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SURVEY OF THE NORTHWESTERN BOUNDARY OF THE UNITED STATES, 1857–1861.—BAKER

WASHINGTON
GOVERNMENT PRINTING OFFICE
1900

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

SURVEY

OF THE

NORTHWESTERN BOUNDARY OF THE UNITED STATES

1857-1861

BY

MARCUS BAKER

WASHINGTON
GOVERNMENT PRINTING OFFICE
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CONTENTS.

	Page.
Letter of transmittal	7
Introduction	9
Sources of information	9
Establishment of the line	13
History of the survey	13
Cost	18
Maps	19
Original manuscript maps	19
Preliminary	19
Final drawings	21
British maps	25
Geographic coordinates	27
Magnetics	40
Elevations	42
Indian names	58
Scientific results	61
Appendix A. Mode of determining points on the parallel	64
Appendix B. Report by J. G. Parke, November 12, 1859	66
Appendix C. Report by Archibald Campbell, February 3, 1869	72
Index	77

ILLUSTRATION.

PLATE I. Index map	22

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., June 9, 1900.

SIR: I have the honor to transmit herewith, for publication as a bulletin, an account of the establishment of and survey of the boundary line between the United States and Canada, along the forty-ninth parallel, from the summit of the Rocky Mountains to the Pacific.

Very respectfully,

MARCUS BAKER, *Cartographer.*

Hon. CHARLES D. WALCOTT,
Director United States Geological Survey.

SURVEY OF THE NORTHWESTERN BOUNDARY OF THE UNITED STATES, 1857–1861.

By Marcus Baker.

INTRODUCTION.

By the Northwestern Boundary, as here used, is meant that part of the boundary line between the United States and Canada which extends from the summit of the Rocky Mountains westward along the forty-ninth parallel to the seacoast at Point Roberts and thence through the waters of Georgia, Haro, and Juan de Fuca straits to the Pacific. This line naturally divides itself into two parts, the land boundary and the water boundary. This paper treats only of the land boundary. As to the water boundary, the joint commission charged with the survey disagreed, and its location was finally determined by arbitration in 1871, the arbiter, Emperor William I, of Germany, deciding in favor of the American claim. The prominence given this part of the line, growing out of the arbitration, has made its history well known. In regard to it there is an abundance of printed material. The history of the land boundary, however, is very imperfectly known. Little has been published respecting it, and its story is to be gathered largely from manuscript memoranda, notes, sketches, pictures, correspondence, and the memories of men still living.

From time to time information respecting this line is needed by the Executive Departments. In 1897 the Geological Survey was directed by Congress to survey and mark the boundary between Montana and Idaho. In performing this duty it became necessary to connect with the survey of the forty-ninth parallel. The search then made of the records in the State Department showed the desirability of preparing a concise history of the northwestern boundary, its establishment, survey, and marking, with a summary of results. To exhibit such a history and summary is the object of this bulletin.

SOURCES OF INFORMATION.

The sources of information from which this account is prepared are three, viz:

(a) Government publications, consisting of the Statutes at Large, executive documents, official reports, etc.

(b) Manuscript records in the State Department, consisting of the original notebooks, observations, computations, plattings, sketches, maps, correspondence, etc.

(c) The memories of some of the surviving participants in the survey. These will be discussed in the order indicated above.

(a) In the Statutes at Large are contained all laws enacted by Congress touching the boundary, including also all the treaties. For the original treaty of June 15, 1846, see vol. 9, pages 869–870; for the act creating the commission to survey and mark the boundary, vol. 11, page, 42; for various appropriation acts, vol. 11, pages 42, 159, 312, 403, and vol. 12, page 20.

On November 12, 1859, Lieut. (now Gen.) John G. Parke, chief astronomer and surveyor, made a short report of progress. This is a document of 7 pages and is printed as Senate Ex. Doc. No. 16, Thirty-sixth Congress, first session. It is here reprinted as Appendix B.

Nothing further, in official documents, appears for nine years. The civil war turned attention to more urgent matters and this subject was dropped. In February, 1868, however, President Johnson sent to the Senate a long communication on the San Juan boundary question. This document (Senate Ex. Doc. No. 29, Fortieth Congress, second session) of 280 pages, though dealing chiefly with the water boundary, nevertheless throws considerable light on the history of the land boundary.

On January 13, 1869, the House of Representatives, by a resolution, requested information as to expenditures by the Northwestern Boundary Commission. In response, a message from President Johnson was laid before the House of Representatives on February 13, 1869. (House Ex. Doc. No. 86, Fortieth Congress, third session.) This document of 102 pages is almost wholly given to a detailed tabular exhibit of expenditures. There is, however, a letter of 4 pages from the commissioner, Hon. Archibald Campbell, summarizing the entire history of the survey. This is apparently the nearest approach to a report on this subject that has ever appeared in print.

Finally, in 1889, Capt. George M. Wheeler, U. S. A., published in his report upon geographical surveys west of the one hundredth meridian (vol. 1, pp. 614–619) a short account of the Survey of the Northwestern Boundary of the United States 1857–1861.

(b) The manuscript records of the survey are nearly all contained in two blue chests stored in the division of manuscripts in the library of the State Department. Some of the maps being too large to go into these chests are kept elsewhere in the library. The memoranda, notes, correspondence, maps, etc., in this collection are the chief source of information from which this account has been prepared. But unfortunately the most important document of all was not found there, and a diligent search has failed to bring it to light. This paper is the final report, written on foolscap paper and consisting of four parts, one by

Archibald Campbell, the commissioner; one by Gen. J. G. Parke, chief astronomer and surveyor; one by G. Clinton Gardner, assistant astronomer and surveyor, and one by J. S. Harris, general assistant. For this description of the missing manuscript I am indebted to Mr. William J. Warren, Bureau of Engineers, War Department. When Captain Wheeler was preparing his account of this survey he made an unsuccessful search for this missing report. He says:[1]

I have been unable to trace the manuscript of the final report, including that of the chief astronomer and the specialists, which it is believed was made. According to the Journal of the Senate of February 9, 1871, this report was called for by the Senate, but a search of the Senate records and also those of the State Department, made at my request by Mr. Dwight, librarian of the State Department, remained unavailing on June 15, 1887. Mr. William J. Warren, secretary of the commissioner [and] now chief clerk [in the office] of the [Chief of] Engineer[s] [War] Department, recollects to have seen the manuscript of this report at the office of the Northern Boundary [Survey], established in 1873, as does also Maj. J. F. Gregory, Corps of Engineers, a member of that commission, but it could not be found by Mr. Dwight in the records transmitted at the close of the latter survey to the State Department.

The search above mentioned I have now repeated and with like result. The manuscript has not been found.

The existence of the manuscript is attested by Mr. Warren, who gave me the description above written. The call for it made by the Senate in 1871 is set forth in the following extract from the Senate Journal of February 9, 1871, page 254:

Mr. Howard [Jacob M., of Michigan] submitted the following resolution, which was considered by unanimous consent, and agreed to:

"*Resolved*, That the President be respectfully requested, if not incompatible with the public interests, to transmit to the Senate copies of the final report, and the accompanying documents, of the commissioner on the part of the United States to carry into effect the first article of the treaty with Great Britain of June 15, 1846."

An examination of the records in the office of the Secretary of the Senate reveals no other entry concerning it, from which it is concluded that it was never sent. Similarly an examination of the records in the Index Bureau of the State Department shows the call, but no action is indorsed thereon, thus corroborating the belief that it was not sent.

When the *Northern* Boundary Commission was created, in 1872, Mr. Archibald Campbell was appointed United States commissioner of *that* survey also. He found at the outset that it was desirable to have for reference the records of the *Northwestern* Boundary Survey, and accordingly wrote to the State Department asking permission to withdraw those records for temporary use.

The following is a copy of his letter, which is now on file in the Index Bureau of the State Department:

U. S. NORTHERN BOUNDARY COMMISSION,
Washington, D. C., June 27, 1872.

SIR: In preparing for the duties of the boundary commission it would be of the greatest assistance to have the use of the records, notebooks, and other papers of

[1] G. M. Wheeler, U. S. Geog. Surv. W. One Hundredth Mer. 4°. Washington, 1889, vol. 1, p. 617.

the Northwest Boundary Commission, deposited by me in the Department at the close of the work in October, 1869.

I have therefore the honor to request that you allow me to withdraw these records and papers temporarily. Before leaving for the field they will be returned to the Department.

I have the honor to be, very respectfully, your obedient servant,

ARCHIBALD CAMPBELL,
Commissioner, Northern Boundary Survey.

HON. CHAS. HALE,
Acting Secretary of State.

Upon that letter is indorsed: "Papers, etc., herein referred to sent to Mr. Campbell 27th June."

A search of the records of the Index Bureau of the State Department fails to reveal any other entry touching these papers. If they were returned no record was made of such return. It is certain that these papers were in the possession of the Northern Boundary Commission in 1872. Beyond that there is no trace. It would therefore be natural to look for them among the papers of the Northern Boundary Commission, which were sent to the State Department on June 30, 1876. But a search among these papers made by me in March, 1900, was unsuccessful. The missing manuscript was not found.

Prof. C. L. Doolittle, now at the Flower Observatory at Upper Darby, Pennsylvania, was connected with the Northern Boundary Survey. In response to an inquiry as to whether he had any information touching the report desired, he writes, among other things, under date of March 12, 1900:

My connection with the northern boundary began after active operations had been going on for a year. We then had our office at Detroit. After field operations were completed we removed to Washington. It is not a great exaggeration to say that I saw every scrap of paper to be found in the Detroit office. At all events, this report was not to be found there. I remember hearing such a report spoken of, but it was then said to be stored away with other Government archives at Washington.

(c) Archibald Campbell, the commissioner, died in the city of Washington July 27, 1887. To his son, Charles Campbell, now an employee in the Department of State, I am indebted for information as to the survey. I have also conferred with Gen. J. G. Parke, Corps of Engineers, U. S. A. (retired), who was chief astronomer and surveyor of the Northwestern Boundary Survey Commission, and with Mr. William J. Warren, chief clerk in the office of the Chief of Engineers, U. S. A., who was secretary of the commission. To both of these gentlemen, and especially to the latter, I am indebted for information used in preparing this account. Mr. G. Clinton Gardner, the assistant astronomer and surveyor from 1857 to 1868, is now a civil engineer in Peru, South America, while Mr. Joseph S. Harris, general assistant Northwest Boundary Survey from 1857 to 1864, is now president of the Philadelphia and Reading Railroad. To both of these gentlemen I am indebted for letters relating to the boundary and its survey. I have

also talked on this subject with Mr. J. V. Wurdemann, now employed in the Library of Congress, who participated in the survey and with Dr. Theodore Gill, who prepared a report on the fishes collected by the survey. To the courtesy of these gentlemen as also to that of Prof. C. L. Doolittle, to the Smithsonian Institution, to the Coast Survey, and to the General Land Office I am indebted for bits of information used in preparing this report.

ESTABLISHMENT OF THE LINE.

The present boundary line between British Columbia on the north and Washington, Idaho, and Montana on the south was established in 1846. Prior to that date the boundary was in dispute between the United States and Great Britain and the Oregon question was a burning one. Great Britain claimed as far south as forty-two degrees north latitude, the northern limit of California to-day. The United States claimed as far north as 54° 40′, the present southern boundary of Alaska. The slogan of the day was "Fifty-four forty or fight." But there was no fight and no fifty-four forty. A treaty was arranged by which the disputed tract was divided between the claimants. The boundary line adopted was the present line along the forty-ninth parellel from the summit of the Rocky Mountains to the middle of the channel between Vancouver Island and the continent and thence southward along the main channel and Juan de Fuca Strait to the Pacific.

The diplomatic agents who drew this treaty were, on the part of the United States, James Buchanan, then Secretary of State, and on the part of Great Britain, the then British minister, Richard Pakenham. The treaty was signed at Washington June 15, 1846, ratifications exchanged at London July 17, and proclaimed August 5, 1846.[1]

The first article of the treaty describes the boundary in the following words:

> From the point on the 49th parallel of north latitude, where the boundary laid down in existing treaties and conventions between the United States and Great Britain terminates, the line of boundary between the Territories of the United States and those of Her Britannic Majesty shall be continued westward along the said 49th parallel of north latitude, to the middle of the channel which separates the continent from Vancouver's Island and thence southerly through the middle of the said channel, and of Fuca's [Juan de Fuca] Straits, to the Pacific Ocean.

HISTORY OF THE SURVEY.

On August 11, 1856, almost exactly ten years after the proclaiming of the treaty of limits, which for brevity may be called the Buchanan-Pakenham treaty, Congress passed an act to carry its first article into effect. This act provided for the appointment of a commissioner and a chief astronomer and surveyor on the part of the United States to unite

[1] Stat. L., vol. 9, pp. 869–870; vol. 11, p. 42.

with similar officers to be appointed by Great Britain to survey the boundary and mark it with monuments. It also provided for the appointment of an assistant astronomer and surveyor, a secretary, and a clerk; it appropriated $11,000 for the annual salary of these five officers, and $60,000 for provisions, transportation, and contingencies; it restricted the work to the northern boundary of Washington, which then extended from the Rocky Mountains to the Pacific; and finally it authorized the President to direct the employment of such officers, assistants, and vessels of the Coast Survey as he might deem necessary or useful.

Under this law Mr. Archibald Campbell was appointed commissioner on February 14, 1857, and on the same day Lieut. (now Gen.) John G. Parke, Corps of Engineers, U. S. A., was appointed chief astronomer and surveyor,[1] each at a salary of $3,000 per annum. Two weeks later, viz, February 28, 1857, Mr. G. Clinton Gardner was appointed assistant astronomer and surveyor, and on April 5 entered upon his duties. On April 9 Mr. William J. Warren (now chief clerk Office of Chief of Engineers, U. S. A.) was appointed secretary, and on March 6 Mr. John J. Major was appointed clerk to the commissioner. Mr. Campbell remained commissioner to the end in 1869. On the outbreak of the civil war, in the spring of 1861, General Parke left the work and never returned to it. Messrs. Gardner and Warren served with the commission until December 31, 1868, and perhaps a little later.[2] Mr. Major resigned December 9, 1864.

Of the other principal employees, Mr. Joseph S. Harris, now president of the Philadelphia and Reading Railroad, is recorded as assistant surgeon and naturalist March 27, 1857, to March 31, 1864, when he left the survey to engage in private business. Francis Herbst and Henry Custer served as topographers, the former about two years from April 16, 1857, till March 31, 1859, the latter about seven years from April 16, 1857, till June 30, 1864. Mr. J. Nevine King served as quartermaster and commissary from May 21, 1857, to January 15, 1861; Mr. George Gibbs as geologist and interpreter from June 22, 1857, till May 31, 1862, and Mr. R. V. Peabody as guide from August 1, 1857, to January 15, 1861. Dr. C. B. R. Kennerly served as surgeon and naturalist from March 22, 1857, till his death in 1861.

On February 28, 1857, Mr. Campbell received his instructions from the Secretary of State, dated February 25, whereupon, he says, "I proceeded at once to collect all such information within my reach which might contribute to a proper understanding of the meaning of the language of the treaty, and in the execution of the work intrusted to me.[3] Having arranged with Professor Bache, Superintendent of the Coast Survey, for the use of the surveying steamer *Active* and the brig

[1] House Ex. Doc. No. 86, Fortieth Congress, Third session, p. 100.
[2] House Ex. Doc. No. 86, Fortieth Congress, Third session, p. 23.
[3] Senate Ex. Doc., No. 29, Fortieth Congress, second session, p. 8.

Fauntleroy, with the officers and assistants attached,[1] Mr. Campbell sailed from New York April 20 and reached San Francisco via the Isthmus of Panama on May 15. On June 17 the party sailed on the *Active* for Victoria, where they arrived five days later and learned that the first British commissioner, Capt. James Charles Prevost, R. N., commanding H. B. M. S. *Satellite*, had arrived at Esquimalt ten days before. The second British commissioner was Capt. George Henry Richards, R. N., whose ordinary duties were those of chief astronomer and surveyor, he being empowered to act as commissioner only in the event of the death of Captain Prevost. Captain Richards, commanding the British steamer *Plumper*, left England at the close of March, 1857, for Victoria. By an accident to the *Plumper's* machinery he was delayed at Rio de Janeiro for some time and did not reach Victoria till November, 1857. The powers of these first and second British commissioners did not extend to the whole line, but only to the water boundary. "So much of the boundary between her Majesty's possessions in North America and the territories of the United States as is comprised between the continent of America and Vancouver's Island." Such is the language of the instructions to Captain Prevost.

The British and American commissioners held their first meeting on Saturday, June 27, 1857, on board the *Satellite* in Esquimalt harbor. The respective commissions of themselves and assistants were exhibited, read, and found in due form. A second meeting was held three weeks later in Nanaimo harbor on board the *Satellite*. Captain Richards not yet having arrived, it was decided that nothing further could be done with the water-boundary question.

Accordingly the American party proceeded to the vicinity of the forty-ninth parallel at Point Roberts on the mainland and began operations on the land boundary. It was not till the summer of the next year, 1858, that the British commissioner for surveying the land boundary, Col. J. S. Hawkins, Royal Engineers, arrived from England. The American parties worked, therefore, alone during the fall and winter of 1857 and spring of 1858. "Before the spring [of 1858] four astronomical points on the 49th parallel were determined, and the country thoroughly reconnoitered in the vicinity of the parallel, for a considerable distance eastward."[2]

After the arrival of Colonel Hawkins a joint meeting of the commission was held to arrange a plan of field operations for surveying and marking the line. The outcome of that meeting is set forth in the following agreement:[2]

After discussing plans for determining and marking the line as far eastward as the Cascade Mountains, it was concluded to be inexpedient at the present time, in con-

[1] From Coast Survey Report for 1857, p. 116, we learn that, "At request of State Department," steamer *Active* and party, in charge of Lieut. Commander Richard M. Cuyler, U. S. N., were placed at disposal of Archibald Campbell, esq., commissioner of the Northwestern Boundary Survey.

[2] House Ex. Doc. No. 86, Fortieth Congress, Third session, p. 95.

sequence of the great expense, consumption of time, and the impracticable nature of the country, to mark the whole boundary by cutting a track through the dense forest.

It was therefore agreed to ascertain points on the line by the determination of astronomical points at convenient intervals on or near the boundary, and to mark such astronomical stations or points fixed on the parallel forming the boundary by cutting a track of not less than 20 feet in width on each side for the distance of half a mile or more, according to circumstances. Further, that the boundary be determined and similarly marked where it crosses streams of any size, permanent trails, or any striking natural feature of the country.

In the vicinity of settlements on or near the line it is deemed advisable to cut the track for a greater distance and to mark it in a manner to be determined hereafter.

This arrangement for the part west of the Cascades appears to have been subsequently applied to the whole line; and thus it resulted that of the entire boundary, 409.5 miles long, from the boundary station on the crest of the Rocky Mountains westward to the obelisk on the western side of Point Roberts, 190 miles were cleared and marked and 220 miles were not traced out, cleared, surveyed, or marked. These figures are obtained by scaling off from the final maps.

At the end of the season of 1858 the line had been reconnoitered eastward as far as the valley of the Skagit, near the one hundred and twenty-first meridian, a distance of about 90 miles, and the astronomical observations necessary for determining three points on the parallel in the valley of the Chiloweyuck completed.

In the season of 1859 the work of surveying and marking the boundary was carried eastward from the valley of the Skagit to the Columbia River, a distance of about 150 miles. General Parke, writing November 12, 1859, thus summarizes the work done during the season:

A completion of the determination and marking of the parallel from three points astronomically fixed at the close of the last season.

A complete set of observations for latitude at four stations, from which the parallel has been determined and marked at the crossings of the following streams: The Skagit, Pasayten, Similkameen, Okinakane (Lake Osoyoos), and Nehoialpitkwu; and before the astronomical parties leave the field the necessary observations will be completed for determining two other points of the parallel, the third crossing of the Nehoialpitkwu and the Columbia River.

A chronometer trip for difference of longitude between Camp Simiahmoo and Chiloweyuck depot.

Observations of the transit of the moon and moon-culminating stars at two of the latitude stations for absolute longitude.

A triangulation covering an area of about 50 square miles.

A survey of the nearest practical lines to the parallel, connecting the astronomical stations, making a total distance chained of about 370 miles.

Reconnoissances for developing the topography along and adjacent to the boundary line, and for locating routes of communication. These reconnoissances have extended over an area of about 6,000 square miles.

A full set of magnetic observations were made at one station, and throughout the work all the necessary observations for time, azimuth, micrometer value, and instrumental corrections were carefully made.

In the season of 1860 the surveying and marking of the entire land boundary was nearly or quite completed. I have not found any statement as to just when the field work ended. The Auditor's accounts indicate that a considerable number of laborers, axmen, packers, etc., were employed during 1861, of whom 22 were discharged on March 31 and 14 on June 30. Others received their final pay at various dates in 1861, the latest being in September. General Parke, who came out with the last party, tells me that on reaching the Columbia Plains he heard of the first battle of Bull Run. It seems to me likely, therefore, that the field work closed late in 1860 or early in 1861. During this season, then, the surveying and marking of the line was carried on over a distance of 170 miles—between the summit of the Rocky Mountains and the Columbia River.

