight, every effort was made to carry along as few articles as possible containing water. Thus, butter, condensed milk, and jam were practically the only articles coming under this latter class, except on the glaciers in the higher altitudes, where it was found more feasible to carry cooked "pork and beans" in tins ready to warm up, than to carry fuel enough to cook the ordinary dried beans.

[1] Ration list, Appendix v, page 278.

APPENDIX V.

RATION LISTS.

The following comparative table shows the quantities and assortments of food used by various organizations in the field. The first six columns are reproduced from "The Manual of Instructions for the Survey of Dominion Lands,"[1] and the seventh column is compiled from the amount of provisions purchased and used by the Boundary Survey in 1910.

The amount of bacon and ham could have been decreased materially had it been possible to estimate with any degree of accuracy the amount of fresh meat procurable in the country during the season, but enough salt or smoked meat had to be taken in to ensure a supply in case little or no game could be procured.[2]

This ration list, of course, does not apply to any special trips, such as the attempt at climbing Mount St. Elias, in which case, as mentioned in the narrative, the rations were strictly confined to the staples, of which only a bare sufficiency was taken along.

[1] Ottawa: Government Printing Bureau, 1910.

[2] Appendix vi, page 280.

RATION LIST.

Figures for 100 rations, or subsistence for one man for 100 days.

Articles.		Alaskan Parties, U. S. Geological Survey.	National Transcontinental Railway.	Canadian Militia.	C. P. R. Land Department.	Canadian Pacific Railway.	Grand Trunk Pacific Railway.	International Boundary Survey.[10]
Allspice	lb.		0·10			0·12	0·07	
Apples, evap	"		5·80		16·60	11·90	8·33	9·0
Apricots, evap	"		4·16			5·95		3·0
Bacon	"	71·60	50·00	12·50	66·70	23·80	41·66	54·00
Bacon, long clear	"						27·77	
Baking powder	"	2·90	0·83		3·30	2·38	2·77	0·7
Barley	"		1·66			2·38	(8)	
Beans	"	14·30	26·60	12·50	16·66	11·90	27·77	24·0
Beef, corned	"		26·60				20·83	
Beef, extract	"		1·66					
Beef, dried	"	2·70				5·95	(8)	
Beef-tea capsules	"	0·20						
Biscuits	"		20·00	(3)				
Bread	"			100·00				
Butter	"	14·00	15·80	12·50	20·80	14·28	16·66	19·0
Cabbage	"						(8)	2·0
Candles	"		6·66		3·33			
Celery salt	"	0·04						
Cereal	"	17·90						15·0
Cheese	"		5·80	6·25	9·15	5·95	5·55	2·0
Cherries, canned	"					9·60		
Chocolate and cocoa	"	1·80						1·5
Cinnamon	"	0·04				0·12	0·14	
Coal oil	Gal.					1·10		
Coffee	lb.	5·40	3·33	2·08	5·00	9·52	5·55	4·5
Codfish	"		5·00			5·95	0·69	
Corn, canned	"		2·50			19·20	(8)	
Corn meal	"		5·00		10·00	7·14	8·33	1·5
Corn starch	"		3·33			2·38	(8)	0·5
Cream, condensed[11]	"		5·83					10·0
Currants	"		3·33			2·38	2·77	1·5
Curry	"	0·04						
Eggs, crystallized	"	3·00						1·0
Fish, dried	"						8·33	
Flour, wheat	"	100·00	125·00		133·20	95·24	166·00	88·0
Flour, buckwheat	"					11·90	13·88	6·0
Fruit, evap	"	22·30						
Ginger	"	0·04	0·08			0·12	0·27	0·06