As to the disbanding of the field parties and their return to Washington we gather some facts from the Auditor's accounts, so often cited here. It appears that all returned via the Isthmus of Panama, the fare being $258 from San Francisco to New York and $7.50 from New York to Washington. Commissioner Campbell, Secretary Warren, Geologist Gibbs, and Artist Alden left the field November 25, 1860, and reached Washington January 10, 1861, the journey taking forty-six days. Henry Custer, Charles T. Gardner, T. Hudson, and James Nooney left the field April 30, 1861, and G. Clinton Gardner on May 10, 1861. All these came direct to Washington. Finally, in the last quarter of 1861 (exact date not given), General Parke, J. S. Harris, J. V. Wurdemann, and John J. Major returned to Washington. With these returning parties came instruments, records, collections, baggage, etc. There is a charge for freight on "41 packages instruments and baggage" and "24 boxes natural-history specimens."

Arrived in Washington, the commission rented rooms and established an office over a store at the SE. corner of Pennsylvania avenue and Twentieth street NW., and there proceeded with the plattings, computations, drawing of maps, and preparation of the final report. The scientific reports appear to have been completed in 1862 and the drawing of the final maps, at least of the land boundary, late in 1865 or early in 1866. The work upon the report, however, continued, and there began to be some good-natured raillery as to when it would be completed. Finally, on January 13, 1869, the House of Representatives, by a resolution, requested information as to expenditures on account of the Northwestern Boundary Survey. The reply to that request has furnished the chief source of information for this history.[1] In October, 1869, the work was brought to a close and the results deposited in the State Department. But the report, unfortunately, was not published, and the manuscript has for many years

[1] House Ex. Doc. No. 86, Fortieth Congress, third session.

been lost to view. Its whereabouts are still unknown. The reason it was not published, I am informed, is that Mr. Fish, Secretary of State at that time, deemed its publication too expensive. The war had brought a mountain of debt, and under these conditions he refused to sanction so costly a publication.

COST.

The total cost of surveying and marking the line, including all expenses, was about $600,000, or $1,463 per mile. The first appropriation for the work, made August 11, 1856, was $71,000. This and the subsequent appropriations are as follows:

Appropriations for surveying and marking the boundary along the forty-ninth parallel, between the United States and the British Possessions, from the Rocky Mountains to the Pacific Ocean.

Date.	Fixed salaries.	Other expenses.	Total.	Authority.
August 11, 1856	$11,000	$60,000	$71,000	Stat. L., vol. 11, p. 42.
February 7, 1857	11,000	60,000	71,000	Stat. L., vol. 11, pp. 159–160.
June 5, 1858	11,000	60,000	71,000	Stat. L., vol. 11, p. 312.
March 3, 1859	11,000	139,000	150,000	Stat. L., vol. 11, pp. 403–404.
May 26, 1860	11,000	139,000	150,000	Stat. L., vol. 12, pp. 20–21.
Total	55,000	458,000	513,000	

The amount actually expended somewhat exceeded this sum, aggregating nearly $600,000.

In response to the House resolution of January 13, 1869, above referred to, Mr. Seward, then Secretary of State, transmitted, on February 9, 1869, a detailed reply, consisting, in the main, of a statement by Mr. C. M. Walker, then Fifth Auditor of the Treasury Department, of "disbursements on account of Northwest Boundary Survey from February 14, 1857, to December 31, 1868."[1] The total expenditures in that period were for—

Salaries	$385,508.78
Contingent expenses	209,724.25
Total	595,233.03

Most of these were made in the five years 1857 to 1861, inclusive. After the latter year a small office was maintained in Washington at an annual rental of $250, which, with various minor items, entailed an annual expense of from $1,200 to $1,400. The work was finally closed up and the records deposited in the State Department in October, 1869.[2]

[1] House Ex. Doc. No. 86, Fortieth Congress, third session, 102 pp.
[2] Letter from Archibald Campbell to Acting Secretary of State, June 27, 1872.

For the preparation of scientific reports on magnetics, mammals, birds, fishes, plants, insects, fossils, etc., including the making of drawings, there was expended about $3,500[1] and for the drawing of the final maps about $9,400.

For building the initial monument at Point Roberts was paid $7,590.38, one-half of which was paid by the United States and one-half by Great Britain.[2]

The cost to the British Government of running and marking the boundary line I have not found. A single item bearing on the matter is contained in Parliamentary Papers, 1863, volume 37, page 287 (55–v), where there is "An estimate of the sum required to be voted in the year ending March 31, 1864, to complete the expenses of surveying the line of boundary between the British and United States territory in the western part of North America, 4,300 pounds."

While the boundary survey was going forward there was another independent exploration by the British in progress in the region, under the direction of Capt. John Palliser. Early in 1857 the president of the Royal Geographical Society recommended to the British foreign office that a grant of £5,000 be voted to cover the expense of two years' exploration along the forty-ninth and fifty-third parallels and between the one hundredth and one hundred and fifteenth meridians.[3] This sum was voted and later on £1,500 additional, to continue the work one year more, making three years in all. Among the estimates for the year ending March 31, 1861, is an item of £6,300 for completing Palliser's explorations. The results of Palliser's work, his route of travel, etc., are set forth in the Journal of the Royal Geographical Society of London, 1859, volume 29, pages xcvii–c; and 1860, volume 30, pages 267–314.

MAPS.

ORIGINAL MANUSCRIPT MAPS.

Two large blue chests in the manuscript room at the State Department contain the original observations, computations, sketches, notes, etc., relating to the Northwestern Boundary Survey. They do not contain the final maps, these being kept among the treaty maps. They do, however, contain the following manuscript map material, which may be classified as preliminary and final:

Preliminary.—First. Several rolls of rough sketches of reconnoissances, triangulation, trails, office plattings, field sketches, etc., on rough paper, drawing paper, tracing linen, and tracing paper. Some of this is original field material identified by title, date, and signature. Much of it, however, is of the nature of office studies, plattings, etc., which served a temporary purpose and is no longer of value.

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[1] House Ex. Doc. No. 86, Fortieth Congress, third session, p. 101.
[2] Same, p. 97.
[3] Parliamentary Papers, 1857, vol. 26, p. 29 (38–vii–sess. 2).

Second. There is a series of 19 sheets on tracing linen covering the entire line from the sea coast eastward to the Rocky Mountains. These sheets are numbered from west to east, 1 to 19. Each sheet except the first embraces 30′ of longitude and from 15′ to 25′ of latitude. Sheet 2, for example, includes from 123° to 122° 30′; sheet 3, longitude 122° 30′ to 122°, while sheet 19, the easternmost of the series, includes longitude 114° 30′ to 114°. The relief is shown by broken horizontal curves. The scale is not stated, but the parallels and meridians enable us to infer that it is 1: 64000, or about 1 mile to 1 inch. These sheets bear no title, no legend, no date, and no names.

Third. There is a series of five manuscript maps (not numbered) on a scale of 1:120000, showing the entire line from the sea coast to the Rocky Mountains. They appear to be unfinished drafts. Relief is shown by contours in green, trails in red, and there are a few names. They are drawn on backed drawing paper. None of them have legends or titles, or names of draftsmen or any authority. They contain no dates. They appear to be compilations from original sketches, notes, and surveys. They are not numbered. Beginning at the west end of the line, the sheets cover the following areas: The first sheet covers from latitude 48° 40′ to 49° 25′, and from longitude 123° 20′ to 120° 50′, being 30 inches high and 61 inches wide. The second sheet covers from latitude 48° 33′ to 49° 35′, and from longitude 121° 15′ to 119° 12′, being 38 inches high and 50 inches wide. The third sheet covers from latitude 48° 30′ to 49° 18′, and from longitude 119° 35′ to 117° 40′, being 29 inches high and 50 inches wide. The fourth sheet covers from latitude 47° 35′ to 49° 10′, and from longitude 117° 50′ to 114° 40′, being 59 inches high and 55 inches wide. Owing to its inconvenient size this sheet has been cut into two pieces along the parallel of 48° 21′. The meridians are erroneously numbered. The fifth sheet covers from latitude 48° 15′ to 49° 35′, and from longitude 116° 08′ to 113° 13′, being 50 inches high and 71 inches wide. This map also has been cut into two pieces along the meridian of 114° 55′. Like the preceding, the meridians are erroneously numbered. Owing to its size, this roll of maps is not kept with the other material in the chests above mentioned.

Fourth. There is an unfinished manuscript map, in two sheets, on unmounted drawing paper, covering the entire line from the sea coast to the Rocky Mountains. It includes latitude 47° to 50° and longitude 113° 30′ to 125°, is on the conic projection, and is projected on the one hundred and nineteenth as the central meridian. The eastern part includes longitude 113° 30′ to 119°, the western 119° to 125°. The scale is not stated, but appears to be 1 : 601000. There is no title, no date, no signature. It is an outline map, no relief being shown. The camps are shown, but the boundary monuments are not.

Fifth. The foregoing four groups I have called preliminary maps. There is, however, a fifth group, a set of seven tracings, which have an official character which places them in a different category. These seven tracings, on tracing linen, are on a scale of 1 : 120000, are numbered from west eastward, and each sheet includes 1° 20′ of longitude and 30′ of latitude, being 15′ on each side of the forty-ninth parallel. Sheet 1, the westernmost, includes longitude 123° 10′ to 121° 50′; sheet 2, 121° 50′ to 120° 30′, and so on; and sheet 7, the easternmost, 115° 10′ to 113° 50′. On these maps are shown trails, camps, caches, monuments, and names; the relief also is shown by red contour lines.

Sheet 1 has the following legend:

Tracings numbering from 1 to 7, showing the topography, names, and scales adopted by the British and United States Boundary Commissions for their final maps. By order of the commissioners.

R. W. HAIG,
Capt'n R'l Art'y, Astr. British Commis'n.
G. CLINTON GARDNER,
Ass't Astr. and Surv., U. S. B. C.

WASHINGTON CITY, *May 30, 1863.*

Final drawings.—The final original manuscript maps resulting from the survey are thirteen in number. To this should be added the title page, making fourteen drawings. They are beautifully drawn on "smooth antiquarian" drawing paper, backed with muslin, and bound with blue braid. The sheets are of uniform size, being 30 inches high and 42 inches wide. They are kept among the treaty maps in the library of the Department of State. They are drawn wholly in black and show trails, timber, camps, monuments, etc. Topography is shown by hachures. The scale of the ten detailed maps is 1: 120000, or 1.89 miles to 1 inch; of the two general maps 1: 720000, or 11.37 miles to 1 inch, and of the index map 1: 1200000, or 18.94 miles to 1 inch. This series of drawings was obviously planned to form an atlas. Of this the contents would be:

1. Title.
2. Index map showing location of ten detailed sheets.[1]
3. General map, eastern section.
4. General map, western section.
5. Detailed sheets numbered 1 to 7 (from east to west), showing land boundary.
6. Detailed sheets numbered 8 to 10, showing water boundary.

The title is as follows:

Maps of the Boundary between the United States and the British Possessions as established by the treaty of Washington, June 15, 1846. Surveyed under the direction of the Joint Commission appointed to carry into effect the First Article of the Treaty.

The index map is entitled:

Index Map showing the limits of the detailed sheets of the U. S. North Western Boundary Survey.

[1] The plate which accompanies this bulletin is a copy, on a reduced scale, of this map.

The general map (western section) has outside the border the legend "U. S. North West Boundary Survey, Archibald Campbell, U. S. Commissioner; John G. Parke, U. S. Eng., Chief Astr. and Surveyor." The title is as follows:

Map of Western Section. From notes by John G. Parke, U. S. Engineers, Chief Astr. and Surveyor, G. Clinton Gardner, Ass't Astr. and Surveyor, and Jas. S. Harris, Henry Custer, Chas. T. Gardner, George Gibbs, Francis Hudson and R. V. Peabody, Ass'ts U. S. Boundary Survey.

Compiled and drawn by Lemuel D. Williams, Theodor Kolecki, and Edward Freyhold. By order of U. S. Commissioner. (Signed) G. Clinton Gardner, Ass't Astr. and Surveyor, U. S. Boundary Survey, Office Washington D. C. 1866. Scale 1:720000 or 11.37 miles to one inch.

This map includes from longitude 118° to 125,° and the eastern section, bearing a similar title, includes from longitude 110° to 118°.[1]

The detailed sheets showing the land boundary, numbered 1 to 7, are signed "Jno. G. Parke, Major of Engrs., Brevet Major General, U. S. A., Chief Astr. and Surv. Archibald Campbell, U. S. Commissioner, etc. etc. etc. and J. S. Hawkins, Colonel R'l Eng'rs., H. B. M. Commissioner." The date of signing is recorded as May 7, 1869.

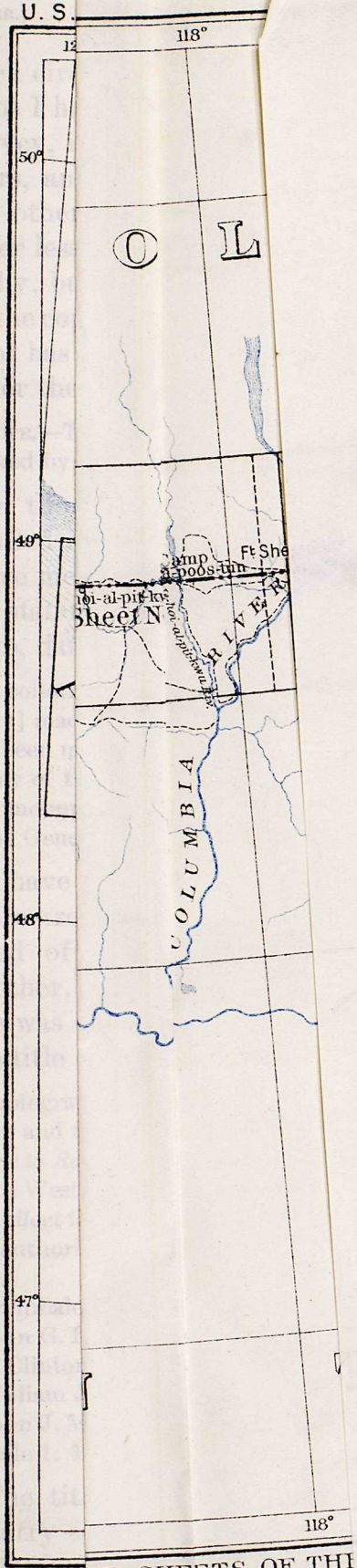
The detailed sheets showing the water boundary, numbered 8 to 10, have no titles, but each has the following written upon it: "That part of the boundary line described in the treaty of June 15, 1846, between the continent and Vancouver Island not agreed upon by the Joint Commission." These are signed by John G. Parke and Archibald Campbell. They do not bear the signature of any member of H. B. M. Commission. The date of signing is November 3, 1869.

Of these final maps, the seven detailed sheets showing the land boundary have been photolithographed and a small edition printed. Just when they were printed or how large the edition I have not learned. These photolithographs are on double the scale of the original (i. e., 1:60000). They were printed by the New York Lithographing, Engraving, and Printing Company, Julius Bien, superintendent. The sheets are numbered from east to west, and the seventh or westernmost bears the following title:

Photo-lithographic Copy of the detailed maps of the North West Boundary from Point Roberts to the Rocky Mountains between the United States and the British Possessions under the Treaty of June 15th, 1846, showing Monuments, Cuts, and other Marks. Archibald Campbell, U. S. Comr. N. W. Boundary Survey. Scale 1:60000 (enlarged to twice the scale of original drawings). Photo-lith. by New York Litho'g Engrav'g and Print'g Co., Julius Bien, Sup't.

The sheets are printed wholly in black, are 28 inches high by 71 inches wide and printed in two pieces. Relief is shown by hachures and timber by the usual convention. Boundary marks are shown by

[1] In the library of the Coast and Geodetic Survey I have seen a photograph of this western sheet. It is a pale and faded copy, 18 by 24 inches, was made by Alexander Gardner, and is on a scale of 1:1070000, or about 17 miles to 1 inch.



Reduced SHEETS OF THE
SURVEY

90 100 MILES

black circles unaccompanied by names or any designations. Of these maps I have seen copies in the Library of Congress, in the Geological Survey, in the General Land Office, in the Office of the Chief of Engineers, and in the State Department. Some of these are numbered and others not. Could there have been two editions? These sheets cover less territory than the originals. They show the belt of topography, but omit the signatures and legends, if indeed there were any on the copy furnished the lithographer. The copy in the State Department has a clear, strong red line along portions of the boundary and under the title (sheet 7) has the following in the draftsman's hand:

NOTE.—The red lines indicate the portions of the boundary actually surveyed and marked by vistas cut through the forest and monuments of stone.

In the General Land Office there is a photographic copy of the detailed sheets dated 1866, on which are lines similar to the red ones above mentioned. As to this photographic copy we have the following statement made by Mr. Campbell in a letter to the Secretary of State, dated February 3, 1869:[1]

In collating the results of the survey * * * complete maps on a large scale [were] made of the entire boundary and the adjacent country. A general map has also been made, showing the extent of the country traversed. And to facilitate the survey of the public lands, photographic duplicates of the detailed sheets showing each monument on the boundarv line, with its geographical position, were furnished to the General Land Office.

I have examined these photographs in the General Land Office. There are four of them, each 20 by 70 inches in size, and each composed of several separate photographs, which have been joined together, mounted on cloth, and bound with blue braid. A special title was prepared and photographed for each of these four maps. The title of the easternmost sheet is as follows:

Photographic Sketch of the detailed Maps of the Boundary between the United States and the British Possessions, showing the Monuments *from Mooyie and Yah'k Divide to Rocky Mountain Divide.* Mapped under the direction of the United States North West Boundary Commission. From Surveys by the Joint Commission to carry into effect the 1st Article of the Treaty between the United States and Great Britain and authorized on the part of the United States by Act of Congress of August 11th 1856.

Archibald Campbell, U. S. Commissioner.
John G. Parke, U. S. Eng., Chief Astr. and Surveyor.
G. Clinton Gardner, Ass't Astr. and Surveyor.
William J. Warren, Secretary.
John J. Major, Clerk.
Scale 1: 120000. 1866.

The titles of the others are identical with this, except as to the country covered. This easternmost sheet embraces longitude 113° 45′ to 116°, *from Mooyie and Yah'k Divide to Rocky Mountain Divide;*

[1] House Ex. Doc. No. 86, Fortieth Congress, third session, p. 96.

the next, longitudes 116° to 118½°, *from Inchuintum River to Mooyie and Yah'k Divide;* the next longitudes, 118½° to 121°, *from Divide of Cascade Mountains to Inchuintum;* and the last, longitudes 121° to 123¼°, *from Point Roberts to Divide of Cascade Mountains.*

The geographic positions of the various camps, stations, etc., are given on these maps, as are also the longitudes of the boundary monuments, accompanied by brief descriptions of the locations. These positions, classified in two groups and arranged in order of longitude, are printed on pages 28–39 of this bulletin.

The preparation of the 13 final original drawings was apparently begun in 1863. There is an autograph memorandum by Mr. G. Clinton Gardner, dated June 30, 1863, containing an estimate of the time required to make these drawings. He estimates that the drawing of seven sheet of 1:120000 scale will take eighty-two weeks' work, and that two sheets of the general map of 1:720000 scale thirty-five weeks' work. After discussing methods and costs he adds:

> The scale spoken of by the English commissioner for the general map was 1:600000, but that scale would require larger sheets than those used for the detailed maps. I have therefore proposed to use for the general maps 1/6 instead of 1/5 of that of the detailed maps in order that all the sheets shall be of uniform size.

As to the drawing of these sheets and their cost, there are three memorandums in the handwriting of Mr. Gardner. The first, undated, is as follows:

Seven detail sheets from Point Roberts to Rocky Mountains, at $600	$4,200
The water-boundary sheet	1,800
The two general sheets, one from Columbia River west	1,500
And the other from Columbia east to Fort Benton	1,000
	8,500

The second memorandum, dated October 31, 1864, is as follows:

The seven detail sheets have cost $4,085, [and] when completed [will cost] $115 [more]	$4,200
The general sheets have cost $1,867, [and] when completed [will cost] $813 [more]	2,500
The water-boundary sheet has cost $750, [and] when completed [will cost] $925 [more]	1,675
Total	8,375

The third memorandum, dated January 1, 1865, is as follows:

Water-boundary sheet	$2,000
Detail sheets, 7 at $600	4,200
General maps, No. 1, $1,800; No. 2, $1,400	3,200
Total cost of the drawing of maps	9,400

Thus it appears that the drawing of these maps was completed late in 1864 or early in 1865. The photographic copy of them in the General Land Office is dated 1866.

The drawing was done by Edward Freyhold, of No. 44 Sharp street, Baltimore, by L. D. Williams, and by Theodor Kolecki. Freyhold did the "hill work"—i. e., the hachures—and the others the outline, lettering, etc. Prior to February, 1864, Freyhold had drawn the hill work on detail sheets 3 and 7.

Among the papers is an unexecuted contract (apparently the original draft) between the United States Northwestern Boundary Commission and Edward Freyhold, whereby Freyhold agrees to draw the hill work on sheets 1, 2, 4, 5, and 6 "similar and not inferior to certain other work executed by him on sheets 3 and 7" for $1.75 per square inch, and to complete the work "before the 31st day of August, 1864."

Sheet 4 was finished March 5, 1864, and contained 214½ square inches of hill work; sheet 6 was finished April 26, 1864, and contained 249½ square inches of hill work; sheet 5 was finished June 6, 1864, and contained 137$\frac{5}{16}$ square inches of hill work; sheet 2 was finished August 13, 1864, and contained 225$\frac{1}{64}$ square inches of hill work. There is no record as to No. 1, but it is probable that it was finished on March 5, so that the hill work was all completed by August 13 and the drawing of the final maps completed about the beginning of the year 1865.

BRITISH MAPS.

On June 23, 1871, Sir Edward Thornton, then British minister in Washington, sent to the Department of State an atlas comprising maps, views, and tables of geographic positions of the northwest boundary. This atlas is entitled:

Maps of the land boundary between the British possessions in North America and the United States as established by the treaty of Washington, 15th June, 1846, and surveyed and marked under the direction of the Joint Commission appointed to carry into effect the 1st article of the treaty. Scale 1:120000, or 1.8939 statute miles to one inch. Photo-zincographed at the ordnance survey office, Southampton, under the superintendence of Cap't. Parsons, R. E., F. R. A. S.; Col. Sir Henry James, R. E., F. R. S., etc., director, 1869.

Then follows:

(a) An index map composed of two double-page sheets on a scale of 1:600000.

(b) Seven detailed sheets, scale 1:120000, numbered 1 to 7 from west to east. All are dated May 7, 1869, and signed by J. S. Hawkins, H. B. M. Comm'r, Archibald Campbell, U. S. Comm'r, Samuel Anderson, Lt. R. Eng'rs Secretary for Captain Haig, R. A., Chief Astronomer. Sheets 1 and 7 were drawn by J. Carroll, 2 by H. Walthouse, and 3, 4, 5 and 6 by F. B. Grose.

(c) A title page for another series of six sheets on the mile scale is as follows:

Maps of the land boundary between the British possessions in North America and the United States as established by the treaty of Washington 15th June, 1846, and

surveyed and marked under the direction of the Joint Commission appointed to carry into effect the 1st article of the treaty. Scale of 1:63360 or one statute mile to one inch. Photo-zincographed at the ordnance survey office under the superintendence of Captain R. M. Parsons, R. E., F. R. A. S.; Col. Sir H. James, R. E., F. R. S., etc., director, 1869.

The six sheets following this are numbered 1 to 6, from west to east, and are signed "J. S. Hawkins, colonel, Royal Engineers, H. B. M. commissioner, 7th May, 1869." The geographic coordinates of camps and stations are given; topography is shown by hachures, trails are shown in brown, and water in blue. Iron monuments are shown by a square symbol (■) and stone monuments by a round one (●). The vistas and cleared part of the line appear to be indicated by two lines, one down on each side of the parallel, thus, ═══════.

(d) Between the title of the mile scale sheets and the sheets themselves are two double pages, the first containing ten photographic views of monuments and vistas, as follows:

Initial monument, stone obelisk, Point Roberts, four views, one of each face.
Boundary monument, Mooyie River.
Boundary monument and cutting, Kootenay East.
Boundary monument and cutting, Yak'h River.
Boundary monument and cutting, Kish-e-nehn.
Boundary monument, watershed Rocky Mountains, looking north.
Boundary monument, watershed Rocky Mountains, looking south.

The second double page contains two tables of geographic coordinates, with descriptions of stations. These tables are printed in this bulletin, pages 29, 31, 33, 35, 37, and 39.

According to these tables there are 161 monuments, marking parts of a boundary line 410 miles long. These are:

Stone obelisk	1
Iron pillars	42
Pyramids of stones	3
Bench marks	2
Mound of earth	1
Piles of stones	112
Total	161

(e) Lastly we have this double title page:

Maps to illustrate the boundary line established by the convention of London, 20th October, 1818, and the treaty of Washington, 15th June, 1846, between the British Possessions in North America and the United States, compiled from the following authorities:

* * * * * * *

Scale of .0528 inches to 1 statute mile, or 1:1200000. Photozincographed, etc. 1869.

This is followed by three double-page photographic maps showing the country between the forty-fifth and fifty-first parallels of north latitude and from the Pacific Ocean eastward to Minnesota.

GEOGRAPHIC COORDINATES.

The geographic positions of various camps and stations in the vicinity of the parallel were determined astronomically. Latitudes were determined with the zenith telescope; azimuth and time with the transit. Longitudes were determined by chronometer, by moon-culminating stars, and at one station, Camp Mooyie, by the solar eclipse of July 7, 1860.

It would seem that 28 fundamental or base stations were established near the boundary. For these stations measurements were made to the parallel. Thereupon other stations, with monuments, were established on the parallel.[1] Of these stations on the parallel there are 161. The description of these fundamental or base stations and of the 161 stations on the parallel, their location, longitude, etc., are given in Tables I to IV herewith. Tables I and III are made up from data on the photographic copies of the final map which were deposited in the General Land Office in 1866. Tables II and IV are copied from the British atlas in the State Department, which was presented by the British minister, Sir Edward Thornton, in 1871. The results from the two sources are almost identical, but as they are not absolutely so, and as the originals are not conveniently accessible, it was deemed best to print, side by side, the results from these two sources.

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[1] For method employed see Appendix A, pp. 64-65.

TABLE I.—*Geographical coordinates of camps, stations, etc.*

FROM AMERICAN SOURCES.

No.	Station.	Latitude.			Longitude.		
		°	′	″	°	′	″
1	Camp Akamina	49	00	52.2	114	03	34
2	Camp Kishenehn	49	00	02.6		21	09
3	Ford of Flathead River	48	57	01.1		24	26.6
4	Junction of trail to Wigwam Station	48	55	31.4		43	33.7
5	Wigwam Station	48	59	42.8		45	02
6	Camp Kootenay East	48	59	44.4	115	11	19.2
7	Yahk'h Station	48	59	55.4		38	51
8	Camp Mooyie	49	01	25.6	116	12	40.5
9	Mooyie trail monument	49	00	01.3		14	59.2
10	Acklew Cache, junction of trails	48	54	21.4		22	02.1
11	Camp Kootenay West	48	59	54.9		31	16.2
12	Kootenay Mountain Station	49	00	12.8	117	10	48.4
13	Pend d'Oreille Station	49	00	03.5		21	52.9
14	Fort Shepherd Station	49	00	00		37	19.4
15	Camp Columbia	48	59	49.1		37	41.8
16	Camp Statapoostin	49	00	13.96	118	16	15.6
17	Inchuintum Station	48	59	58.5		28	12.3
18	Camp Nehoialpitkun	48	59	02.9		44	28.5
19	Camp Osoyoos or Osoyoos Station	48	59	56.4	119	24	12
20	Camp Similkameen	48	59	12.0		34	53.2
21	Nais-nu-loh Station	48	59	52.9	120	00	18.8
22	Junction of trails, Naisnuloh	49	07	54.8		00	59.9
23	Camp Pa-say-ten	48	59	42.2		32	12.8
24	Junction of trails, Pa-say-ten Valley	49	09	38.8		33	38.9
25	Roche Station	48	59	49.8		39	14.8
26	Camp Skagit	49	00	01.8	121	02	45.2
27	Crossing of Skagit River on trail	49	07	42.7		08	29.2
28	Camp Chuch-che-hum	49	00	03.5		16	41.4
29	Camp Chiloweyuck	49	00	21.9		23	41.8
30	En-saw-kwatch Station	49	00	30		30	41.8
31	Sen-eh-say Station	49	00	34.3		36	15.4
32	Camp Tummeahai	49	02	04.9		47	34.4
33	Intersection of Whatcom and Lake trails	48	06	05.4		54	56.8
34	Chiloweyuck Depot	49	09	28.2		57	59
35	Camp Sumass	49	01	25.8	122	11	52.8
36	British Station	49				37	01.6
37	Camp Simiahmoo	49	00	43.1		45	30
38							

TABLE II.—*Geographical coordinates of camps, stations, etc.*

FROM BRITISH SOURCES.

No.	Station.	Latitude.			Longitude.		
		°	′	″	°	′	″
1	Camp Akamina and Station	49	00	52.0	114	03	34.0
2	Camp Kish-e-nehn	49	00	02.8	114	21	09.0
3							
4							
5	Wigwam Station	48	59	42.8	114	45	02.0
6	Camp Kootenay East	48	59	44.6	115	11	19.2
7	Yahk'h Station	48	59	55.4	115	38	57.0
8	Camp Mooyie	49	01	26.0	116	12	49.5
9							
10							
11	Camp Kootenay West	48	59	55.1	116	31	16.2
12	Kootenay Mountain Station	49	00	12.8	117	10	48.4
13	Pend d'Oreille Station	49	00	03.5	117	21	52.9
14	Fort Shepherd Station	49	00	00.0	117	37	19.4
15	Camp Columbia	48	59	50.4	117	37	41.8
16	Camp Stat-a-poos-tin	49	00	10.8	118	16	15.6
17	In-chu-in-tum Station	48	59	58.5	118	28	12.3
18	Camp Ne-hoi-al-pit-kwu	48	59	04.3	118	44	28.5
19	Camp O-so-yoos & O-so-yoos Station	49	00	00.9	119	24	12.0
20	Camp Simil-ka-meen	48	59	12.1	119	34	53.2
21	Nais-nu-loh Station	48	59	53.9	120	00	18.8
22							
23	Camp Pa-say-ten	48	59	42.6	120	32	12.8
24							
25	Roche Station	48	59	49.8	120	39	14.8
26	Camp Skagit	49	00	02.3	121	02	45.2
27							
28	Camp Chuck-che-hum	49	00	03.7	121	16	41.4
29	Camp Chiloweyuck	49	00	22.2	121	23	41.8
30	En-saw-kwatch Station	49	00	30.0	121	30	41.8
31	Sen-eh-say Station	49	00	34.3	121	36	15.4
32	Camp Tummeahai	49	02	04.9	121	47	34.4
33							
34							
35	Camp Sumass and Station	49	01	25.8	122	11	52.8
36	British Station	49	00	00.0	122	43	59.9
37	Camp Simiahmoo Observatory	49	00	43.1	122	45	30.0
38	Obelisk at Initial Point	49	00	00.0	123	03	53.0

TABLE III.—*Locations and longitudes of the boundary monuments.*

FROM AMERICAN SOURCES.

No.	Location of monument.	Longitude.
		° ′ ″
1	Divide of Rocky Mountains	114 03 28.4
2	Left bank of Kishenehn Creek	20 53.9
3	Near trail entering Boundary Pass	21 17.3
4	Second terrace, left bank of Flathead River	27 09.4
5	First bench, right bank of Flathead River	28 02.5
6	West bank of river	45 16.1
7	Hillside, west of river	45 42
8	Small creek, foot of mountain	115 03 28.7
9	Second plateau, left bank of river	10 11.6
10	Right bank of river	11 11.2
11	Brink of ravine, base of mountain	16 01.4
12	Side of hill	38 02.8
13	Ridge of hill	38 29.1
14	Flat, east side of river	39 10.5
15	Flat, west side of river	39 24.5
16	Flat, west of river	39 46.5
17	High bluff, left bank of creek	*a* 116 11 24
18	Left bank of creek, water's edge	11 25.6
19	Plateau above creek	*a* 11 54
20	Side of mountain, west side of valley	12 22.3
21	.....	.....
22	Brow of first hill, right bank of river	31 05.9
23	Mountain slope, west side of valley	35 44.9
24	Bench, west side of river	117 08 55.9
25	Mark on face of rock on hillside	09 56.5
26	Right bank of river, meridian of Pend d'Oreille Station	21 52.9
27	Bench, west side of river	22 03
28	Sharp ridge, west side of river	22 54.8
29	Near east bank of river	36 59.4
30	.....	.....
31	On brink of hill, west bank of river	37 36.2
32	On hilltop, west of Camp Columbia	38 49.1
33	On ridge	41 17.7
34	.....do	45 49.5
35	On ridge between streams	53 08.1
36	.....do	59 00.9
37	On slope of hill between streams	118 01 52.2
38	On slope of hill east	03 17.1
39	On hill between streams	05 15.8
40	On hill west side of stream	09 26

a Approximate.

TABLE IV.—*Locations, longitudes, and descriptions of the boundary monuments.*

FROM BRITISH SOURCES.

No.	Location of monument.	Longitude.	Description.	From what station determined.	No. in British Atlas.
		° ′ ″			
1	On the divide of the Rocky Mountains.	114 03 28.41	Pile of stones.	Camp Akamina and Station.	161
2	On left bank of Kishenehn Creek..	20 53.9	.....do.....	Camp Kishenehn.	160
3	Near trail entering Boundary Pass.	21 17.3	.....do.....	.....do.....	159
4	On first bench, right bank Flathead River.	27 09.4	.....do.....	.....do.....	158
5	On second terrace, left bank Flathead River.	28 02.5	.....do.....	.....do.....	157
6	Near west bank of river.....	45 16.1	.....do.....	Wigwam Station .	156
7	On hill west of river	45 42.0	.....do.....	.....do.....	155
8	At foot of mountains, left bank small creek.	115 03 28.7	.....do.....	Camp Kootenay East.	154
9	On second plateau, left bank river.	10 11.6	.....do.....	.....do.....	153
10	On right bank Kootenay River	11 11.2	.....do.....	.....do.....	152
11	On east brink ravine beyond which the mountains rise.	16 01.4	.....do.....	.....do.....	151
12	On hillside east of river	38 02.8	.....do.....	Yahk'h Station...	150
13	.....do.....	38 29.1	.....do.....	.....do.....	149
14	Near east bank of river	39 10.5	.....do.....	.....do.....	148
15	On west side of river	39 24.5	.....do.....	.....do.....	147
16	.....do.....	39 46.5	.....do.....	.....do.....	146
17	On high bluff, left bank.....	*a* 116 11 24	.....do.....	Camp Mooyie.....	145
18	On left bank of creek close to water.	11 25.6	.....do.....	.....do.....	144
19	On plateau above creek	*a* 11 54	.....do.....	.....do.....	143
20	On side of mountain, west side of valley.	12 22.3	.....do.....	.....do.....	142
21	On trail leading from the north to Cholemta.	14 59.2	.....do.....	.....do.....	141
22	On brow of first hill, right bank river.	31 05.9	.....do.....	Camp Kootenay West.	140
23	On side of mountain, west side of valley.	35 44.9	.....do.....	.....do.....	139
24	On bench, west side, South Fork Salmon River.	117 08 55.9	.....do.....	Kootenay Mt. Station.	138
25	On face of rock on ridge east.....	09 56.5	Bench mark.. ↑	.....do.....	137
26	Latitude mark, Pend d'Oreille Station.	21 52.9	Pile of stones.	Pend d'Oreille Station.	136
27	On bench, west side of river.....	22 03	.....do.....	.....do.....	135
28	On high ridge west	22 54.8	.....do.....	.....do.....	134
29	Near east bank of Columbia River.	36 59.4	.....do.....	Fort Shepherd Station.	133
30	Near east bank of river	37 05.2	.....do.....	Camp Stat-a-poostin.	132
31	On brink of hill, west bank Columbia River.	37 36.2	.....do.....	.....do.....	131
32	On hilltop, west of Camp Columbia.	38 49.1	.....do.....	.....do.....	130
33	On side of hill between streams....	41 17.7	.....do.....	.....do.....	129
34	.....do.....	45 49.5	.....do.....	.....do.....	128
35	.....do.....	53 08.1	.....do.....	.....do.....	127
36	.....do.....	59 00.9	.....do.....	.....do.....	126
37	On slope between streams.....	118 01 52.2	.....do.....	.....do.....	125
38	.....do.....	03 17.1	.....do.....	.....do.....	124
39	On hill between streams.....	05 15.8	.....do.....	.....do.....	123
40	On hill west side of stream.....	09 26.0	.....do.....	.....do.....	122

a Approximate.

TABLE III.—*Locations and longitudes of the boundary monuments*—Continued.

FROM AMERICAN SOURCES—Continued.

No.	Location of monument.	Longitude.
		° ′ ″
41	Side of mountain east of river	118 09 58.4
42	Gravel bench west of river	11 56.1
43	Near the trail to Colville	13 19.1
44	Point of ridge at bend of valley	14 21.0
45	North slope of mountain south of river	16 36.
46	High ridge south of river	18 45.4
47	High ridge south of Nehoialpitkwu River	21 36.8
48	.....do	22 18.6
49	In valley at base of mountain, south	24 07.2
50	.....do	25 38.2
51	In valley south of Nehoialpitkwu River	26 32.6
52	In valley east of Colville trail	27 40.8
53	Near edge of first plateau	28 40.8
54	First plateau west of river	29 48.7
55	First bench west of small creek	31 28.4
56	Summit between creeks	33 43
57	Divide in bend of the Nehoialpitkwu River	36 43.4
58	Sharp ridge between creeks	38 24.9
59	Northern slope of mountain	39 51.5
60	.....do	40 57.2
61	Open country east of Rock Creek	41 49.6
62	.....do	42 38.4
63	.....do	43 24.5
64	East of Colville trail	44 13.8
65	Foot of mountain, right bank of Nehoialpitkwu River	45 12.6
66	Point of ridge in bend of river	45 48.9
67	.....do	46 45.6
68	Foot of mountains south side of valley	48 27.3
69	Point of hill south of creek	51 14.9
70	Ridge between two creeks	52 26.6
71	.....do	53 06.6
72	.....do	55 05
73	.....do	55 58.2
74	Summit east of wagon road	56 58.9
75	In valley east of wagon road	59 33.6
76	High plateau south of Rock Creek	119 01 23
77	.....do	02 54.9

TABLE IV.—*Locations, longitudes, and descriptions of the boundary monuments*—Cont'd.

FROM BRITISH SOURCES—Continued.

No.	Location of monument.	Longitude.	Description.	From what station determined.	No. in British Atlas.
		° ′ ″			
41	On side of mountain east of Nehoialpitkwu River.	118 09 58.2	Pile of stones.	Camp Stat-a-poos-tin.	121
42	On a gravel ridge west of river.....	11 56.1	.....do.....	.....do.....	120
43	In valley near trail to Colville.....	13 19.1	.....do.....	.....do.....	119
44	On point ridge right side of valley.	14 21.0	.....do.....	.....do.....	118
45	On north slope of mountains south of river.	16 36.7	.....do.....	In-chu-in-tum Station and Camp Stat-a-poos-tin.	117
46	On high ridge south of river.....	18 45.4	.....do.....	.....do.....	116
47	.....do.....	21 36.3	.....do.....	.....do.....	115
48	.....do.....	22 18.6	.....do.....	.....do.....	114
49	In valley of Nehoialpitkwu south of river.	24 17.2	.....do.....	.....do.....	113
50	.....do.....	25 38.2	.....do.....	.....do.....	112
51	.....do.....	26 32.6	.....do.....	.....do.....	111
52	In valley near and east of Colville trail.	27 40.8	.....do.....	.....do.....	110
53	On first plateau west of river.....	28 40.8	.....do.....	Camp Ne-hoi-al-pit-kwu and In-chu-in-tum Station.	109
54	.....do.....	29 48.7	.....do.....	.....do.....	108
55	On first bench west of small creek..	31 28.4	.....do.....	.....do.....	107
56	On summit between two creeks....	33 43.0	.....do.....	.....do.....	106
57	On devide between Rock Creek and Nehoialpitkwu.	36 43.4	.....do.....	.....do.....	105
58	On sharp ridge between heads of tributary of Rock Creek.	38 24.9	.....do.....	.....do.....	104
59	On southern slope of mountain....	39 51.5	.....do.....	.....do.....	103
60	.....do.....	40 57.2	.....do.....	.....do.....	102
61	In open country east of Rock Creek.	41 49.6	.....do.....	.....do.....	101
62	.....do.....	42 38.4	.....do.....	.....do.....	100
63	.....do.....	43 24.5	.....do.....	.....do.....	99
64	East of and near Colville trail.....	44 13.8	.....do.....	.....do.....	98
65	At foot of mountain, right bank of Nehoialpitkwu River.	45 12.6	Mound of earth.	Camp Osoyoos and Camp Ne-hoi-al-pit-kwu.	97
66	On point of ridge in bend of Nehoialpitkwu River.	45 48.9	Pile of stones.	.....do.....	96
67	On point of ridge in bend of Nehoialpitkwu.	46 45.6	.....do.....	.....do.....	95
68	In valley of Nechoialpitkwu.....	48 27.3	.....do.....	.....do.....	94
69	On point of ridge south and east of creek.	51 14.9	.....do.....	.....do.....	93
70	On ridge between two creeks.....	52 26.6	.....do.....	.....do.....	92
71	On same ridge.....	53 06.6	.....do.....	.....do.....	91
72	.....do.....	55 05.0	.....do.....	.....do.....	90
73	.....do.....	55 58.2	.....do.....	.....do.....	89
74	On summit east of wagon road to Rock Creek.	56 58.9	.....do.....	.....do.....	88
75	In valley east of wagon road to Rock Creek.	59 33.6	.....do.....	.....do.....	87
76	On high plateau south of Rock Creek.	119 01 23.0	.....do.....	.....do.....	86
77	.....do.....	2 54.9	.....do.....	.....do.....	84

TABLE III.—*Locations and longitudes of the boundary monuments*—Continued.

FROM AMERICAN SOURCES—Continued.