RATION LIST—*Concluded.*

Articles.		Alaskan Parties, U. S. Geological Survey.	National Transcontinental Railway.	Canadian Militia.	C. P. R. Land Department.	Canadian Pacific Railway.	Grand Trunk Pacific Railway.	International Boundary Survey.[10]
Ginger, essence	Gal.		0·08					
Ham	"		33·30		28·30	23·80		17·0
Hops	"		0·20					
Jam	"		5·00	12·50			(8)	4·0
Lard	"		6·60			9·52	8·33	3·5
Lemon extract	"		0·08		0·31	0·21	0·13	
Lime juice	"	0·08	2·10					
Lye	"					0·48	0·27	
Macaroni	"		0·83			1·20	(8)	1·0
Marmalade	"		1·66				(8)	2·5
Matches, small boxes			4·50	(4)	2·50	2·5	2·75	
Meat	"			100·00				
Milk, condensed	"		6·60			6·24	6·05	10·0
Molasses	pt.		10·00				(8)	
Mustard	lb.	0·42	0·04		0·21		0·55	0·25
Nutmegs	"	0·01	0·05			0·06	0·07	
Oatmeal	"	16·60			10·00	9·52	13·88	
Onions	"	0·54	6·60			4·62		11·0
Peaches, canned	"		6·60			24·00	(8)	
Peaches, evap	"					11·90		
Pears, canned	"						(8)	
Peas, split	"			3·125		4·76	(8)	3·0
Peas, canned	"		10·00				(8)	
Pea sausages	"	3·20						2·0
Pepper, black	"	0·20	0·36	0·17	0·36	0·24	0·27	0·25
Pickles	gal.		0·31		0·62	1·43	(8)	0·2
Potatoes	lb.			100·00		95·24	(8)	
Potatoes, evap	"	16·10	6·60					8·0
Prunes, evap	"		6·60			11·90	16·66	7·0
Pork	"		43·30					
Raisins	"		3·30				7·49	1·5
Rice	"	8·50	5·83			5·95	16·66	9·0
Salt	"	5·30	5·50	3·125	8·00	4·75	5·55	4·5
Sago	"					2·38		1·0
Sauce, Worcestershire	bot.		1·66			1·95	1·66	0·5
Soap	lb.		5·00		6·66		5·55	6·0
Soap, toilet	cake		3·00					2·0
Soda	lb.		0·20			0·71		0·12
Soup, veg. evap	"	1·80	0·26		1·20			
Soup, condensed	"		1·66					0·5
Strawberries	"						(8)	
Sugar	"	25·10	33·33	12·50	31·60	35·71	41·65	64·5
Syrup	gal.		0·40		1·25	1·19		(9)
Tapioca	lb.		2·66			2·38	(8)	1·5
Tobacco, chewing	"		2·50					
Tobacco, smoking	"		5·00					
Tomatoes, canned	"		8·30			36·00	(8)	
Tea	"	3·60	6·66	1·56	3·30	3·55	5·55	3·0
Vanilla extract	oz.		0·10			0·12		
Vegetables, fresh	lb.			3·75	5·00		(8)	
Vinegar	gal.	0·18	0·20		0·20	0·24	0·27	
Yeast, cake	lb.		1·60		1·40	1·50	1·66	0·7

1 The amounts of some articles will, of course, be reduced if fresh meats, eggs, and vegetables can be bought in the country, and also if transportation permits the carrying of canned vegetables, fruit, and milk.
2 Calculated from the figures for one man for one month. The following named articles may be selected by the District Engineer in quantities varying from the above list, but retaining the same relative amount of meat and vegetable food as given in the list:—Bacon, pork, corned beef, ham, peas, rice, oatmeal, cornmeal, buckwheat flour, condensed soup, assorted jam, and marmalade.
3 When bread or biscuit is not available, an equivalent in weight of wheat flour, or oat or cornmeal, instead of the ration of bread or biscuit, may be issued.
4 When fresh meat is not available, salted or dried meat, as can best be obtained, may be issued instead.
5 Calculated from the figures for one man for thirty days.
6 Calculated from the figures for fourteen men for thirty days.
7 Calculated from the figures for twelve men for thirty days. Eggs, fresh meat, and vegetables may be supplied as required if they can be obtained from the farming community.
8 The article may be supplied instead of similar articles opposite which weights or measures have been shown.
9 Includes sugar to make syrup.
10 Calculated from purchases and amount used in 1910.
11 Now known as evaporated milk.

APPENDIX VI.

BIG GAME SEEN ALONG THE BOUNDARY.

In this Appendix no attempt has been made to cover the subject in an exhaustive manner. It consists simply of a compilation of notes made in the field by M. W. Pope, of the United States section of the survey, and by Frederick Lambart, D.L.S., of the Canadian section.

MOUNTAIN GOAT (*Creamnis montanus*).

Although no mountain goats were seen by any of the Boundary survey parties within 50 miles of the 141st Meridian, scattered bands were found a few miles to the westward of the junction of Skolai Creek and the Nizina River, about 55 miles west of the Boundary near latitude 61° 30′. Several males were shot, some of them being very large compared with those in southeastern Alaska, and those shot in September had a great deal of fat on their bodies. These goats were ranging amidst abundance of good feed on a " goat island " entirely surrounded by glaciers.

On several occasions lone " billies " were observed on the steep cliffs to the east of the Nizina River. Also it was reported by trappers at Rampart House that there were goats north of the Porcupine River on the Arctic Range and along the Firth River, but none were seen by members of the survey parties and the rumours were apparently without foundation.