No.	Location of monument.	Longitude.
		° ′ ″
78	High plateau south of Rock Creek	119 04 36
79	Rocky ledge east of small lake	06 15
80	Summit east of creek	08 02.8
81	West bank of creek	09 32.8
82	First bench west of creek	10 18.4
83	Slope of hill north of small lake	11 56.5
84	South and east of Colville trail	14 27.2
85	North and west of small creek	17 10.4
86	Spur from mountain to the north	18 58.1
87	.....do	21 26.4
88	Summit of first ridge east of the valley	22 37.6
89	East side of Osoyoos Valley	24 08.9
90	West side of Osoyoos Valley	26 04.5
91	Plateau north of Similkameen River	28 48
92	.....do	29 52.6
93	Southern slope of rocky knoll	33 24
94	Ridge east of trail	36 14.6
95	Near trail	37 45.9
96	Isolated mountain east of Similkameen River	39 56.6
97	Left bank of Similkameen River	40 32.7
98	Foot of mountains west side of Similkameen Valley	42 20.9
99	Flat east side of swamp	58 38.7
100	Near small stream	59 57.9
101	Sharp ridge west side of stream	120 00 46.1
102	Bench east side Pa-say-ten Valley	32 00.9
103	Slope west side Pa-say-ten Valley	32 29.3
104	Hillside east of Chuchuwanten River	38 51.9
105	Hillside west of Chuchuwanten River	39 47.2
106	Bench of hill east side of Skagit Valley	121 02 26.6
107	Slope of mountain west side of Skagit Valley	04 22.2
108	Base of mountain south of camp	16 41.4
109	West of and near trail to Skagit	16 56.3
110	East of and near trail to Skagit	18 57.3
111	East side of Klahaihu Valley	23 11
112	West side of Klahaihu Valley	23 48.5
113	East of river	30 08.4
114	On rock west of river	30 21.2

TABLE IV.—*Locations, longitudes, and descriptions of the boundary monuments*—Cont'd.

FROM BRITISH SOURCES—Continued.

No.	Location of monument.	Longitude.	Description.	From what station determined.	No. in British Atlas.
		° ′ ″			
78	On high plateau south of Rock Creek.	119 4 36.0	Pile of stones.	Camp Osoyoos and Camp Ne-hoi-al-pit-kwu.	85
79	On rocky ridge east of small lake ..	6 15.0	.....do	.....do	83
80	On summit east of fork of Rock Creek.	8 02.8	.....do	.....do	82
81	On valley of fork of Rock Creek, west bank.	9 32.8	.....do	.....do	81
82	On first bench west of fork of Rock Creek.	10 18.4	.....do	.....do	80
83	North of small lake.....	11 56.5	.....do	.....do	79
84	Southeast of Colville trail	14 27.2	.....do	.....do	78
85	North and west of small creek	17 10.4	.....do	.....do	77
86	On spur from mountain to the north.	18 58.1	.....do	.....do	76
87	.....do	21 26.4	.....do	.....do	75
88	Summit of first ridge east of Lake Osoyoos.	22 37.6	.....do	.....do	74
89	East of trail up east bank of Lake Osoyoos.	24 08.0	.....do	.....do	73
90	West of trail up west bank of Lake Osoyoos.	26 04.5	.....do	Camp Similkameen and Camp Osoyoos.	72
91	Near divide between Osoyoos and Similkameen and near junction of trail.	28 48.0	.....do	.....do	71
92	On plateau north of Similkameen..	29 52.6	.....do	.....do	70
93	On southern slope of a rocky knoll.	33 24.0	.....do	.....do	69
94	On summit of ridge east of trail up Similkameen.	36 14.6	.....do	.....do	68
95	East of and near trail up Similkameen.	37 45.9	.....do	.....do	67
96	On summit of isolated mountain of Similkameen.	39 56.6	.....do	.....do	66
97	On left bank of Similkameen	40 32.7	.....do	.....do	65
98	At foot mountains west side Similkameen Valley.	42 20.9	.....do	.....do	64
99	On flat east side of stream.....	58 38.7	.....do	Nais-nu-loh Station.	63
100	East and near to stream.....	59 57.9	.....do	Nais-nu-loh Station.	62
101	On sharp ridge west side of stream.	120 00 46.1	.....do	.....do	61
102	On bench, east side of Pasayten Valley.	32 00.9	.....do	Camp Pa-say-ten.	60
103	On slope west sideof Pasayten Valley	32 29.3	.....do	.....do	59
104	On hillside east of river	38 51.9	.....do	Roche Station....	58
105	On hillside west of station	39 47.2	.....do	.....do	57
106	On side of hill east of Skagit Valley.	121 02 26.6	.....do	Camp Skagit	56
107	On side of mountain west side of Skagit Valley.	04 22.2	.....do	.....do	55
108	At foot of mountain south of camp.	16 41.4	.....do	Camp Chuch-che-hum.	54
109	West of and near trail to Skagit ...	16 56.2	.....do	.....do	53
110	East of and near trail to Skagit	18 57.3	.....do	.....do	52
111	On east side of Klahaihu Valley ...	23 11.0	.....do	Camp Chilowe-yuck.	51
112	On west side of Klahaihu Valley...	23 48 5	.....do	.....do	50
113	On east side of Ensaw-kwatch River.	30 08.4	.....do	En-saw-kwatch Station.	49
114	On west side of Ensaw-kwatch River.	30 21.2	Bench mark ↑	.....do	48

TABLE III.—*Locations and longitudes of the boundary monuments*—Continued.

FROM AMERICAN SOURCES—Continued.

No.	Location of monument.	Longitude.
		° ′ ″
115	East side of Sen-eh-say River	121 35 28.4
116	Side of mountain south of creek	42 56.3
117	.....do	43 31.6
118	Side of mountain west of falls of creek	43 58.1
119	Whatcom trail (last iron pillar) *a*	122 04 45.2
120	Small bench east base of hill	05.26.6
121	Summit of hill east of Sumass Prairie	06 31.9
122	Bench above rocky precipice	07 21.7
123	Face of hill	07 50.4
124	Small bench west of stream	08 38.4
125	Flat east of stream	10 02.7
126	Rising ground	11 00.8
127	Meridian of Camp Sumass	11 52.8
128	East side of Sumass River	12 46.3
129	Trail west of Sumass River	12 55.2
130	Trail crossing boundary	14 01
131	Trail on sharp ridge west of swamp	15 04.1
132	Flat north of trail	16 29.1
133	Hill east of trail	18 00.6
134	East bank of small lake	19 08.9
135	Trail crossing boundary	19 55.1
136	West of swamp and north of trail	20 29.4
137	Flat north of trail	21 47.6
138	Trail crossing boundary	22 20.7
139	Trail east side of Cullam Creek	23 05.9
140	Flat south of trail	24 22.7
141	.....do	25 04.1
142	Rising ground between swamp and creek	27 19.3
143	Belt of timber between swamps	28 32.9
144	Edge of slope west of swamp	29 37.2
145	Trail west bank of Sehkomehkl Creek	30 07.9
146	Ridge west of Sehkomehkl Creek	31 05.1
147	Flat north of trail	32 13.7
148	Small ridge south of trail	33 27.7
149	Flat south of trail	34 46.7
150	Flat near stream, south of trail	36 08.5
151	Latitude mark, British station	37 01.6
152	First bench and south of trail	37 26.9

a A pencil note here says: "All iron pillars from western end to Whatcom trail—43 in all—36 given here."

TABLE IV.—*Locations, longitudes, and descriptions of the boundary monuments*—Cont'd.

FROM BRITISH SOURCES—Continued.

No.	Location of monument.	Longitude.	Description.	From what station determined.	No. in British Atlas.
		° ′ ″			
115	On east side of Sen-eh-say, or Selacee, River.	121 35 28.4	Pile of stones.	Sen-eh-say Station	47
116	On side of mountain south of creek.	42 56.3	Pyramid of stones.	Camp Tummea-hai.	46
117	.....do.....	43 31.6	.....do.....	.....do.....	45
118	On side of mountain west of falls of creek.	43.58.1	.....do.....	.....do.....	44
119	On De Lacy's trail, Whatcom to Fort Hope, crossing line.	122 4 45.2	Iron pillar....	Sumass Station and Camp.	43
120	On bench at base of hill	5 26.6	.....do.....	.....do.....	42
121	On top of mountain east side of Sumass Prairie.	6 31.9	.....do.....	.....do.....	41
122	On bench above rocky precipice east of trail.	7 21.7	.....do.....	.....do.....	40
123	On face of hill 5 chains from base and near trail.	7 50.4	.....do.....	.....do.....	39
124	On bench west of stream.....	8 38.4	.....do.....	.....do.....	38
125	On flat east of stream	10 02.7	.....do.....	.....do.....	37
126	On mound east of latitude mark...	11 00.8	.....do.....	.....do.....	36
127	Latitude mark Sumass	11 52.8	.....do.....	British Station ...	35
128	On east side of Sumass River	12 46.3	.....do.....	.....do.....	34
129	On Whatcom trail west side Sumass River.	12 55.2	.....do.....	.....do.....	33
130	On trail crossing boundary line....	14 01.0	.....do.....	.....do.....	32
131	On top of hill west of swamp and on trail crossing line.	15 04.1	.....do.....	.....do.....	31
132	On flat north of trail and west of swamp.	16 29.1	.....do.....	.....do.....	30
133	On hill 20 chains east of trail crossing line.	18 00.6	.....do.....	.....do.....	29
134	On east side small lake.....	19 08.9	.....do.....	.....do.....	28
135	On trail crossing boundary line....	19 55.1	.....do.....	.....do.....	27
136	On west side of swamp and north of trail.	20 29.4	.....do.....	.....do.....	26
137	On flat north of trail	21 47.6	.....do.....	.....do.....	25
138	On trail crossing boundary line....	22 20.7	.....do.....	.....do.....	24
139	On trail crossing boundary line east side of creek.	23 05.9	.....do.....	.....do.....	23
140	On flat south of trail.....	24 22.7	.....do.....	.....do.....	22
141	.....do.....	25 04.1	.....do.....	.....do.....	21
142	On slightly elevated ground west of creek.	27 19.3	.....do.....	.....do.....	20
143	On belt of timber between swamps.	28 32.9	.....do.....	.....do.....	19
144	On edge of slope west of stream and south of trail.	29 37.2	.....do.....	.....do.....	18
145	On trail crossing line west side of Seh-ko-mehl Creek,	30 07.9	.....do.....	.....do.....	17
146	On ridge west of Seh-ko-mehl Creek.	31 05.1	.....do.....	.....do.....	16
147	On flat north of trail.....	32 13.7	.....do.....	.....do.....	15
148	On ridge south of trail and stream .	33 27.7	.....do.....	.....do.....	14
149	On flat south of trail.....	34 46.7	.....do.....	.....do.....	13
150	On flat near stream south of trail...	36 08.5	.....do.....	.....do.....	12
151	Latitude mark, British station	37 01.6	.....do.....	.....do.....	11
152	On first bench south of trail.....	37 26.9	.....do.....	.....do.....	10

TABLE III.—*Locations and longitudes of the boundary monuments*—Continued.

FROM AMERICAN SOURCES—Continued.

No.	Location of monument.	Longitude.
		° ′ ″
153	Slope south of trail	122 38 45.5
154	Flat west of ravine	40 04.1
155	....do	41 22.7
156	Small ridge between swamps	42 20.5
157	Parallel station	43 59.9
158	East side of Point Roberts	123 00 42.9
159	Ridge on Point Roberts	02 12.7
160	Flat east of Obelisk	03 02.9
161	Initial Point, Obelisk of stone	03 53

TABLE IV.—*Locations, longitudes, and descriptions of the boundary monuments*—Cont'd.

FROM BRITISH SOURCES—Continued.

No.	Location of monument.	Longitude.	Description.	From what station determined.	No. in British Atlas.
		° ′ ″			
153	On slope south of trail	122 38 45.6	Iron pillar	British Station	9
154	On flat west of ravine	40 04.1	do	do	8
155	do	41 22.7	do	do	7
156	On small ridge between swamps	42 20.5	do	do	6
157	Near high-water mark, Simiahmoo Bay.	43 59.9	do	do	5
158	On east side of Point Roberts	123 00 42.9	do	Camp Simiahmoo observatory.	4
159	On ridge	02 12.7	do	do	3
160	On flat east of Obelisk, Point Roberts.	03 02.9	do	do	2
161	On west face of Point Roberts	03 53.0	Obelisk	do	1

MAGNETICS.

Both the British and the American surveyors were equipped with an outfit of instruments for determining the magnetic declination, dip, and force. The British instruments were standardized at Greenwich, and the resulting elements at 23 stations, as obtained by Captain Haig, were discussed by General Sabine and published in the Philosophical Transactions. An abstract of these results is printed on page 42 of this bulletin.

As to the results by the American parties, much, unfortunately, must be left to inference, their results being, supposedly, in the "lost report." Mr. Campbell, writing in 1869,[1] says: "A magnetic survey extending over a range of 3° 20′ in latitude and 4° in longitude, with the necessary observations of the magnetic elements of the astronomical stations, was also made." The work appears to have been done by Mr. J. S. Harris, whose results were secured by the United States Coast Survey. From these it appears that the observations covered a considerably larger extent of territory than that above indicated by Mr. Campbell. The character of the instrumental outfit and its fate in the field can be inferred, in part, from the two following passages from General Parke's report of progress, written November 12, 1859: "A full set of magnetic observations were made at one station" (in 1858).[2] Also, "I am happy to report that we have got thus far through the season's work without any damage to our astronomical instruments. I regret, however, that we have been less fortunate with the magnetic instruments. The mule carrying these missed his footing and rolled down a precipitous bank. The magnetic theodolite will have to be replaced, and the other instruments will require repairing."[3]

The Coast and Geodetic Survey has furnished from its manuscript registers the following table of results for declination, dip, and intensity.

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[1] House Ex. Doc. No. 86, Fortieth Congress, third session, p. 95.
[2] Senate Ex. Doc. No. 16, Thirty-sixth Congress, first session, p. 6.
[3] Same, pp. 6–7

Declination, dip, and force for the mean epoch 1860.

[Results from observations by Joseph S. Harris, United States Northwestern Boundary Commission, 1858 to 1861. From manuscript furnished by the United States Coast and Geodetic Survey.]

Station.	Latitude.	Longitude.	East declination.	Dip.	Horizontal force.		Total force.
					Br. units.	C. G. S. units.	C. G. S. units.
	° ′	° ′	° ′	° ′			
Magnetic station	49 00	114 21	22 58	.....	.....	.....	.....
Do	48 59	115 10	22 58	.....	.....	.....	.....
Camp No. 11	49 07	115 16	.....	73 37	.....	.....	.....
Camp No. 14, Joseph Prairie	49 31	115 35	23 34	73 49	3.757	0.1732	0.6217
Magnetic station	49 00	116 33	22 37	.....	.....	.....	.....
Do	48 42	116 19	22 16	.....	.....	.....	.....
Do	48 10	116 45	21 49	.....	.....	.....	.....
Peon Prairie	47 44	117 14	21 53	72 05	4.099	0.1890	0.6146
Spokane Ferry	47 49	117 49	22 07	71 52	4.132	0.1905	0.6123
Colville Depot	48 34	117 52	22 31	72 31	3.976	0.1833	0.6100
Tukannon River	46 32	118 00	20 55	70 22	4.380	0.2020	0.6009
Lugenbeel Creek	47 09	118 06	20 55	71 19	4.229	0.1950	0.6085
Cow Creek	46 53	118 10	21 01	71 01	4.301	0.1983	0.6097
Dry Creek	46 09	118 18	20 13	70 47	4.289	0.1978	0.6007
Magnetic station	46 03	118 25	20 00	.....	.....	.....	.....
Do	49 00	118 44	22 07	.....	.....	.....	.....
Near Wallula	46 02	119 00	19 46	.....	.....	.....	.....
Camp Osoyoos	49 00	119 24	.....	72 33	.....	.....	.....
Magnetic station	49 00	119 35	23 34	.....	.....	.....	.....
Do	49 03	120 55	24 19	.....	.....	.....	.....
Skagit	49 00	121 03	.....	72 40	3.933	0.1812	0.6084
Magnetic station	49 05	121 07	22 23	.....	.....	.....	.....
Camp Chiloweyuck	49 01	121 23	22 09	72 25	4.025	0.1856	0.6141
Magnetic station	48 59	121 42	22 47	.....	.....	.....	.....
Do	49 01	121 45	22 55	.....	.....	.....	.....
Do	48 59	121 57	22 39	.....	.....	.....	.....
Semiahmoo	49 01	122 46	22 55	72 01	4.094	0.1888	0.6115
Point Roberts	48 59	122 58	22 39	71 46	4.111	0.1896	0.6056

Declination, dip, and force for the mean epoch 1860.

[Abstract of results obtained by Capt. R. W. Haig, R. A., with standard instruments, between August, 1858, and August, 1861, in connection with the survey of the northwest boundary. From Philosophical Transactions of the Royal Society, 1864, vol. 154, pp. 161–166.]

Station.	Latitude.		Longitude.		East declination.		Dip.		Total force.	
									Br. units.	C. G. S. units.
	°	′	°	′	°	′	°	′		
Akamina station	49	01	114	04	22	56	73	38	13.522	0.6235
Wigwam station	49	00	114	45	22	50	73	30	.496	0.6223
Tobacco Plains (Kootenay)	48	57	115	08	.....		73	24	.481	0.6216
On Kootenai River	48	40	115	17	22	36	73	09	.460	0.6206
South Crossing (Kootenay)	48	22	115	21	22	28	72	55	.443	0.6198
Chelemta	48	41	116	19	22	27	72	59	.423	0.6189
Pack River	48	22	116	28	22	19	72	43	.401	0.6179
Sinyakwateen	48	09	116	44	22	10	72	30	.238	0.6104
Chemikane River	48	00	117	45	21	57	72	12	.334	0.6148
Colville B. B. C. Barracks	48	40	118	05	22	11	72	39	.357	0.6159
Inshwointum	49	00	118	28	22	15	72	50	.361	0.6161
Osoyoos station	49	00	119	24	22	07	.....		.....	.....
Ashtnolou station	49	00	120	00	22	12	72	34	.306	0.6135
On Ashtnolou River	49	07	120	00	22	04	.....		.....	.....
Do	49	10	120	00	22	06	72	42	.315	0.6139
Dalles, 8-mile camp	45	40	120	49	.....		69	49	.091	0.6036
Dalles, 3-mile camp	45	35	120	49	20	27	69	45	.087	0.6034
Chiluweyuk	49	02	121	23	.....		72	21	.257	0.6113
Schweltza Lake	49	02	122	00	21	44	72	14	.234	0.6102
Sumass Prairie	49	01	122	12	21	42	72	11	.226	0.6098
Nisqually	47	07	122	25	20	51	70	39	.111	0.6045
Fort Vancouver	45	38	122	28	20	13	69	28	.026	0.6006
Esquimalt	48	26	123	27	21	20	71	30	.148	0.6062

ELEVATIONS.

Elevations were determined along and near the boundary by both the American and British parties throughout the progress of the survey. Most of them were measured barometrically; a few were determined by triangulation.

Among the State Department papers is a short summary or table of heights determined by the British, and a longer and incomplete list of elevations determined by the United States parties.

The British list, contained on two leaves of blue foolscap paper, is entitled: "Abstract of the principal heights determined by barometrical measurements on the line of the North American boundary in the years 1859, 60–61."

The table contains eight columns. The first gives the year; the second, name of station; third, latitude; fourth, longitude; fifth, barometer (always marked A or M, meaning probably aneroid or mercurial); sixth, number; seventh, elevation above sea level; eighth, how determined. The paper is not dated or signed. Columns 2, 3, 4, and 7 of that table are here printed on pages 43 and 44.

The American list is entitled: "Data concerning the determination of altitudes by the U. S. N. W. Boundary Commission in the years 1857, 58, 59, and 60."

This data is contained in two cahiers, of six double sheets each, designated Vol. I and Vol. II. The first one has been revised throughout; the second one is apparently revised in part only and is incomplete. The data is in nine columns. The first gives the date "when occupied;" the second, the name of station; third, barometer (designated by number, 790, 1224, 1219, 1226); fourth, number; fifth, latitude; sixth, longitude; seventh, observer; eighth, altitude; ninth, remarks. We here print columns 2 and 9 (consolidated), 5, 6, and 8.