The Mountain Goat. (*Creamnis montanus.*)

WHITE SHEEP (*Ovis dalli*).

These beautiful animals were seen at intervals along the 141st Meridian from the northern slopes of Mount St. Elias to within 15 miles of the Arctic Ocean. Frequently they were found in great numbers, especially in the vicinity of White River where many hundreds, in bands of about twenty, were observed daily and many specimens were secured by members of the Boundary survey parties, who never lacked the delicious sheep meat in their camps. As a matter of fact, some of the Boundary work could not have been done as quickly, if at all, had it not been possible to procure this meat on the ground.

They were also seen near Tatonduk River in a broken and mountainous country for a distance of about 35 miles, and a few scattered specimens were seen, or tracks noted, on two very limited ranges cut off on the north and south by large areas of swamps and wide timbered valleys between the Porcupine and Black Rivers.

Scattered bands were seen amidst good feed along Joe Creek in latitude 68° 56′ and on the north slopes of the British Mountains to within 15 miles of the Arctic Ocean. On this Arctic range a great many old sheep skulls and bones were found along the numerous well worn game trails, suggesting that possibly some disease may have recently greatly decreased their numbers, or that more probably they were the result of depredations of the numerous hunting parties sent out in quest of meat to feed the crews of whalers that formerly wintered at Herschel Island.

The few seen and shot on the Arctic range, though gracefully built, seemed dwarfed compared to those procured south of the Porcupine, and weighed a third less than those shot farther south in the vicinity of White River. This is probably due to climatic environment and the scarcity of feed. All these sheep wer uniformly pure white with the exception of a few dark or black hairs in the tail, and of the many specimens carefully examined only two shot on the British Mountains showed any dark hairs.

Fannen's Sheep (*Ovis fanninni*).

These sheep were seen in but one locality along the 141st Meridian. This was for a distance of about seven miles between triangulation stations " View N.E." and " Casca ", about 40 miles north of the Yukon River. At the latter station this species was particularly common and several specimens were secured. They were of various hues, from those with a decided grey saddle and dark tail, and grey hair running down the front of each leg, to white sheep of a faint greyish pattern. The grey and white sheep mingled on the side-hill north of station " Casca " beyond which their range ended abruptly, and neither this species nor any sheep resembling *ovis fanninni* was again observed along the Boundary Line.

The White Sheep. (*Ovis dalli.*)

Alaskan Moose (*Alces gigas*).

The moose were found throughout the timbered country from White River north to Firth River. They

The Alaskan Moose. (*Alces gigas.*)

were most abundant south of the Yukon about the swamps of Yellow Water Lakes and Scottie Creek, and north of the Yukon along the Nation and Black Rivers. The food most to their liking seemed to be the willows.

They are killed with great regularity by the Yellow Water Indians who still-hunt them at salt licks. As a food supply they are highly prized by these Indians and also by those to the north, around Rampart House.

Near Nation River hundreds of immense moose antlers, which had been shed in the fall, were found along the creeks. One matched pair was picked up which, if mounted, would have had a spread of more than 72 inches.

There were also a great many moose along Kandik River, and a fine specimen was shot at the headwaters of Old Crow River on Ammerman Mountain, but none were seen north of this locality by any of the Boundary survey parties.

A few tracks and evidences of browsing were seen ten miles north of Firth River, which is now the northern limit of their range in the vicinity of the Boundary. A native trapper asserted that at one time their range extended farther to the north and that Eskimos of the coast and Herschel Island on their winter hunting expeditions used to shoot moose on Aspen Creek in latitude 69° 03′, but members of the Boundary survey parties saw no tracks or signs of moose here in 1912.

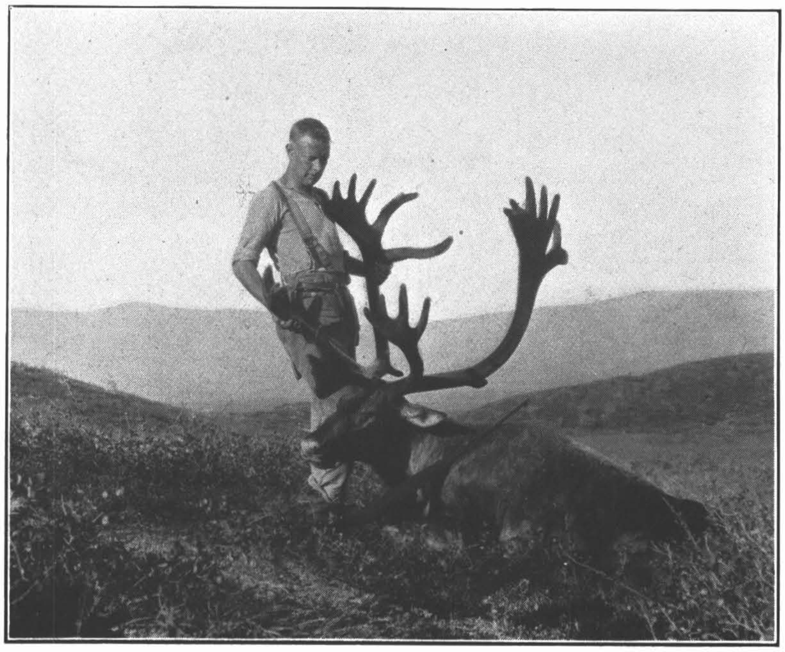
Timber Wolf (*Canis occidentalis*).

Timber wolves, although rarely seen, exist along the 141st Meridian from the White River to the tundra on the Arctic coast. Their coats vary from dark brown to light shades and from black to very light gray.

In 1910 a band of nine, headed by a large black wolf, came within 50 feet of two packers who had become lost and were unarmed, but after circling several times they disappeared. In the same year, while descending the Black River on a raft, two members of the survey party were surrounded by a large pack of wolves which remained hidden in the bush along the river bank uttering their prolonged deep-chested howls.

On a gravel bar of Kandik River a pack of six wolves contested the approach of a member of the survey to the carcass of a moose which he had shot the previous night, necessitating his return to camp for his rifle. Many skins of these animals, measuring from seven to eight feet in length, are brought annually out of this section by trappers.

Numerous tracks were observed along the mud banks of Old Crow River where the wolves are attracted in the late spring by young geese and ducks. A few scattered specimens were seen near Firth River in close proximity to caribou herds and many mute evidences were noted where the strong robust wolf with its powerful jaws had pulled down the straggling caribou.


The Woodland Caribou. (*Rangifer stonei.*)

WOODLAND CARIBOU (*Rangifer stonei*).

This species of caribou exists along the 141st Meridian from White River to Ammerman Mountain. Its favourite ranges during the summer months are on smooth flat-topped mountains. South of the Yukon this species was frequently seen on Beaver Creek and Fortymile River, and north of the Yukon straggling bulls were occasionally seen near Kandik River, one coming within 50 feet of camp, a photograph being obtained of him. On another occasion a herd of about 500 was seen just south of Black River.

These animals assemble in large bands in the fall, generally about the middle of August, and migrate along the ridges in certain well-defined routes of travel to their winter feeding grounds in the timbered country. Some of these routes cross the heads of Ladue Creek, and Sixtymile and Fortymile Rivers; another runs westward along Rapid River passing about 15 miles north of Rampart House. Up to about the year 1900 the herd which follows this latter route was in the habit of regularly crossing the Porcupine River at Rampart House, which for this reason used to be known by the old traders as a " deer post." It is this caribou more than any other animal which renders human existence possible at Rampart House.

This species of caribou occurs frequently on the flat summits of the mountains surrounding the Old Crow Flats, and many specimens were secured. North of this they were not seen by any of the survey parties.

BARREN LAND CARIBOU (*Rangifer arcticus*).

This wide-ranging species occurs abundantly in the sparsely wooded country from the Arctic Ocean to the Old Crow Flats, very few being seen south of there. Though blending in many characteristics with the woodland type, they are distinguished by their much smaller size and by their smaller and more slender antlers with fewer points. At a certain season of the year, generally in June, they assemble in great herds and feed along the hills along the south bank of the Firth River. Members of the survey parties observed different herds of more than 300 cows and calves and a few bulls uttering the grunting noise which the caribou always makes while travelling. Herds like these while feeding and restlessly wandering over the low rolling hills are easily approached within gunshot.

They were numerous on the tundra between the Arctic Ocean and the barren foothills of the British Mountains. Small scattered bands and individuals were always in sight, their curiosity bringing them at times to within 100 feet of the pack-trains. Specimens shot here appeared to have a higher brain case than those shot farther south. They are not always startled by the crack of a rifle. For several weeks at this point caribou meat was most plentiful in the camps and a decided lack of energy and endurance, which was felt by most of the members of the parties, was attributed to eating too much of this kind of meat.

Black Bear (*Ursus americanus*).

Black bears were continually seen and shot from the White River north to the Flats of the Old Crow, probably being most abundant in the vicinity of the Yukon River where many tracks were seen on the mountains and foot-hills. Just north of the Yukon it was not unusual to see as many as six at a time feeding and digging on the fire-swept hills.