Elevations along the forty-ninth parallel from the Pacific Ocean to the Rocky Mountains, determined barometrically, in the years 1857–1860, by the British Northwestern Boundary Commission.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′ ″	° ′ ″	*Feet.*
1	River about 2 miles below lower end of Chief Mountain Lake	.....	.....	5,028
2	Watershed in South Kootenai Pass	.....	.....	6,970
3	Mountain near following station	.....	.....	8,454
4	End of boundary line, watershed in latitude 49°	49 0 00	114 3 25	7,524
5	Terminal latitude station	49 0 52	3 34	6,548
6	Watershed on trail below Summit Station	49 1 26	3 54	5,859
7	Mule Camp	49 3 38	7 30	5,191
8	Junction of trails south of Kootenai Pass	49 5 39	11 42	4,753
9	Flathead latitude station	49 0 00	21 06	4,136
10	Ford of Flathead River	48 57 01	24 24	4,073
11	Flathead Valley, upper terrace	48 56 18	28 40	4,267
12	Wigwam River Station	48 59 43	45 02	4,694
13	Watershed, Tobacco and Wigwam	48 57 23	45 02	5,332
14	Camp [near head of Tobacco River, homeward]	48 53 06	45 43	4,350
15	Camp near head of Tobacco River [outward]			4,358
16	Camp on Tobacco River—homeward	48 49 04	53 52	2,998
	Camp on Tobacco River—outward			3,103
17	Mooyie cutting	49 00 00	116 11 40	2,252
18	Crossing of Mooyie River	48 54 08	11 38	2,142
19	Second ridge west of Yakh River	48 54 17	8 30	4,466
20	First ridge west of Yakh River	48 33 55	4 00	5,791
21	High peak above following station	.....	.....	8,531
22	Watershed, Kootanie and Yakh rivers	48 58 13	115 25 00	7,664
23	Watershed at head of Mooyie River	49 27 00	115 46 00	2,920
24	Yakh River Station	48 59 55	38 48	2,927
				2,998
25	Third crossing, Kootanie River on Tobacco plains near trading post	48 37 30	10 00	2,228
				2,296
				2,300
26	Second crossing, Kootanie River	48 22 01	26 30	2,136
27	Chelempta Kootanie River	48 41 15	116 34 24	1,712
28	Sinyakwateen Ferry	48 09 16	50 20	1,996
29	Lake 9 miles south of Sinyakwateen	48 00 03	52 00	2,192
30	Edge of wood, Spokane plains	48 48 35	117 00 45	2,143

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.			Longitude.			Elevation.
		°	′	″	°	′	″	*Feet.*
31	Plants house	48	42	50	117	17	00	2,018
32	Little Spokan Springs	48	46	10		29	00	1,641
33	Spokan River—west bend	47	53	20		40	30	1,423
34	Chém-a-kane bridge	48	0	14	116	46	24	1,890
35	N. A. B. C. Barracks, at Colville, Columbia River	48	39	58	118	05	10	1,268 1,336
36	Fort Shepherd	49	01	05	117	36	58	1,405
37	Third boundary crossing of Colville River	48	58	26	118	13	28	1,534
38	Statapoostin Station	49	00	13		17	09	1,515
39	Camp 8½ miles below In-chú-in-tum Station	49	00	23		25	00	1,871
40	In-chú-in-tum Station	49	00	01		30	13	1,991
41	Camp on line near Rock Creek	48	59	30	119	02	10	2,351
42	Haigs Pond	49	00	00		8	40	3,784
43	Camp Archer, near Osoyoos	48	59	50		19	05	2,880
44	Larchtree Hill	49	00	00		13	00	3,964
45	Similkameen River, near Vermilion Forks							1,597
46	Camp above Similkameen							3,031
47	Camp near Moodys Flat							4,119
48	Camp 21 miles out on road							1,652
49	Fort Hope							*a* 140
50	Osoyoos Lake	49	00	00	119	26	40	757 928 949
51	Similkameen River							1,180
52	Haynes house	49	02	00	119	43	00	1,130
53	Similkameen—lower ford	49	12	05		53	10	1,244
54	Highest Ashtnolon Mountain	48	58	40	120	01	30	*b* 7,500
55	Ashtnolon Station	48	59	54		02	44	5,558
56	Upper Ashtnolon Ford	49	08	00		03	15	2,431
57	Ashtnolon Cache	49	07	20		19	20	3,556
58	Ptarmigan Hill	49	08	40		26	00	6,331
59	Mouth of Pasayten River	49	09	55		35	55	3,060
60	Roche River Station	48	59	50		41	20	4,300
61	Mouth of Roche River	49	03	30		44	40	3,774 3,459
62	Camp about 600 feet below summit on east side of Hozomeen {outward / returning}	49	02	05		59	30	5,538 5,527
63	Summit of Hozomeen Pass	49	02	40	121	00	45	6,277
64	Skagit Ford	49	08	00		11	05	1,640 1,634
65	Chuchchehum Pass		00	20		17	40	4,719
66	Chiloweyuck Lake		01	30		25	10	2,052

a Assumed. *b* Approximate.

Elevations along the forty-ninth parallel from the Pacific Ocean to the Rocky Mountains, determined barometrically in the years 1857–1860 by the United States Northwestern Boundary Commission.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
1	Camp Simiahmoo	49 00.7	122 45.5	11
2	Camp Sumass	01.4	11.9	14
3	Sumass Creek, mouth of; by the creek and lake about 15 miles below Camp Sumass, about 57 miles from the sea; ordinary tides rise here about 1 foot	08.7	04.3	7
4	Mountains east of Pekosie Lake	48 58.5	01.0	4,991
5	Harrison Lake	49 19.1	121 43.4	30
6	Harrison or Shook-o-meh River, mouth of	.....	.....	20
7	Chiloweyuck River, near Hudson Bay Company fishery	.....	.....	15
8	Hach-tcha village, about 77 miles above mouth of Fraser River	.....	.....	29
9	Skow-aal-hu village, about 90 miles above mouth of Fraser River	.....	.....	70
10	Fort Hope, altitude of Fraser River	.....	.....	120
11	Indian village on Chiloweyuck River, 5 miles above Chiloweyuck Depot	49 07.8	121 55.0	77
12	Foot of first high ridge after leaving Chiloweyuck Depot	06.9	56.2	179
13	Chiloweyuck River, north bank, 14 miles above Chiloweyuck Depot, in flat below mouth of Tummeahai Creek, at foot of first mountain over which trail passes	05.0	51.9	419
14	Chiloweyuck River; Frenchmans Camp, 21 miles above Chiloweyuck Depot	05.1	42.3	723
15	Chiloweyuck River; mouth of Utzetza (second large tributary from the north), 26 miles above Chiloweyuck Depot	06.6	36.8	1,071
16	Chiloweyuck River; Samana village, 24 miles above Chiloweyuck Depot and 2 miles above mouth of Senehsay Creek	05.8	39.3	913
17	Chiloweyuck River; 33 miles above Chiloweyuck Depot and 3 miles below Chiloweyuck Lake	06.0	30.7	1,550
18	Chiloweyuck River, 10 miles above Chiloweyuck Depot	06.0	57.3	157
19	Trail, Chiloweyuck Depot to Chiloweyuck Lake; spring west of summit of first high ridge	05.7	54.4	1,027
20	Trail, Chiloweyuck Depot to Chiloweyuck Lake, summit first ridge	05.5	54.2	1,268
21	Tummeahai Creek, mouth of (25 feet above water), 15 miles above Chiloweyuck Depot	04.4	49.3	400
22	Chiloweyuck Depot (15 feet above mean water), 63 miles from the sea	09.5	58.0	39
23	Camp Tummeahai, 3 miles above mouth of Tummeahai Creek	02.1	47.6	1,146
24	Forks of Tummeahai, 7 miles above mouth of Tummeahai Creek	00.2	43.8	2,056
25	Put-lush-go-hap Lake, on Main Fork Tummeahai Creek, 10 miles above its mouth	48 58.5	41.0	3,639
26	Foot of rapids in Tummeahai Creek, below lake, 9½ miles from creek's mouth	59.2	41.3	2,915
27	Divide between Tummeahai Creek (Main Fork) and Sen-eh-say and Nooksahk, 12 miles above mouth of Tummeahai Creek, 11 miles from mouth of Sen-eh-say Creek, and 5 miles from Nuquoichum, tributary of the Nooksahk	57.4	39.4	6,117
28	Tummeahai Creek (head of South Fork), 11 miles above mouth of Tummeahai Creek	57.8	44.9	3,745
29	Divide between Nooksahk and Tummeahai (South Fork), 11½ miles above mouth of Tummeahai Creek and 14 miles above Cowap, tributary of the Nooksahk	57.4	44.8	5,893

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
30	La-yome-sin Creek, crossing about ¼ mile above mouth, 11 miles above Chiloweyuck Depot	49 04.3	121 54.0	572
31	La-yome-sin Creek, 4 miles above mouth	02.8	52.9	1,026
32	Summit, east head of La-yome-sin and Nooksahk, 8 miles above mouth of La-yome-sin	00.0	49.4	5,212
33	Summit of mountain in divide between La-yome-sin and Tummeahai, near junction of this ridge with the Chiloweyuck-Nooksahk divide	00.4	49.6	4,930
34	Chiloweyuck-Nooksahk divide, highest point in this immediate vicinity	48 59.2	53.0	5,200
35	Summit Kaisootst Mountain	57.8	57.0	5,289
36	Summit Signal peak	59.2	122 00.1	4,991
37	Summit Tummeahai	49 01.9	121 45.1	6,633
38	Divide between Nooksahk and Tummeahai	48 57.3	43.5	5,893
39	Summit La-yome-sin Mountain	49 01.9	50.5	5,884
40	Summit Klehtlakeh Mountain	11.0	40.0	6,840
41	Near summit Put-lush-go-hap Mountain	48 59.7	38.8	*a* 7,195
42	Summit Put-lush-go-hap Mountain	59.7	38.8	7,687
43	Sen-eh-say Creek, mouth of, 22 miles above Chiloweyuck Depot	49 04.0	40.8	823
44	Sen-eh-say Creek, 5 miles from mouth, at mouth of Chuchum Creek	02.0	38.0	1,621
45	Sen-eh-say Creek, 8 miles from mouth, at forks	48 59.8	36.7	2,394
46	Sen-eh-say Creek, 11 miles from mouth, at head of West Fork	57.7	39.4	3,302
47	En-saaw-kwatch Creek, mouth of, 29 miles above Chiloweyuck Depot	49 05.5	34.7	1,296
48	En-saaw-kwatch Creek, 4 miles above its mouth	02.2	32.7	2,900
49	En-saaw-kwatch Creek, heads of, 10 miles above its mouth	48 58.5	29.4	5,073
50	Divide between two western tributaries of Klab-neh Creek, 4½ miles from mouth of tributaries	57.4	28.3	5,617
51	High point on same divide; En-saaw-kwatch and Klab-neh	57.0	28.4	6,856
52	First western tributary of Klab-neh Creek, 4 miles above its mouth	58.2	27.3	4,317
53	First western tributary of Klab-neh Creek, mouth of, 2 miles above mouth of Klab-neh and 42½ miles above Chiloweyuck Depot	59.6	23.5	2,076
54	Camp Chiloweyuck on Klab-neh Creek, 1 mile above Lake Depot	49 00.4	23.7	2,002
55	Lake Depot on Chiloweyuck Lake (6 feet above lake level, approximately)	01.8	23.0	1,997
56	Peak west of Chiloweyuck Lake	02.2	26.6	7,244
57	Pekosie Lake, 4 miles above mouth of Pekosie Creek	48 58.9	122 02.8	790
58	Nooksahk River, 46 miles above mouth, and 4 miles above mouth of Pekosie Creek	55.6	02.5	635
59	Nooksahk River, 50 miles above mouth, at mouth of Cowap Creek	53.7	121 57.0	701
60	Nooksahk River, 53 miles above mouth, near mouth of Noochsakatsu, South Branch	53.3	55.1	*b* 936
61	Nooksahk River, 56 miles above mouth, near mouth of Tchahko, South Branch	53.2	52.0	1,299
62	Nooksahk River, 62 miles above mouth, right bank	53.9	44.7	1,307
63	Nooksahk River, 66 miles above mouth, right bank, at mouth of Nuquoichum	54.1	40.3	2,044
64	Head of Nuquoichum, 4½ miles from mouth	57.8	38.0	5,451

a "Summit perhaps 300 feet higher." H. Custer, 1863.

b Observations taken on the trail and "should not perhaps be taken as the height of the river."

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
65	Limit of growth of timber, Put-lush-go-hap Mountain	49 00.0	121 39.0	6,593
66	.....do	48 57.5	37.5	6,117
67	Kockolum Creek, half mile above mouth (mouth is half mile below Chiloweyuck)	49 05.7	26.2	1,973
68	Kockolum Creek, 3 miles above mouth, outlet of first lake (Kehkawalum)	07.2	25.6	2,652
69	Kockolum Creek, 4½ miles above mouth, between two lakes	08.8	24.8	2,843
70	Kockolum Creek, 5½ miles above mouth, divide from Klehkwunnum; near head of Indian Lake and 4 miles from mouth of this tributary of Klehkwunnum	09.5	24.3	3,259
71	Water of second lake, 16 miles from mouth of Klehkwunnum *a*	09.6	24.4	3,132
72	Klehkwunnum Creek, mouth of Pips Creek	12.3	21.4	1,917
73	Klehkwunnum Creek, 19 miles from mouth, marsh lakes near head of	10.0	18.0	1,927
74	Divide between Skagit and Fraser rivers, head of Kle-sil-kwu Creek *b*	09.3	16.8	1,948
75	Junction of Man-sel-pan-ik and Kle-sil-kwu creeks.	07.8	13.6	1,820
76	Junction of Man-sel-pan-ik and Kle-sil-kwu creeks, 4½ miles above mouth of Kle-sil-kwu	08.0	13.0	1,860
77	High mountain, northeast side of Klehkwunnum.	10.6	14.5	6,480
78	Skagit Ford, 110 miles from mouth of Skagit River.	07.7	08.5	1,752
79	Man-sel-pan-ik Creek, 4 miles from junction with Kle-sil-kwu Creek	04.6	14.5	3,027
80	Man-sel-pan-ik Creek, 7 miles from junction with Kle-sil-kwu Creek	02.4	14.3	3,491
81	Man-sel-pan-ik Creek, 7½ miles from junction with Kle-sil-kwu Creek, first western tributary	01.6	14.4	3,550
82	Man-sel-pan-ik Creek, 8 miles from junction with Kle-sil-kwu Creek, where Whatcom trail strikes it	01.2	14.4	4,080
83	Man-sel-pan-ik and Skagit divide, second summit on Whatcom trail	01.9	13.4	5,718
84	Summit on trail, Chuch-che-hum to Skagit, 9 miles from mouth of Man-sel-pan-ik; 7 miles from mouth of Chuch-che-hum	00.6	15.3	4,505
85	Lowest point of same divide	00.5	15.3	4,445
86	Head of gorge 150 yards west of divide	00.4	15.1	4,143
87	Summit of old Whatcom trail	00.9	16.3	5,664
88	Blue Lake, 6 miles from mouth of Chuch-che-hum Creek	00.4	15.6	3,725
89	Divide, Chiloweyuck-Skagit-Fraser	02.3	16.3	6,837
90	Camp Chuch-che-hum, 5½ miles from mouth of Chuch-che-hum Creek	00.1	16.7	3,420
91	Nef Prairie, 3 miles southeast of Lake Depot	00.2	20.2	2,592
92	Klab-neh Creek, 4 miles from mouth	48 58.0	22.6	2,078
93	Klab-neh Creek, 5 miles from mouth, first tributary from the east	57.2	23.1	2,090
94	Klab-neh Creek, 7 miles from mouth, near second large tributary from the east	55.8	23.3	2,243
95	Klab-neh Creek, 9½ miles from mouth, near third large tributary from the east	54.3	25.2	2,414
96	Klab-neh Creek, 10 miles from mouth	54.0	25.6	2,538
97	Near summit of ridge west of Klab-neh	54.0	26.9	4,410

a This is supposed to be the lowest of all the divides between these two streams, 20 miles from mouth of Klehkwunnum Creek and 7 miles from mouth of Kle-sil-kwu Creek.

b This stream is supposed to fall gently till near its entrance into Fraser River, 2 miles below Fort Hope, where it becomes rapid.

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
98	Summit of Goat Mountain; divide between Klab-neh and Zakeno (tributary of the Skagit), 30 miles above mouth of Zakeno, 50 miles above mouth of Skagit, and 16 miles from mouth of Klab-neh	48 51.7	121 24.0	5,862
99	On divide Klaheh Creek, a branch of Red Mountain Creek, 4 miles above mouth of latter	52.0	24.2	5,106
100	Red Mountain Creek	52.6	23.1	2,932
101	Red Mountain Creek, 4½ miles above mouth, near head of southern branch	50.9	21.4	3,754
102	Divide Klab-neh and Glacier creeks, 8½ miles above mouth of Red Mountain Creek, 15 miles above mouth of Glacier Creek	52.0	17.6	5,107
103	Glacier Creek (Sko-mel-pua-nook), head or first forks of, 13½ miles above its mouth	52.0	15.4	2,891
104	Glacier Creek, 11 miles above its mouth	52.9	13.4	2,550
105	Glacier Creek, 9 miles above its mouth	53.3	11.2	2,292
106	Glacier Creek, 5 miles above its mouth	54.4	08.0	2,075
107	Glacier Creek, 2½ miles above its mouth	54.4	04.7	1,940
108	Glacier Creek, mouth of, junction with Skagit, 84 miles from mouth of Skagit	55.0	02.4	1,525
109	Skagit River, 87 miles above its mouth	57.2	03.4	1,531
110	Skagit River, 82 miles above its mouth	53.5	01.2	1,468
111	Skagit River, 71 miles above its mouth	48.6	01.6	1,405
112	Skagit River, 64 miles above its mouth	44.2	02.0	1,298
113	Camp Skagit, 96 miles above mouth of Skagit (15 feet above river)	49 00.0	02.8	1,573
114	Skagit Cache, in Skagit Valley, 2 miles east of river	02.2	01.2	1,748
115	Camp on tributary of Skagit, ½ mile above mouth; its mouth 97 miles above Skagit's mouth	01.5	02.0	1,586
116	Camp on tributary of Skagit (Ne-pó-pe-eh-kum), 1 mile above mouth; its mouth 99 miles above Skagit's mouth	02.6	03.1	1,611
117	Camp on Skagit (15 feet above water), 100 miles above Skagit's mouth	02.9	04.0	1,624
118	Camp on Skagit (25 feet above water), 101 miles above Skagit's mouth	03.6	04.3	1,637
119	Camp on slough of Skagit, 104 miles above Skagit's mouth	04.7	05.0	1,675
120	Camp on Skagit (20 feet above water), 108 miles above Skagit's mouth	06.7	07.2	1,727
121	Skagit River, 115 miles above its mouth	11.0	02.6	1,812
122	Skagit River, 120 miles above its mouth, above mouth of Kullas Creek	14.1	03.0	1,947
123	High point on divide, Skagit-Similkameen	18.3	120 56.8	6,871
124	Camp near Skagit-Similkameen divide, 126 miles from mouth of the Skagit	17.8	58.1	5,254
125	Near head of large tributary to the Skagit, 9 miles from its entrance into the Skagit, at which point the elevation is about 1,980 feet, the point being 122 miles above its mouth	16.3	52.1	2,969
126	Summit of pass between Skagit and Similkameen, 126 miles from mouth of Skagit	17.9	59.0	5,668
127	Lake, head of Similkameen, 125 miles from mouth of Similkameen	18.3	57.5	5,307
128	Camp, first forks, *a* 122 miles from mouth of Similkameen	21.6	53.7	4,163
129	On divide, crossing a great bend of the Similkameen	23.2	52.0	5,074
130	Fort Hope trail, 1 mile east of junction with Whatcom, near two small lakes	25.3	52.5	5,947
131	High point on trail	25.0	51.9	5,490

a Whatcom trail leaves river.

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
132	Forks—trails to Whatcom and to Fort Hope	49 25.8	120 51.1	5,722
133	Fort Hope trail, upper crossing of Similkameen, 120 miles above its mouth	23.8	54.5	4,028
134	Fort Hope trail, 6 miles west of Similkameen crossing and 6 miles from mouth of creek up which the trail runs	21.2	121 00.8	4,436
135	Summit of ridge, left bank of Similkameen, near upper crossing	23.7	120 55.3	4,750
136	Fort Hope trail, summit between two crossings of Similkameen	25.3	52.4	5,965
137	Camp on Fort Hope trail	29.4	47.5	4,906
138	On ridge south of valley of Similkameen	30.4	47.1	4,559
139	Encampement des Femmes, junction of trails to Forts Hope and Kamloops, 104 miles above mouth of Similkameen	31.5	45.2	2,506
140	Summit of ridge north of Encampement des Femmes	34.5	42.8	4,921
141	Summit of ridge on trail	27.2	35.5	4,085
142	Camp on creek 1 mile east of last summit, 1½ miles above mouth of creek, which is 90 miles above mouth of Similkameen	27.3	34.4	4,035
143	Camp on Similkameen 82 miles above its mouth and one-half mile below mouth of Pa-say-ten Creek	27.0	23.9	2,069
144	Summit of ridge on south side of Similkameen	21.6	24.5	4,041
145	Base of same ridge, crossing of Yakl-keh-whel-lich-ler (?), 11 miles above its mouth, which is 72 miles above mouth of Similkameen	21.5	23.9	2,580
146	Yan-set-ah-skwa Creek, 5 miles above its mouth, which is 81 miles above mouth of Similkameen.	31.2	24.9	2,379
147	Camp on Similkameen 64 miles above its mouth and 6 miles below Skai-shin Creek	21.3	05.2	1,919
148	Camp on Similkameen 52 miles above its mouth and 3 miles above mouth of Nais-nu-loh	14.5	119 59.9	1,477
149	Similkameen River, 49 miles above its mouth and just below mouth of Nais-nu-loh	13.1	56.8	1,455
150	Camp on Similkameen 36 miles above its mouth, in brushy bottom	09.5	43.8	1,406
151	Camp on northeast tributary of Similkameen 2 miles above mouth, the mouth 38 miles above mouth of Similkameen	11.7	42.5	2,248
152	Camp in flat near river, one-half mile above mouth of large creek coming from west, its mouth 31 miles above mouth of Similkameen	05.2	43.0	1,356
153	Camp on side of mountains, one-half mile north of creek coming from southwest, its mouth 26 miles from mouth of Similkameen	01.8	41.1	1,652
154	Summit of ridge bordering Similkameen River on west side	03.0	43.0	5,068
155	Camp Similkameen, 12 miles above mouth of Similkameen	48 59.2	34.9	1,164
156	Camp on Similkameen 1½ miles above mouth of Similkameen	55.5	25.0	904
157	Camp on Okinakane 11 miles below forks, 61 miles above mouth of Okinakane; 567 miles above mouth of Columbia	46.0	22.6	955
158	Lake Osoyoos, foot of (4 feet above water), 76 miles above mouth of Okinakane	57.0	24.2	957
159	Lake Osoyoos, camp on east side, 82 miles above mouth of Okinakane	49 02.4	25.0	953
160	Lake Osoyoos, north end of (inlet), 86 miles above mouth of Okinakane	04.5	29.2	931
161	Height of second plateau at foot of hills	13.1	32.3	1,633
162	.....do	05.9	28.9	1,430

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.		Longitude.		Elevation.
		°	′	°	′	*Feet.*
163	Summit of ridge, 3 miles east of Okin-á-kane River.	49	07.3	119	27.8	3,027
164	Summit of trail, Similkameen to Okinakane		11.4		39.0	4,251
165	Lake Haipwil (2½ miles long by three-fourths mile wide)	48	51.0		37.0	1,120
166	Summit of mountain, north of lake		55.6		36.8	4,565
167	Camp on Haipwil Creek 3 miles above forks and 12 miles above its mouth		47.0		37.9	1,376
168	Camp on Haipwil Creek one-half mile above forks and 9 miles above its mouth		48.9		38.0	1,366
169	On Haipwil where it enters couleé, 20 miles above its mouth		40.8		39.1	1,643
170	Divide between Haipwil and Okinakane, near two lakes		48.5		35.4	1,701
171	Summit of hill, Okinakane Valley		45.1		23.6	2,487
172	Camp on Haipwil (West Fork) 8 miles above forks and 17 miles above mouth of Haipwil		47.5		48.7	4,599
173	Summit of trail between a tributary of Che-wach (branch of Haipwil) and [Lake?] Methow, 20 miles from mouth of Haipwil and 5 miles from mouth of Che-wach		46.2		52.0	6,854
174	West foot of ascent to summit		45.9		52.6	6,220
175	On Che-wach at forks, 67 miles above mouth of Methow and 559 miles above mouth of Columbia.		47.8		57.5	3,296
176	Near mouth of tributary of west fork of Haipwil, 9 miles from forks of Haipwil		47.9		49.7	4,627
177	Large lake southwest of mouth of Similkameen, south end, 8 miles from Okinakane River		50.9		29.0	1,819
178	Smaller lake southwest of mouth of Similkameen, east side, 2 miles from Okinakane River		53.0		27.5	1,766
179	Summit of trail, Skagit to Pasayten	49	02.3	120	57.4	5,900
180	Saddle Divide, waters Skagit and Pasayten, 10 miles from mouth of Ne-po-pe-eh-kum Creek, which is 100 miles above mouth of Skagit and 24 miles from mouth of N'-shitl-shutl River		02.1		57.1	5,281
181	Summit Cache		01.9		56.5	5,594
182	First depression east of Summit Cache		02.0		55.3	5,570
183	Third high point east of Summit Cache		02.3		53.7	5,819
184	Summit to north of trail *a*		02.5		54.6	6,221
185	Summit near end of ridge		03.0		50.0	6,233
186	First water below ridge on trail, 15 miles above mouth of N'-shitl-shutl, which is at Pasayten Cache		03.2		48.6	3,860
187	Camp on N'-shitl-shutl 10½ miles above its mouth, at mouth of Chu-chu-wun-ten		03.5		42.9	3,431
188	Pasayten Cache, at mouth of N'-shitl-shutl, 24 miles above mouth of Pasayten, which is 82 miles above mouth of Similkameen		09.6		33.6	3,194
189	Camp Pasayten, 36 miles from mouth of Pasayten.	48	59.7		32.2	3,676
190	First knoll on mountain east of Pasayten Cache	49	08.7		32.0	4,880
191	Top of rocky slide near which trail passes on same mountain		07.5		29.5	6,456
192	Camp on west slope of mountain		08.7		31.3	4,777
193	Elevation east of hill		08.6		30.8	5,157
194	Camp		07.5		28.3	4,701
195	Western principal summit		07.5		25.5	6,433
196	Eastern principal summit		07.8		23.5	6,455
197	Camp east and above tributary of Nais-nu-loh		08.2		22.2	6,494
198	Elevation 1½ miles east of above		08.3		21.6	6,170

a To the north of this trail, in latitude 49° 03.7′, longitude 120° 53.5′, is another divide, between Ne-po-pe-eh-kum and N'-shitl-shutl, which is about 4,500 feet high. It is 11 miles from mouth of N'-shitl-shutl.

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
199	Camp on Nais-nu-loh, 18 miles above its mouth	49 08.8	120 15.1	3,568
200	Camp Nais-nu-loh Cache, 21 miles above mouth of Nais-nu-loh	07.2	17.3	3,678
201	Saddle between two principal summits, 26 miles above mouth of Nais-nu-loh	07.5	24.2	6,005
202	Camp on Nais-nu-loh, 7 miles above its mouth, at bend, mouth of creek	07.8	00.5	2,525
203	Camp on Nais-nu-loh, 5½ miles above its mouth, at trail crossing	09.1	00.2	2,171
204	On Nais-nu-loh, ¼ mile above its mouth, where trail leaves it	13.1	119 57.4	1,515
205	Camp on southeastern tributary of Lake Osoyoos, 6 miles from its mouth, last trail crossing	48 59.5	16.4	3,092
206	Summit of trail, Lake Osoyoos to Ne-hoi-al-pit-kwu River	49 00.6	11.8	4,068
207	Highest terrace east of summit	01.1	09.3	3,476
208	Fourth terrace east of summit, just before descending to valley of Rock Creek	02.6	05.4	3,032
209	First crossing of Rock Creek, 6 miles above its mouth	02.7	05.2	2,762
210	Fourth terrace, just after ascending from valley of Rock Creek	02.8	04.9	3,101
211	Upper terrace above town [? Twai-yeep] on Rock Creek, just before descending to Ne-hoi-al-pit-kwu River	03.2	118 59.0	2,366
212	Upper camp on Ne-hoi-al-pit-kwu, 80 miles above its mouth, at mouth of Rock Creek	03.2	58.7	2,153
213	Camp Ne-hoi-al-pit-kwu, 66 miles above its mouth (20 feet above water)	48 59.1	44.5	1,826
214	On Ne-hoi-al-pit-kwu River, 44 miles above its mouth	49 00.4	23.4	1,663
215	Camp Statapoostin, 36 miles above its mouth	00.2	16.3	1,636
216	En-cháhm Lake, outlet of, 1½ miles from Ne-hoi-al-pit-kwu River, at a point 32 miles from its mouth	02.1	12.7	1,531
217	Camp on Ne-hoi-al-pit-kwu, 29 miles from its mouth	48 59.4	12.5	1,468
218	Camp on Ne-hoi-al-pit-kwu, 16 miles from its mouth	50.5	10.4	1,466
219	Camp on Ne-hoi-al-pit-kwu, 9 miles from its mouth	46.3	06.8	1,226
220	Camp on Ne-hoi-al-pit-kwu, 1 mile from its mouth	40.9	06.5	1,271
221	Camp on Ne-hoi-al-pit-kwu, at mouth, 746 miles from mouth of Columbia	40.0	06.2	1,252
222	Columbia River crossing, 1 mile below Kettle Falls (20 or 25 feet high), 782 *a* miles above its mouth	36.8	07.5	1,202
223	Columbia River camp (25 feet above river), 766 miles above its mouth	51.6	117 53.9	1,341
224	Camp Columbia (53 feet above water now nearly at lowest stage), 783 miles above its mouth	59.8	37.7	1,317
225	Camp Columbia (another measure)			1,514
226	Camp on summit on trail westward from Camp Columbia	58.6	45.4	3,410
227	Camp on tributary of Yóme-tsin, 4 miles from Yóme-tsin's mouth, which is 775 miles from mouth of Columbia	58.1	48.1	2,166
228	High point on trail	58.9	49.5	4,650
229	Camp	58.0	58.7	2,684
230	Summit on trail, divide between Yome-tsin and Ne-hoi-al-pit-kwu	57.7	118 02.9	4,739
231	Camp on tributary of Ne-hoi-al-pit-kwu, 5 miles above its mouth, which is 28 miles above mouth of Ne-hoi-al-pit-kwu	57.2	07.0	3,363

a Apparently an error for 742.

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
232	High point on trail east of divide	48 57.8	118 02.0	4,707
233	Crossing Creek, 3 miles east of camp—first plateau, 2 miles above mouth of creek, which is 59 miles above mouth of Okinakane	43.7	119 19.2	1,383
234	Crossing Creek, 5 miles east of camp—second plateau, 6 miles above mouth of Kwahaloose Creek, which is 57 miles above mouth of Okinakane River	42.1	15.2	2,158
235	Divide between Kwahaloose Creek and large eastern tributary [Lower Bonaparte of Arrowsmith's map] of Okinakane River	40.6	13.7	3,350
236	Camp on first large branch of Lower Bonaparte River, 3 miles above mouth of branch and 12 miles above mouth of river	39.6	08.2	2,563
237	Divide between 2 branches of Lower Bonaparte River and a southern tributary of the Ne-hoi-al-pit-kwu River; 11 miles above mouth of first branch, which is 12 miles above mouth of second branch, which is 33 miles above mouth of Lower Bonaparte River and 22 miles from mouth of southern tributary of Ne-hoi-al-pit-kwu River, which is 63 miles above mouth of that river	41.3	118 58.3	4,312
238	Camp on second branch of Lower Bonaparte River, 9 miles above its mouth	40.7	54.7	3,531
239	Camp on second branch of Lower Bonaparte River, 3 miles above its mouth	38.7	47.8	2,459
240	Summit of ridge north of No. 238=average height of mountains in vicinity	41.0	56.6	5,220
241	Crossing of Lower Bonaparte, 38 miles above its mouth	38.7	39.9	2,746
242	Divide between Okinakane and Columbia, 45 miles from mouth of Lower Bonaparte and 19 miles from the Columbia, at a point 739 miles from its mouth	37.9	32.3	5,662
243	High point north of trail on divide between Okinakane and Columbia	39.2	33.1	7,035
244	Camp No. 3, on Columbia River *a*	48 37.0	118 06.9	1,207
245	Camp No. 2, on Columbia River			1,622
246	Summit of ridge bordering Colville Valley to north			3,017
247	Camp No. 1, on Peptashin Creek near mouth			1,535
248	Summit of ridge=average height of ridges in vicinity			3,718
249	Camp No. 15, Peptashin Creek near town			1,957
250	Colville depot, at observatory			1,963
251	Camp No. 1, Mill Creek near Colville depot			1,653
252	Lake 5 miles southeast of Colville depot			2,153
253	Summit of mountain west of Colville depot			3,330
254	Summit of mountain 6 miles east of Colville depot			5,697
255	Camp No. 2 on Mill Creek near Stugar's farm			1,629
256	Mountain east of Camp No. 2			4,880
257	Mountain south, on same ridge, and north of Francois' house			4,096
258	Camp No. 3, near Francois' farm			1,717
259	Mountain southwest of Francois', near trail			3,186
260	On branch of Mill Creek, at crossing of trail, 5 miles south of Francois', An-i-aht-wa or Oit-chin Prairie			1,765
261	Crossing of first stream south of Hughes ranch on wagon road			1,734
262	On wagon road between Colville and Spokane at small ponds			2,119
263	On head of small lake, east end, near wagon road			1,970

a Second cahier begins here.

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
264	Highest point on Colville wagon road			4,033
265	Chemakane bridge, junction of trail and wagon road			1,922
266	Summit of trail between Mill Creek and Little Spokane			2,735
267	Walker's Prairie, on small branch of Chemakane			1,897
268	Mouth of Chemakane—approximate			1,366
269	Summit of trail, short cut between Chemakane and Spokane			2,809
270	Trail at northernmost bend of Spokane River, 13 miles below mouth of Little Spokane *a*			1,500
271	On plateau above Spokane River, 7 miles below mouth of Little Spokane			1,854
272	On edge of Spokane River, 7 miles below mouth of Little Spokane			1,553
273	Little Spokane, mouth of, at water's edge			1,635
274	Summit of hill, northeast of mouth of Little Spokane			3,140
275	On little Spokane, near crossing of trail			1,609
276	On plateau south of crossing			1,760
277	On plateau of Spokane River			1,878
278	Hill in bend of Little Spokane, about 5 miles from mouth			2,355
279	On edge of plateau south of trail			2,266
280	On Spokane River, water's edge, near Plant's			1,901
281	On plateau north of Plant's			2,375
282	Plant's house			2,08
283	Trail to Sinyakwateen, 11 miles from Plant's			2,228
284	Trail on Spokane, 3½ miles below lake [Cœur d' Alene]			2,135
285	Cœur d'Alene Lake			2,151
286	Hill near lake, south of trail			2,499
287	On small lake north of Cœur d'Alene Lake			2,205
288	On summit of spur bordering lake			2,862
289	Average height of rolling country north and northeast of lake			3,170
290	Plateau north and east of trail to Mission			2,767
291	Creek 3½ miles east of arm of lake [Cœur d'Alene]			2,121
292	Plateau north of creek crossing			2,681
293	Shore of large lake south of Checolsum Mountain			2,262
294	Point on mountain spur between lakes			3,577
295	Trail to Sinyakwateen, 19 miles from Plant's			2,200
296	Little knoll 5 miles beyond and west of road			2,835
297	Tesemmeus lakes, [? Tesimini]			2,322
298	On edge of plateau 3 miles east of road			2,540
299	Top of plateau on road 4 miles south of Pekowla Lake			2,539
300	Bottom of plateau			2,333
301	On Pekowla Lake			2,200
302	Sinyakwateen depot, right bank of Clark Fork of the Columbia River			2,084
303	Vermilion Creek, mouth of fall of Clark Fork from [Pend Oreille] lake to falls about 0.44 foot per mile; falls about 5 feet			2,074
304	Checolsum Mountain			5,706
305	Crossing of trail near forks of creek north of Checolsum Mountain			2,455

a From the northernmost bend to mouth of Spokane the average fall is about 9 feet per mile.

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
306	Crossing of tributary of Little Spokane. Little Spokane has an average fall of about 15 feet per mile			1,880
307	Lake on Little Spokane			1,947
308	Trail north of lake			2,093
309	On plateau above Little Spokane			? 2,441
310	On high plateau on trail			2,358
311	Lake at head of Little Spokane			2,237
312	Trail between Spokane and Clark Fork Divide			2,335
313	Clark Fork at outlet of Pend Oreille Bay			1,942
314	Clark Fork 8 miles below falls			2,024
315	Clark Fork 4 miles above Mission			1,937
316	Clark Fork at mouth of Skomin Creek			1,926
317	St. Ignatius Mission			1,894
318	Skomin Creek, 5 miles above mouth			2,769
319	Skomin Creek, 9 miles above mouth			2,901
320	Skomin Creek, 11 miles above mouth			3,736
321	Divide between Skomin and Chelonscan creeks			4,199
322	Mountain 1½ miles south of divide			5,218
323	2 miles below divide on eastern slope			3,438
324	Trail from Mission to Kaniksu Lake, 7 miles			3,041
325	Crossing of creek, 12 miles from Mission			3,535
326	Trail above and beyond crossing of creek			3,640
327	Teh-kwat Mountain, north of trail			5,770
328	Water on Teh-kwat Mountain, south of trail			5,443
329	Crossing of first creek east of divide			2,740
330	Creek 5 miles west of lake			2,606
331	Kaniksu Lake			*a* 2,443
332	Upper Kaniksu Lake			*a* 2,435
333	On creek, 2 miles above Upper Lake			2,469
334	Long bridge on trail from Sinyakwateen to Chelemta, 6 miles			2,086
335	Clark Fork, 14 miles above Sinyakwateen			2,089
336	Kalispelm Lake			2,095
337	Pack River crossing			2,101
338	Divide between Pack and Kootenay rivers			2,138
339	Small lake west of trail and north of divide			2,090
340	Trail in forks of creek			2,064
341	Chelemta depot			1,796
342	Kootenay River, 18 miles below Chelemta			1,802
343	Crossing of Acklew Creek			2,248
344	Acklew Cache			2,304
345	Camp Kootenay West (about 50 feet above water)			1,823
346	Mountain N. 42° E. from Camp Kootenay West			5,573
347	Trail from Chelemta to Acklew, 8 miles, first water			2,695
348	Trail from Chelemta to Acklew—10½ miles			2,694
349	Trail from Chelemta to Acklew—14 miles—crossing of stream			2,557
350	Trail from Chelemta to Acklew—17 miles—grassy mound			2,548
351	Trail from Acklew to Mooyie—1 mile—divide on trail			3,260
352	Trail from Acklew to Mooyie—3 miles—divide			2,985

a The contradiction here by which the upper lake level is less than the lower one is noted in the original MS., but not corrected.

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
353	Trail from Acklew to Mooyie—3½ miles—head of Ar-ka-klu-ne *a* Creek			2,882
354	Trail from Acklew to Mooyie—8 miles—prairie			2,638
355	Trail from Acklew to Mooyie—13 miles—creek crossing			2,798
356	Trail from Acklew to Mooyie—terrace south of crossing			2,811
357	Trail from Acklew to Mooyie—lower crossing of Ar-ka-klu-ne			2,678
358	Trail from Acklew to Mooyie—terrace above			2,756
359	Trail from Acklew to Mooyie—crossing of Mooyie			2,682
360	Camp Mooyie			2,689
361	Mooyie Cache			2,742
362	Mountain ridge east of Camp Mooyie			6,639
363	Summit of ridge			6,698
364	Same ridge 8 miles south			4,466
365	Crossing of Mooyie 8 miles below Camp Mooyie			2,142
366	Second crossing of Mooyie, from cache (14 feet above water)			2,718
367	Fourth crossing of Mooyie, from cache			2,850
368	Sixth crossing of Mooyie, from cache			2,934
369	7 miles from sixth and 2½ miles from seventh crossing			2,940
370	Seventh crossing at foot of lake (3 feet above water)			3,029
371	Terrace east of seventh crossing—on trail			3,291
372	First stream—2½ miles beyond seventh crossing of Mooyie			3,067
373	Second stream—9½ miles beyond seventh crossing of Mooyie			3,766
374	Third stream—10½ miles beyond seventh crossing of Mooyie			3,514
375	11 miles from seventh crossing, north of lakes			3,136
376	Headwaters of Mooyie, 13½ miles from seventh crossing			3,296
377	Terrace near headwaters of Mooyie			3,383
378	South and near divide between Mooyie and Kootenay			3,544
379	Divide between Mooyie and Kootenay			3,642
380	Joseph's Prairie			2,959
381	Crossing of stream [Akis-ka-klail] south of Joseph's Prairie			3,041
382	Kootenay River northeast of Joseph's Prairie			2,451
383	Crossing of first creek going down the Kootenay *b*			2,682
384	Crossing of second creek going down the Kootenay—10 miles beyond			2,679
385	Crossing of third creek going down the Kootenay			2,619
386	Crossing of fourth creek going down the Kootenay			2,741
387	Creek 9 miles beyond			2,420
388	Prairie on Kootenay—25 miles above Camp Kootenay East			*c* 2,400
389	Prairie on Kootenay—10 miles above Camp Kootenay East			2,364
390	Kootenay River—6 miles above Camp Kootenay East			2,361
391	On creek—5½ miles north of Camp Kootenay East			2,401
392	Camp Kootenay East (30 feet above water)			2,348

a Also written Acaclunah.

b The fall of Kootenay River for about 30 miles south from latitude 49° 35′ N. is 2 feet per mile.

c At bend of Kootenay River above mouth of Elk River computed height is 2,381 feet. The fall of the Kootenay for about 20 miles from above mouth of Elk River south is 4½ feet per mile.

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
393	Camp Kootenay East—at water			2,318
394	South of Camp Kootenay East (3 feet above water)			2,313
395	Kootenay River 2½ miles below camp (3 feet above water)			2,300
396	Kootenay Cache			2,316
397	First bench above river			2,368
398	Second bench above river			2,566
399	First creek south of Kootenay Cache			2,355
400	Trail on Tobacco Plains, highest point south of cache			2,755
401	Creek 9 miles from cache			2,691
402	Entrance of Akonoho Pass			3,015
403	11 miles from entrance and 3 miles from summit of pass			4,195
404	2¼ miles west of summit			4,460
405	One-half mile west of summit			5,138
406	Divide between Kootenay and Flathead rivers			5,218
407	On divide, one-half mile north of pass			6,953
408	On spur of divide, 2 miles north of pass			6,278
409	Divide between Wigwam and Akonoho			5,332
410	Wigwam Station			4,694
411	Small prairie one-half mile east of summit of pass			5,065
412	Four miles east of summit of pass (65-feet above water)			4,731
413	Crossing of stream, 7½ miles east of summit			4,522
414	Prairie, 12 miles east of summit			4,164
415	Large creek down which trail follows (water of Yakinikak creek opposite Prairie)			4,112
416	Flathead valley, upper terrace			4,267
417	Peak west of Flathead			7,373
418	Crossing of Flathead			3,827
419	1½ miles beyond crossing, in Prairie			3,763
420	Camp Kishenehn, 4 miles to mouth of Kishenehn—fall 53 feet per mile			4,134
421	Three miles above Camp Kishenehn (3 feet above water)—fall 63 feet per mile			4,252
422	Prairie, 8 miles above Kishenehn—fall 58 feet per mile			4,541
423	Angle of valley, 12 miles above—fall 36 feet per mile			4,705
424	Angle of valley, 2½ miles above this angle			4,808
425	Open place in burnt timber			5,133
426	Mule camp			5,191
427	Summit of pass, 9 miles from angle, 21 miles from Camp Kishenehn and 25 from mouth of creek			5,846
428	Near outlet of lake east of summit			5,407
429	1½ miles east of summit, on creek			5,378
430	Camp Akamina			6,447
431	On divide north of summit monument			7,986
432	Bluff SE. of Camp Akamina			6,648
433	Summit monument			*a* 7,490
434	Mountain in divide 1¼ miles N. of pass			8,087
435	Mountain in divide 1 mile NE. of last			8,207
436	Mountain in divide one-half mile N. of last			8,313
437	Mountain in divide 2½ miles NE. of last			8,333

a Another value given in the table, and without comment, is 6,548. Can this be an error for 7,548?

Elevations along the forty-ninth parallel, etc.—Continued.