The survey parties were greatly annoyed at times by these bears disturbing and scattering the contents of food caches which for certain reasons had not been placed on elevated platforms.

A short distance south of Black River their characteristic trails were conspicuous through the brush on ridges worn by erosion. The underbrush generally gives them ample warning of anyone's approach. Generally they are all black, a few having brown faces. North of Rampart House they become quite scarce, and it is unlikely that they roam north of Old Crow River.

Grizzly Bear (*Ursus horribilis.*)

Remarkably few grizzlies were seen or shot along the boundary line. In 1910 a large one was encountered in thick bush near Tatonduk River. In the following year a large specimen was shot in the same vicinity. Another was encountered near the bank of Firth River, unfortunately in bush so thick as to make a shot impossible.

A great many tracks of this bear were observed along Aspen Creek, near the northern limit of timber, and evidences were seen of their digging for ground squirrels, but it is unlikely that they range north of this creek. A medium-sized specimen was shot in this locality by a member of one of the Canadian parties.

Barren Ground Grizzly (*Ursus internationalis*).

The only specimen secured is thus described by Dr. C. Hart Merriam, the noted authority:—

Type: adult, No. 1763 Ottawa Museum. Killed on the Alaska-Yukon Boundary about fifty miles south of the Arctic coast, in latitude 69° 00'., July 3, 1912, by Frederick Lambart of the Canadian Boundary Survey.

Skull similar to that of *phœonyx* but shorter; frontal shield more deeply and broadly sulcate (sides of sulcus rising very gradually); postorbital processes thicker and more decurved; orbital rims more elevated (almost everted); sagittal crest lower and more sloping (probably higher and more horizontal in advanced age); palate and postpalatal shelf much shorter; postpalatal notch not truncate; occipito-sphenoid length decidedly less (84 against 96); last lower premolar conical and much smaller lacking heel and without trace of posterior sulcus or marginal cusplets (in *phœonyx*, heel, sulcus, and posterior cusplets are well developed); first lower molar swollen; middle lower molar swollen and convex on inner side.

THE BROWN BEAR (*Ursus americanus*).

This bear, which seems to be close to the grizzly type *ursus horribilis phæonyx*, was frequently seen on the headwaters of the Chitina River, to the west of the 141st Meridian, in latitude 61° 00′, and was also quite numerous on the foot-hills of the Natazhat Range. Tracks of this species of bear on the sand bars sometimes measured 14 inches in length. A large male was shot on the north bank of the Yukon, and two others on the south bank of the Sixtymile, and many large tracks noted.

North of this they were not again encountered until reaching the valley of the Salmontrout River, about thirty miles south of the Porcupine River, where a large bear of this variety compelled a packer to seek safety in a tree for several hours, during which time the bear remained within a hundred feet of the tree. In the same neighbourhood an enormous brown bear was observed chasing several packhorses, which had been unpacked.

They were not again observed, or any tracks seen, until reaching the Firth River, where three were noted, and one of medium size was shot. North of the British Mountains, along Turner River, and the creeks flowing into the Arctic Ocean, many huge bear tracks were observed along the gravel banks and on the glaciered creeks.

GENERAL INDEX.

SPECIAL INDEX.

Index to positions, elevations and descriptions of monuments, and of triangulation and line-projection stations; also to sketches on which the monuments or stations may be found.

Index to positions, elevations and descriptions of monuments etc.—*Continued.*

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Index to positions, elevations and descriptions of monuments, etc.—*Continued.*

Index to positions, elevations and descriptions of monuments, etc.—*Concluded.*

PANORAMA FROM STATION "DIVIDE"

COMPLETE PANORAMA FROM STATION "DIVIDE" (9,565 feet

International Boundary

PANORAMA FROM STATION "LOW"

COMPLETE PANORAMA FROM STATION "LOW" (8,675 feet)

PANORAMA FROM STATION "TURN"

MOUNT LOGAN (19,850 feet) — *Looking South* — *Looking West* — *Looking North* — MOUNT LUCANIA (17,147 feet) — *Looking East*

OGILVIE GLACIER (Approximate Elevation here 5,500 feet) — LOGAN GLACIER (Approximate elevation here 5,500 feet)

PANORAMA FROM STATION "TURN" (6,910 feet)

International Boundary

PANORAMA FROM STATION "POINT"

COMPLETE PANORAMA FROM STATION "POINT" (4,623 feet)

International Boundary

PANORAMA FROM STATION "CRAG"

COMPLETE PANORAMA FROM STATION "CRAG" (9,162 feet)

International Boundary

PANORAMA FROM STATION "PORKY"

PANORAMA FROM STATION "PORKY" (10,200 feet)

International Boundary