No.	Station.	Latitude.	Longitude.	Elevation.
		° ′	° ′	*Feet.*
438	Summit of Boundary Pass			6,955
439	Mountain, 1¾ miles north of pass			7,861
440	Kishenehn Mountain			*a* 8,487
441	Mountain up pass and to the north			*a* 7,409
442	Kishnenehna Mountain, north and west peak			*a* 7,937
443	Kishnenehna Mountain, center peak			*a* 8,170
444	Kishnenehna Mountain, south and east peak			*a* 9,137
445	Divide 2 miles east of Camp Kishenehn			5,541
446	In valley of creek west of camp and north of boundary			5,119
447	Boundary Mountain, highest peak			8,574
448	Southwest point of ridge of Boundary Mountain			7,260
449	Kootenay River, 3 miles below parallel			2,303
450	Kootenay River, 17 miles below parallel			2,256
451	Kootenay River, 33½ miles below parallel			2,204
452	Kootenay River, 39 miles below parallel			2,184
453	Kootenay River, 50 miles below parallel at crossing of trail			2,148
454	Kootenay River, 13 miles below crossing (8 feet above water)			2,057
455	Kootenay River, 25 miles below crossing; below falls, at high-water mark			1,967
456	Kootenay River, 39 miles below crossing; mouth of the Yahk			1,934
457	Kootenay River, 44 miles below crossing; terrace above river			2,298
458	Forage cache on trail 13 miles from Yahk			2,161
459	Camp on terrace on trail 3 miles east of Mooyie Crossing			2,260
460	Kootenay River, 55 miles below crossing; mouth of Mooyie			1,792
461	Kootenay River, 61 miles below crossing; Chelemta depot (9½ feet above high water)			1,796
462	Summit of mountain range between waters of Wigwam River and Skits-ooh-nau-na Creek			7,852
463	Camp in forks of tributary of Tobacco River			3,256
464	Camp on west side of Kootenay Valley			2,942
465	Camp on waters of Kootenay, near divide with Yahk			4,862
466	Summit of divide between Yahk and Kootenay			5,498
467	Camp west of divide			5,520
468	.....do			4,954
469	Camp on mountain, tributary of Yahk			4,794
470	Camp on east fork of Yahk			3,483
471	Camp in forks of Yahk			3,194
472	Camp at east bend of Yahk			2,983
473	Camp on Yahk			2,959
474	Camp at west bend of Yahk			2,935
475	Camp on Yahk			2,759
476	.....do			2,697
477	Camp below falls			2,414
478	Camp at mouth of Yahk			1,926

a Measured with theodolite.

INDIAN NAMES.

In the prosecution of the survey considerable attention was given to the language of the native tribes along the line. George Gibbs, who accompanied the party, is referred to in various capacities as geologist, ethnologist, guide, interpreter, and naturalist. The first Chinook dictionary is said to have been prepared by him, and this was to form a part of the final report of the survey. Later Mr. Gibbs was engaged by the Smithsonian Institution in elaborating linguistic material from the tribes of the Northwest. This work was unfinished at the time of his death in April, 1873. Some of it has been published since. To secure uniformity in the spelling of the names of various camps and stations Mr. Gibbs prepared lists which were submitted to General Parke and made official. There are three such lists among the papers. The first two are signed; the third is not signed. The first list is as follows:

Adopted spelling of the names of camps, etc.

[Official: John G. Parke, chief astronomer and surveyor.]

Chiloweyuck.	Semiahmoo.
Chuch-che-hum.	Sen-eh-say.
En-saaw-kwatch.	Similkameen.
Fraser.	Skagit.
La-yome-sin.	Sumass.
Nooksahk.	Swehl-tcha.
Okinakane.	Tummeahai.
Pehosie.	

The three lists have been combined, arranged, studied in company with the published maps of the boundary and later official maps. The results are here given with notes derived from such comparison and study. For easy reference on the maps the approximate longitudes are given.

	Approximate longitude.	
	°	′
A-kám-i-na;[1] east fork of Kish-e-nehn Creek	114	10
A-kin-ís-sahtl; Flathead River	114	30
A-kin-kwo-náh-ki;[2] branch of Flathead River heading with Tobacco River	114	30
Ak-káph-kleh; falls of the Kootenay River, Flathead County, Montana	115	45
Ak-o-nó-ho; creek tributary to Tobacco River[3]	115	05
Ak-swák; creek from south at bend of the Kootenay[4]	115	15

[1] Kam-i-na=watershed.

[2] Perhaps this is Yokinikah Creek of the Land Office map of Montana.

[3] Tobacco River=Grave Creek of Land Office map of Montana.

[4] Not named on boundary map; apparently Fisher Creek of Land Office map of Montana, and Masula River of official map of British Columbia, 1895.

	Approximate longitude.	
	°	′
Ak-tlak-a; creek above Kish-e-nehn, tributary to Flathead River. Not named on boundary map	114	25
A-kwote-kátl-nam; Chief Mountain or Waterton Lake, upper part across boundary	114	
An-i-áht-wha; Kamass Prairie		
Che-chéet-hu; Skagit cache	121	05
Chelemta (also written Cholemta); cache or depot. Not shown on map or identified. (See Swoots-kóse and Yah-kwoo-káh-keh)	116	20
Che-loús-kan; Little Pend Oreille	116	40
Chém-a-kane; bridge over Walkers Prairie Creek	116	46.4
Chiloweyuck; camp, lake, river, town, etc. Now written Chilliwhack	121	30
Chow-a-wee-la; Fool's Prairie. Not identified.		
Chuk-kóse; the Mooyie Lakes. Not shown on map. In British Columbia, latitude 49° 18′	115	50
Chuch-che-hum; camp and creek tributary to Chiloweyuck Lake	121	15
Chu-chu-wán-ten; creek tributary to N'shitl-shootl River, which is tributary to Pa-say-ten	120	40
En-cháhm;[1] lakes near Statapoostin	118	13
En-kwool-eh-la; mouth of Clark forkof the Columbia. Name not on boundary map	117	37
En-saaw-kwatch;[2] station and creek tributary to the Chiloweyuck	121	30
Háip-wil;[3] lake near camp Similkameen	119	37
Hó-zo-meen; mountain near camp Skagit	121	
In-chú-in-tum;[4] station and river tributary to the Ne-hoi-al-pít-kwu	118	25
Ka-cha-átl; Indian village Aklew (or Acklew) cache	116	22
Kái-seet-lin; crossing of Spokane. Not identified.		
Kais-in; branch of Kat-láh-woke Creek. Not on map and not identified.		
Kal-is-pelm; Pend Oreille Lake in northern Idaho	116	30
Kam-i-na=a watershed.		
Kat-láh-woke; creek running to Flathead [river] through [Boundary] pass; not named on boundary map and not identified. It is near Kísh-e-nehn Creek	114	20
Ka-yak-ka;[5] creek, from south, tributary to Kootenay below falls; large lake on it	115	50
Kin-nook-kleht-nán-na;[6] creek running east from divide [of Rocky Mountains] to [Chief Mountain or Waterton] lake	113	50

[1] Christina Lake of official map of British Columbia, 1895.
[2] Written En-saw-kwatch on boundary map and on above map called Nesquatch.
[3] Harpwil of British Columbia map of 1895 and Blue Lake of Land Office map of Washington.
[4] North fork of Kettle River of British Columbia map of 1895. Also Inishwointon in the manuscript notes.
[5] Lake Creek of Land Office map of Montana.
[6] Kotanie River of official map of British Columbia, 1895.

	Approximate longitude.	
	°	′
Kínt-la; lake and mountains, Flathead County, Montana	114	15
Kísh-e-nehn; camp, creek, and mountain	114	20
Kish-ne-néh-na; mountains	114	15
Kit-lat-laā-nook; creek heading east of Mount Wilson and emptying into lower [Chief Mountain or Waterton] lake	113	50
Kle-síl-kwu;[1] creek tributary to upper Skagit, heading with Klehkwunum	121	15
La-yome-sin;[2] creek, tributary to the Chiloweyuck	121	54
Man-sel-pán-ik;[3] creek, tributary to Kle-sil-kwu Creek, heading with Chuch-che-hum	121	15
Moo-yie;[4] camp, monument, river, and trail	116	15
Nàís-nu-loh; station and river, south fork of Similkameen	120	
Ne-hoi-al-pít-kwu;[5] camp and river	118	30
Ne-pó-pe-éh-kum; creek, tributary to the upper Skagit	121	
Nook-sahk; river, Whatcom County, Washington. Now written Nooksak	122	15
N'-shitl-shootl;[6] creek, tributary to Pa-say-ten River	120	40
Okin-á-kane, now written Okanogan; county and river tributary to the Columbia	119	30
O-só-yoos; camp, lake, and station	119	25
Pa-sáy-ten;[7] river tributary to Similkameen	120	30
Pehosie, or Pekosie; lake and creek tributary to the Nooksak	122	05
Pep-táh-shin; creek at [Colville?] depot	118	
Sah-lílt-kwu; the forks [of?]. Not identified. Name not on boundary map.		
Se-hàí-uks; the creek [at Archer's camp of October 10]. Not identified.		
Se-hàí-ya-kan; Archer's camp of October 10. Not identified.		
Semiahmoo; bay and camp near western end of parallel	122	45
Sen-eh-say;[8] station and creek, tributary to the Chiloweyuck	121	40
Sháh-wa-tum; mountain on upper Skagit	121	
Shwo-yél-pi; Kettle Falls of the Columbia	118	10
Si-míl-ka-meen; camp and river tributary to the Okanogan	119	30
Sin-páíl-hu;[9] creek running south to the Columbia	?118	10
Skagit; cache, camp, county, and river, Washington	122	

[1] Klesilkwa of official map of British Columbia, 1895.
[2] Written Layomesin on boundary map. Sweltzer River of official map of British Columbia, 1895.
[3] Maselpanic, of official map of British Columbia, 1895.
[4] The river is now known as Methow.
[5] Kettle River, of official map of British Columbia, 1895.
[6] Roche River, of official map of British Columbia, 1895.
[7] Pasayton, of official map of British Columbia, 1895.
[8] Slesse, of official map of British Columbia, 1895.
[9] Not shown on boundary map. Land Office map of Washington has Sinpailhu, or Milk Creek (long. 118° 10′), just below Kettle Falls; also San Poil River and guide meridian. This latter is Sans Poil of official map of British Columbia, 1895.

	Approximate longitude.	
	°	′
Skits-ooh-nán-na; small creek tributary to the Kootenay; not shown on boundary map	115	05
Skwài-kwi-éht; mountain at head of Chu-chu-wán-ten Creek	120	40
Stat-a-poós-tin; camp on the Ne-hoi-al-pít-kwu	118	15
Stle-kéhm; Mill Creek [? near old Fort Colville, longitude 117° 40′].		
Sumass, now usually written Sumas; camp, lake, town, etc	122	10
Swehl-tchá;[1] lake in British Columbia	122	
Swoots-kóse; the Chelemta cache [not on boundary map]. See Yah-kwo-káh-keh.		
Tcho-páhk;[2] mountain west of Camp Similkameen	119	45
Te-kum-whéhl-tin; Archer's camp of October 9; not identified		
Tummeahai;[3] camp and creek tributary to the Chiloweyuck	121	45
Twáí-yeep; upper forks of Ne-hoi-al-pít-kwu[4]	119	
Wáí-haist; mountain on Upper Skagit; not named on boundary map	121	
Yah-kwoo-káh-keh; the Chelemta cache. See Swoots-kóse. Not identified.		
Yahk;[5] station and river, Flathead County, Montana	115	45
Yak-ín-a-kahk;[6] creek and pass	114	30
Yakl-tó-le-min; mouth of Pa-say-ten River; not named on boundary map	120	35
Yaks-koo-nák-he;[7] first creek from north below bend of Kootenay	115	30
Yak-toók-i-na;[8] third creek from north tributary to Kootenay, below bend	115	45
Yóme-tsin;[9] White Sheep Creek, tributary to the Columbia	117	50

[1] Cultus of official map of British Columbia, 1895. A creek near by is called Sweltzer.
[2] Tcho Park Mountains of Land Office map of Washington.
[3] Tamihy of official map of British Columbia, 1895.
[4] Apparently junction of Rock Creek and Ne-hoi-al-pít-kwu.
[5] Yahk'h on boundary map.
[6] Yak-in-i-kak on boundary map and Yokinikah of Land Office map of Montana.
[7] Ramy Creek of Land Office map of Montana.
[8] Quartz Creek of Land Office map of Montana.
[9] Sheep Creek of official map of British Columbia, 1895, and Yometsin or Sheep Creek of Land Office map of Washington.

SCIENTIFIC RESULTS.

In the conduct of the survey attention was given to the geology, natural history, etc., of the region traversed. Mr. George Gibbs was attached to the survey as geologist and interpreter, C. B. R. Kennerly as surgeon and naturalist, and James M. Alden as artist. Collections were made and forwarded to Washington. These collections were placed in the hands of specialists, who prepared reports thereon. The nature and extent of these collections can be inferred from the report of the Auditor of the Treasury, already referred to.

It appears from that report that about $3,500 was expended on the preparation of reports on scientific subjects. The persons who prepared those reports, the subjects reported on, and the sums paid are set forth in the following table.[1]

Amounts paid during 1861–62 for work done in the preparation of the scientific part of the final report.

J. S. Harris, report on magnetics, with computations, etc	$743.50
F. B. Meek, report on fossil mollusks, with drawings	375.00
Theodore Gill, report on fishes	300.00
William Stimpson, report on crustaceæ and marine invertebrates	300.00
George Suckley, report on salmonidæ, ornithology, and mammals	300.00
P. B. Carpenter, report on recent mollusks	250.00
J. S. Newberry, report on fossil plants	150.00
Elliot Coues, report on birds, etc	100.00
John Torrey, report on botany	100.00
P. R. Uhler, report on insects	25.00
J. H. Richard, drawings for natural history reports	463.00
John Cassin, eight natural history drawings on stone	160.00
W. B. McMurtrie, drawings for geological reports	100.00
T. Y. Gardner, drawings of fossil plants	65.00
Thomas Egleston, jr., analysis of mineral specimens and preparing catalogue	50.00
Mary B. Codwise, copying natural history papers	12.90
Total	3,494.40

That the reports on these various topics were prepared for insertion in the final report of the commission is abundantly proved. Mr. George Suckley, M. D., assistant surgeon, United States Army, read before the New York Lyceum of Natural History, in June, 1861, a paper entitled "Notices of certain new species of North American salmonidæ, chiefly in the collection of the Northwest Boundary Commission, in charge of Archibald Campbell, esq., commissioner of the United States, collected by Dr. C. B. R. Kennerly, naturalist to the commission."[2] In this paper he says: "Owing to the unfortunate death of Dr. Kennerly on his return from a three-years' exploration, the preparation of a report on certain of the material collected by him was assigned to me. In the course of this undertaking I have prepared a copious synopsis of the species of American salmon and trout, *to appear in the final report of the commissioner*. It has been thought best to issue in advance brief descriptions of the species hitherto unnamed." And later he alludes to papers "to be referred to in the more extended report."

Some of the fossils collected were described by Mr. F. B Meek,[3] who says, "The fossils described in this paper are the new species contained in the collections of the Northwestern Boundary Survey.

[1] House Ex. Doc. No. 86, Fortieth Congress, third session, p. 101.
[2] Annals Lyceum Nat. Hist. New York, vol. 7, pp. 306–313, 1862.
[3] Proc. Acad. Nat. Sci. Phil., vol. 13, pp. 314–318, 1861.

Full illustrations and more extended descriptions of these and other species formerly described by the writer, from Vancouver Island, *will appear in the report of that survey*, which will also contain a report by Mr. George Gibbs, geologist of the expedition, on the general geology of the country along the boundary line."

This full report by Mr. Meek is, so far as I know, still unpublished. Dr. J. S. Newberry's report on the fossil plants seems, however, to have been published in full. At all events, he read, before the Boston Society of Natural History, on October 1, 1862, a paper entitled[1] "Descriptions of the fossil plants collected by Mr. George Gibbs, geologist to the United States Northwest Boundary Commission, under Mr. Archibald Campbell, U. S. Commissioner." This paper, published in February, 1863, "by permission of Archibald Campbell, esq., U. S. commissioner, Northwest Boundary Commission," makes no reference to any other or fuller report. The artist, Mr. James M. Alden, produced a fine series of colored sketches of scenery along the boundary line. These sketches, obviously intended to illustrate the final report, are in the State Department. There are 65 of these, all but two (large ones) included in three portfolios. These sketches and the constantly recurring allusions to the final report, and the conclusive proof that such report was prepared, sharpen the desire and emphasize the need of recovering it.

Has painting through country well.

Whether the geologic report of Mr. Gibbs, alluded to by Mr. Meek, was ever published does not appear. It may be that the rather extensive paper entitled "Physical geography of the northwestern boundary of the United States, by George Gibbs, with twelve illustrations," read before the American Geographical Society November 11, 1869, and published in its journal (vol. 4, pp. 298–392, and vol. 5, pp. 134–157), is the report referred to.

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[1] Boston Jour. Nat. Hist., vol. 7, pp. 506–524, 1863.

APPENDIX A

MODE OF DETERMINING POINTS ON THE PARALLEL.

The following is the agreement as to method of determining points on the parallel by measures from the tangent. This agreement and the accompanying table are copied from the original in the State Department.

TO DETERMINE POINTS ON THE FORTY-NINTH PARALLEL BY MEANS OF THE TANGENT.

Wherever points of the parallel between the astronomical stations are to be determined it is hereby agreed to adopt the method of offsets from the tangent to the parallel.

For computing the length of these offsets the following formula is adopted, being that used in computing the difference of latitude of points in secondary triangles or those whose sides do not exceed 12 miles in length:

$$-dL = kB \cos Z + k^2 C \sin^2 Z + h^2 D$$

where

dL=difference of latitude of the two points;

k=length of side connecting them;

$$B = \frac{1}{R \text{ arc } 1''};$$

$$C = \frac{\tan L}{2 N R \text{ arc } 1''};$$

$$D = \frac{\frac{3}{2} e^2 \sin L \cos L \text{ arc } 1''}{(1 - e^2 \sin^2 L)^{\frac{3}{2}}};$$

$$h = kB \cos Z;$$

$$R = \frac{a(1 - e^2)}{(1 - e^2 \sin^2 L)^{\frac{3}{2}}};$$

$$N = \frac{a}{(1 - e^2 \sin^2 L)^{\frac{1}{2}}};$$

a=equatorial radius of the earth=6 974 127.31 yards;

e=eccentricity=0.081 696 830;

Z=azimuth of tangent counting from south around by west; whence west=90°, east=270°.

This formula becomes in the present case

$$-dL = k^2 C;$$

or, taking offset in yards=δ, distance in yards on the tangent=D

$$\log \delta = 2 \log D + 2.915491.$$

JNO. G. PARKE,
Lieutenant, Corps Topographical Engineers U. S., Chief Astronomer and Surveyor.

R. W. HAIG,
Captain, R. A., Astronomer British Commission.

CAMP SIMIAHMOO, *Forty-ninth Parallel, April 23, 1859.*

Miles.	Offsets.			Miles.	Offsets.		
	Yards.	Feet.	Inches.		Yards.	Feet.	Inches.
0.25	0	0	0.57	5.25	7	0	1.00
.50	0	0	2.29	.50	7	2	1.68
.75	0	0	5.16	.75	8	1	3.49
1.00	0	0	9.18	6.00	9	0	6.45
.25	0	1	2.34	.25	9	2	10.57
.50	0	1	8.65	.50	10	2	3.82
.75	0	2	4.11	.75	11	1	10.23
2.00	1	0	0.72	7.00	12	1	5.78
.25	1	0	10.47	.25	13	1	2.49
.50	1	1	9.37	.50	14	1	0.33
.75	1	2	9.42	.75	15	0	11.33
3.00	2	0	10.61	8.00	16	0	11.47
.25	2	2	0.96	.25	17	1	0.77
.50	3	0	4.45	.50	18	1	3.20
.75	3	1	9.08	.75	19	1	6.79
4.00	4	0	2.87	9.00	20	1	11.52
.25	4	1	9.80	.25	21	2	5.40
.50	5	0	5.88	.50	23	0	0.43
.75	5	2	3.11	.75	24	0	8.60
5.00	6	1	1.48	10.00	25	1	5.93

APPENDIX B.

REPORT OF J. G. PARKE, NOVEMBER 12, 1859.[1]

UNITED STATES BOUNDARY SURVEY, COLVILLE DEPOT,
Washington Territory, November 12, 1859.

SIR: I have the honor respectfully to submit the following report of the progress made during the past season in the survey of the forty-ninth parallel by the several parties of the United States commission:

The organization of the parties throughout the greater part of the season has been as follows: Two astronomical parties, one surveying party, one reconnoissance party.

Mr. G. Clinton Gardner, assistant astronomer and surveyor, in charge of an astronomical party; Professor Nooney, assistant.

Mr. Joseph S. Harris, in charge of second astronomical party; Mr. Hudson, assistant.

Mr. Charles T. Gardner, in charge of the surveying party.

Mr. H. Custer, in charge of the reconnoissance party.

Mr. J. Nevin King, in charge of Chiloweyuck depot, on Fraser river and forwarding supplies to the parties in the field.

Dr. C. B. R. Kennerly, in charge of depot, Chiloweyuck lake, in addition to his duties as surgeon and naturalist.

Mr. George Gibbs, in addition to the geological reconnoissance, had charge of a party engaged in opening a trail through from the Skagit valley to the Similkameen.

Mr. R. V. Peabody, in charge of the subsistence and transportation for the parties to the eastward of the lake depot.

Mr. Major assisted in the computations at the astronomical stations.

The reconnoissance at the close of the last season extended as far east as the valley of the Skagit, and the astronomical observations necessary for marking the three points of the parallel in the valley of the Chiloweyuck were completed. On taking the field the present season, the first object was to complete the measurements and marking the parallel at these three stations, Tummeahai, Chiloweyuck lake, and Chuch-che-hum. Then make reconnoissance for the location of astronomical stations and the opening of trails in advance of the parties occupying these stations.

The first party, under the charge of Mr. G. C. Gardner, left Camp Simiahmoo for the Chiloweyuck depot on the eighteenth day of April.

[1] Reprinted from Senate Ex. Doc. No. 16, 36th Cong., 1st sess., pp. 2-7.

The zenith telescope and transit instrument were put up and observations made for latitude and time. Reconnoitering and surveying parties took the field, with instructions to connect Sumass station with the depot and continue on over the trail, connecting the several astronomical stations, and to obtain the topography of the country along and adjacent to the boundary line. The pack mules were sent from their wintering station to the depot, and arrangements were made for the delivery of subsistence, stores, and forage, at that place.

A chronometer trip was made between Camp Simiahmoo and Chiloweyuck depot by a party under charge of Mr. Harris. Eleven chronometers were transported back and forth, and the entire trip being performed in whale-boats, it is confidently expected that a very nice determination of the difference of longitude will be obtained. The observations for time at the depot were made by Mr. Gardner, and those at Camp Simiahmoo by myself.

On the 19th of May, Mr. Harris left Camp Simiahmoo with the outfit for an astronomical and surveying party. On arriving at the depot, he started for the Tummeahai station, Mr. Custer having previously found a practicable route for a pack trail to that point on the left bank of the Chiloweyuck, it being impracticable at that time to cross the stream opposite the mouth of the Tummeahai. Mr. Custer commenced opening the trail; and, on Mr. Harris taking charge of the party, Mr. Custer continued his reconnoissance over to the Nooksahk, and up the tributaries of the Chiloweyuck.

The trail from the depot to Chiloweyuck lake was reopened and made practicable for pack mules, requiring bridging, corduroying, and heavy grading. The high water of the streams, and the great quantity of fallen timber, made the work very heavy, and required a strong force.

On the third of June I arrived at Chiloweyuck depot, and on the fourth, Mr. G. C. Gardner started for the lake depot. Arriving there, he put the boats in order, built a storehouse for the supplies, and commenced marking the parallel by cutting a vista through the timber across the valley, at the southern end of the lake. On the completion of this, he proceeded to Chuchchehum station, and made a cut there on the parallel, embracing the two crossings of the trail. The parallel at these stations was marked by pyramidal piles of stones from six to eight feet high, covering posts accurately marking points on the line. Mr. Harris marked the parallel in the same manner at the Tummeahai station, having cut a vista through the timber, embracing the two forks of the stream. On the completion of the work at Tummeahai, Mr. Harris proceeded to the lake depot, and commenced opening the trail through to the station on the Skagit river. Here again the work was very heavy, it requiring a force of from ten to eighteen men nearly one month to open about thirty-five miles of trail, of which nearly one-

half had been traveled during the previous year. On reaching the valley of the Skagit Mr. Harris located his observatory, and commenced observations for determining the point where the parallel crosses the river.

While at Chiloweyuck depot, I found that our supply of pack mules was insufficient to enable the parties to progress with the work without great loss of time. Mules, apparejos, and pack-saddles were purchased, and additional packers employed, so that the supplies and outfits of the several parties were carried forward as rapidly as the work progressed and the trail was opened.

On Mr. Gardner's completing the work at Chuchchehum station, we proceeded to make a reconnoissance of the country to the east of Skagit station, with a view of locating astronomical stations and determining a route for a trail through to the Similkameen and Okinakane valleys, a region of country that had been heretofore unexplored and known only to a few Indian hunters. We found a mass of rugged and heavily timbered mountains, extending north and south, and having a breadth of about seventy-five miles. Through by far the greater portion of this distance, no trails were found; but, by dint of constant work of four axemen, we were enabled to force our way through the Similkameen. A good and practicable route was however found, crossing two summits having an elevation of about six thousand feet. A road party was immediately placed upon this route, under charge of of Mr. Gibbs. He was supplied with axes, picks, and shovels; and, after five weeks' labor with a strong force, a trail was opened, so that our instruments and supplies could be packed through without difficulty.

On returning from this reconnoissance Mr. Gardner started with his party to occupy a station on the Similkameen. And Mr. Harris, having completed his determination and marking of the parallel at the Skagit station, proceeded to occupy one nearly midway between the Skagit and Similkameen, on the Pasayten, a tributary of the latter. In the meantime, the survey connecting the astronomical stations was continued by the trail, the nearest practicable line to the parallel, as well as the reconnoissance of the country on both sides of the parallel. On the completion of the observations, computations, and marking the parallel at Pasayten, Mr. Harris's party moved on to the Similkameen, and remained there in camp, while Mr. Harris accompanied me on a reconnoissance, to select another station on the Nehoialpitkwu, about thirty-five miles to the eastward. After reaching the Similkameen, we had no difficulty in traveling, the country being open and grassy, and occupied by horseback Indians; numerous well-worn trails were found running in every direction. One of these we found particularly advantageous, leading eastward from the Similkameen to Fort Colville, on the Columbia river, a distance of about one hundred miles. After

crossing the divide to the east of Lake Osogoos [sic], the trail strikes the Nehoialpitkwu, and follows down the valley of this stream crossing the parallel three times.

From the astronomical station on the Similkameen, two points of the parallel, at an interval of about fifteen miles, were determined and marked by triangulation: one at the crossing of the Similkameen and the other at Lake Osoyoos, in the valley of the Okinakane. The intervening country is generally destitute of timber, and made up of a collection of knobs and high hills with intervening plains and valleys, affording good ground for the location of well conditioned triangles.

The first station on the Nehoialpitkwu was occupied by Mr. Harris, and the parallel was determined by a measurement from the observatory, on the meridian, and marked by a cut, nearly a mile in length, across the valley, and by three monuments—two of earth and one of stone. At this station the stream passes from north to the south of the parallel.

The second station on the Nehoialpitkwu, about thirty miles distant by the trail, is now occupied by Mr. Gardner's party, and Mr. Harris's party is in position on the right bank of the Columbia river, near the mouth of Clarke's Fork. It is believed that these points of the parallel will soon be determined and marked, when these parties, together with the surveying and reconnoitering parties, are instructed to repair to this point and go into winter quarters. The weather, however, is at present very severe, the ground being covered with three or four inches of snow, and the thermometer giving readings for the last three mornings as low as four, two, and ten degrees below zero.

To recapitulate, the following is the amount of work accomplished by parties of the United States commission during the present season:

A completion of the determination and marking the parallel from three points astronomically fixed at the close of the last season.

A complete set of observations for latitude at four stations, from which the parallel has been determined and marked at the crossings of the following streams: the Skagit, Pasayten, Similkameen, Okinakane, (Lake Osoyoos,) and Nehoialpitkwu. And before the astronomical parties leave the field, the necessary observations will be completed for determining two other points of the parallel, the third crossing of the Nehoialpitkwu, and the Columbia river.

A chronometer trip for difference of longitude between Camp Simiahmoo and Chilowayuck depot.

Observations of the transit of the moon and moon-culminating stars at two of the latitude stations for absolute longitude.

A triangulation covering an area of about fifty square miles.

A survey of the nearest practicable lines to the parallel, connecting the astronomical stations, making a total distance chained of about three hundred and seventy miles.

Reconnoissances for developing the topography along and adjacent to the boundary line, and for locating routes of communication. These reconnoissances have extended over an area of about six thousand square miles.

A full set of magnetic observations were made at one station. And throughout the work, all the necessary observations for time, azimuth, micrometer value, and instrumental corrections were carefully made.

The two astronomical parties and the reconnoissance party were furnished with sets of meteorological instruments. Full and detailed registers have been kept at the different stations, and, as far as possible, simultaneous readings of the barometer have been taken, while the parties were moving from station to station; which, with the corresponding observations at camp Simiahmoo and the fixed stations, will enable us to give very exact profiles of the country traversed.

The geological reconnoissance has been extended over the field of operations, and valuable collections made of botanical and natural history specimens.

The forty-ninth parallel, as far as determined during the present season, traverses a mountainous country, and, excepting a few localities, the entire region is eminently unfit for occupation or settlement. The mountains are rugged and precipitous, and attain great elevations; the ridges and peaks of the Cascade mountains being covered with perpetual snow. Glaciers were discovered; and during the months of June and July snow to the depth of two feet was encountered on our very route of travel. A heavy growth of pines and fir abounds throughout the entire line from the Gulf of Georgia, with the exception of short intervals in the valleys of the Similkameen, Okinakane, and Nehoialpitkwu.

Under the forty-ninth parallel the Cascade mountains have a breadth of about two degrees in longitude, and as the general trend of these mountains is at right angles to the line of our work, we were necessarily forced into crossing the ridges with our routes of communication, involving much labor in cutting, grading, and bridging to make these routes practicable for even pack-mule transportation. The water courses are numerous and rapid, rendering the fords frequent and dangerous. A slight rise in these streams makes them impassable. Notwithstanding the difficulties of the country and the precarious mode of transporting the instruments, I am happy to report that we have got thus far through the season's work without any damage to our astronomical instruments. I regret, however, that we have been less fortunate with the magnetic instruments. The mule carrying these missed his footing and rolled down a precipitous bank. The magnetic theodolite will have to be replaced, and the other instruments will require repairing. I also have to report the breakage of our barometer. We were, however, able soon to replace this instrument from the lake depot.

On reaching the valleys of the Similkameen and Okinakane we were met by our additional escort, under the command of Captain Archer, United States army. I take great pleasure in acknowledging my obligations for the timely and valuable assistance rendered us by himself and officers of his command.

Preparations are now making at this place to winter the several parties on their return from the field. A great abundance of material for building quarters is found directly at hand. A supply of provisions has been procured.

The winters of this region are reported to be very severe on animals, the snow falling to a great depth. We have laid in a good stock of hay, and, by erecting temporary shelter, we have little fears of losing any of our mules.

Our work during the next season will extend from the Columbia river to the Rocky mountains. From careful inquiry, the entire distance is represented as mountainous and timbered, excepting perhaps a short stretch in the valley of the Kootenay, near the base of the Rocky mountains. In this valley the Hudson's Bay Company have a trading post near to the parallel. This post is supplied from Fort Colville, and the company's trail to that point will no doubt be of great service to us in sending parties to the line, particularly to those stations close to the Rocky mountains.

In reference to the mode or order of proceeding with the astronomical stations during the next season, I would respectfully suggest that we be allowed to proceed directly to the extreme eastern stations, so that on the melting of the snows, we will be able to complete those, and retire in good season, leaving these nearer this depot for the last. By following this plan we will have less difficulty in falling back on this place, in the event of any great detention or delay from ruggedness of country and swollen streams, or even should the winter set in before the completion of the work. It is confidently expected, however, that we will be able to complete all of the astronomical stations during the next season. Mr. Gibbs is at present making a reconnoissance of the trail in the direction of the Kootenay. This will enable us to commence in the early spring with a working party on this route. It is believed that we will have to build bridges and make flatboats for ferrying Clarke's Fork (Pend d'Oreille) and one of its tributaries, besides much cutting and corduroying.

Before closing this report I take great pleasure in again commending to you the great zeal and devotion to duty evinced by the assistant astronomer and surveyor, and the several assistants engaged upon the work; and I am happy to say that the amount of work accomplished during the season has quite equalled the highest estimates.

I have the honor to be, very respectfully, your obedient servant,

JOHN G. PARKE,

Lieut. Corps Top. Eng's, Chief Astron'r and Surv'r.

APPENDIX C.

REPORT OF ARCHIBALD CAMPBELL, FEBRUARY 3, 1869.[1]

UNITED STATES NORTHWESTERN BOUNDARY COMMISSION.

Washington, D. C., February 3, 1869.

SIR: I have the honor to acknowledge the receipt of your letter of the 16th ultimo, asking for information concerning the matters mentioned in a resolution of the House of Representatives of the 13th of January:

> That the Secretary of State be directed to communicate to the House the total amount expended for the northwestern boundary commission, and to give in detail the items of expenditure, the number and names of persons employed in such commission, how long employed, and at what salaries, and the nature and extent of the services performed.

In reply to your letter I have the honor to transmit herewith the following papers:

Financial statement, January 1, 1869, marked A.

List of persons composing the commission, with rates of salaries &c., marked B.

List of assistants employed in running and marking the boundary line, with statement of pay, &c., marked C.

List of assistants employed in working up the results of the survey, with statement of pay, &c., marked D.

Statement of labor employed in running and marking the boundary line, marked E.

Statement of services of Indians, marked F.

In regard to "the nature and extent of the services performed," nothing short of the full reports of the chief astronomer and surveyor, and other officers of the commission, and the detailed maps of the survey of the boundary line, can give an adequate idea of the subject. It is not supposed, however, that the House of Representatives desires so comprehensive a reply to their inquiry. I shall therefore endeavor as briefly as possible to furnish the information called for.

On the 11th August, 1856, Congress passed a law, authorizing the appointment of a commission on the part of the United States, to unite with a similar commission to be appointed by Great Britain, for the purpose of carrying into effect the first article of the treaty of June 15,

[1] Reprinted from House Ex. Doc. 86, 40th Congress, 3d session.

1846, that is, to determine and mark the boundary line between the United States and British possessions, agreed upon in the treaty, viz:

From the point on the 49th parallel of north latitude, where the boundary laid down in existing treaties and conventions between the United States and Great Britain terminates, * * * westward along the said 49th parallel of north latitude, to the middle of the channel which separates the continent from Vancouver's island, and thence southerly, through the middle of the said channel and of Fuca's straits, to the Pacific ocean.

Toward the close of the year the British Government appointed Captain Prevost, royal navy, commanding steamer Satellite, first commissioner to determine that part of the line which runs through "the channel which separates the continent from Vancouver's island," and announced that he had started on his way to the vicinity of the boundary line, and that Captain Richards, royal navy, second commissioner, would shortly follow.

Although the powers of the British commission were limited to tne determination of the water-boundary alone, while the act of Congress authorized, on the part of the United States, the determination of the boundary from the crest of the Rocky mountains to the Pacific ocean, the President decided to carry out the law by the appointment of officers authorized thereby, and to notify the British government of the difference between the powers of the two commissions. In February, 1857, I was appointed commissioner, Lieutenant John G. Parke, United States army, chief astronomer and surveyor, and G. Clinton Gardner, assistant astronomer and surveyor, on the part of the United States.

Under instructions from the State Department, the United States commission was duly organized and directed to repair to Fuca's straits, via San Francisco, to meet the British commission. At the close of June, I met Captain Prevost, the British commissioner, at Esquimalt harbor, at the southern end of Vancouver's island, and was informed by him that until the arrival of Captain Richards, second commissioner, with the surveying party, he was not prepared to enter upon the determination of the water boundary. The United States commissioner therefore proceeded to the western terminus of the 49th parallel, on the main land, and established a depot and located an observatory, for the commencement of the survey along the 49th parallel, eastward, to the crest of the Rocky mountains. The British government not yet having provided a commissioner for that part of the boundary line, we were obliged to commence the work without its co-operation. Reconnoissances and explorations in the vicinity of the boundary line were at once commenced, and continued as long as the season permitted field operations. Before the spring, four astronomical points on the 49th parallel were determined, and the country thoroughly reconnoitered in the vicinity of the parallel, for a considerable distance eastward.

Towards the close of October, Captain Prevost visited the 49th parallel and informed me that Captain Richards had not yet arrived, but that, as he had satisfied himself of the general accuracy of the United States Coast Survey chart of the channels and islands between the continent and Vancouver's island, he should act independently of him. He therefore proposed that we should at once proceed to the determination of the water boundary. Several meetings of the joint commission accordingly took place, at which the question of the boundary channel was verbally discussed. The British commissioner claimed Rosario straits (the channel nearest the continent,) while I claimed the Canal de Haro, (the channel nearest Vancouver's island) as the boundary channel, intended by the treaty. Between these two channels lies the Haro archipelago, a group of islands, of which San Juan forms a part.

The verbal discussion was followed by a correspondence on the subject, in which the merits of the question were fully set forth. Captain Prevost concluded the correspondence by a proposition to compromise the difference, by running the boundary through an intermediate channel which would secure the island of San Juan to Great Britain. This proposition I declined.

For more full information in regard to the question of the water boundary I would respectfully refer to Senate Ex. Doc. No. 29, 2d session, 40th Congress. This document contains the correspondence above referred to, with a geographical memoir of the islands in dispute, and a map and cross-sections of the channels.

In conformity with the fifth section of the act organizing the commission, the President (through the Secretary of the Treasury) directed the Superintendent of the Coast Survey to place the steamer Active and brig Fauntleroy at the disposal of the commissioner when required. Both vessels were accordingly employed for the survey and soundings of the various channels and islands between the continent and Vancouver's island, a portion of the expenses of the Active being paid by the commission during the time that vessel was employed on this duty.

After the arrival of the British surveying steamer Plumper, Captain Richards co-operated with the United States Coast Survey vessels, and a thorough and complete survey of all the channels and islands between the continent and Vancouver's island south of the 49th parallel was made.

The map above referred to is the result of this joint survey, which occupied several seasons.

In the summer of 1858 Col. J. S. Hawkins, royal engineers, appointed by the British government commissioner to determine the boundary line along the 49th parallel, arrived from England with a suitable party organized for field operations. At the time of his

arrival the excitement arising from the discovery of gold on Frazer river was at its height. This event caused for a time great increase in the price of labor and supplies, and created considerable embarrassment, delay, and additional expense in the field operations of the season.

A meeting of the joint commission was held for the purpose of agreeing upon a plan of field operations for the survey of the land boundary. The following is a copy of the arrangement made:

After discussing plans for determining and marking the line as far eastward as the Cascade mountains, it was concluded to be inexpedient at the present time, in consequence of the great expense, consumption of time, and the impracticable nature of the country, to mark the whole boundary by cutting a track through the dense forest.

It was therefore agreed to ascertain points on the line by the determination of astronomical points at convenient intervals on or near the boundary, and to mark such astronomical stations, or points fixed on the parallel forming the boundary, by cutting a track of not less than 20 feet in width on each side for the distance of half a mile or more, according to circumstances. Further, that the boundary be determined and similarly marked where it crosses streams of any size, permanent trails, or any striking natural feature of the country.

In the vicinity of settlements on or near the line, it is deemed advisable to cut the track for a greater distance, and to mark it in a manner to be determined hereafter.

The work of running and marking the land boundary was carried on through a country previously almost unknown. The 49th parallel extends over rugged and precipitous mountains that attain great elevation, and in the Cascade range, on and near the boundary, perpetual snow covers many of the peaks, whose northern gorges are filled up with immense glaciers. The timber on the western slope of the Cascade mountains is dense, being a heavy growth of pine and fir, that in many places stands over a fallen forest not yet decayed. This is the character of the country as far east as the valley of the Similkameen river, one of the tributaries of the Columbia. Here the timber becomes more open and surveying operations less difficult.

After passing the Okinokane river, which is the lowest line of the great valley between the Cascade and the Rocky mountains, the country again becomes rough and the timber more dense, but less so than the western slope of the Cascade mountains.

It being impossible to follow the 49th parallel continuously, the line of survey was carried over the nearest practicable route for a pack trail, connecting each astronomical station, making a total length of line of survey of about 800 miles. Astronomical stations were established by parties of the joint commission at almost every accessible point from which the boundary line is ascertained, and marked by a vista across all valleys and trails, where rough stone monuments were erected over posts buried in the ground to indicate the exact line.

The reconnaissance work extends over an area of about 30,000 square miles. Within this space the barometrical heights of over 800 points have been obtained.

A magnetic survey, extending over a range of 3° 20′ in latitude and 4° in longitude, with the necessary observations of the magnetic elements of the astronomical stations, was also made.

The entire length of the land boundary line is over 9° in longitude, or about 410 miles, and the length of the route traveled in surveying it is double that distance. Trails had to be opened for three-fourths of the distance traveled, involving great labor in cutting, grading, and bridging to make the route practicable for pack-mule transportation. The water-courses were numerous and rapid, rendering the fords frequent and dangerous; and a slight rise of many of the streams would have made them impassable but for the timely precaution of building bridges at small streams and ferry boats at the river crossings. Many of the trails opened are now traveled routes to the mines then and since discovered, which are rapidly developing that section of the country, where almost every valley of any extent affords facilities for agricultural pursuits.

In collating the results of the survey reports upon the geology, botany, and natural history of the country reconnoitered were prepared, and complete maps, on a large scale, made of the entire boundary and the adjacent country. A general map has also been made, showing the extent of the country traversed. And to facilitate the survey of the public lands, photographic duplicates of the detailed sheets, showing each monument on the boundary line, with its geographical position, were furnished to the General Land Office. Photographic duplicates of the detailed sheets of the water boundary have also been made and furnished the Department of State in illustration of the question of the boundary channel.

I have the honor to be, very respectfully, your obedient servant,

ARCHIBALD CAMPBELL,
Commissioner Northwest Boundary Survey.

Hon. WILLIAM H. SEWARD,
Secretary of State.

INDEX.

Page.

Alden, J. M., artist 61
left field 17
sketches made by 63
Astronomer, American 14
assistant 13
British 15
Boundary, northwest, defined 9, 13
Buchanan, J., agent for United States 13
Campbell, A., appointed commissioner of Northern Boundary Commission 11
appointed commissioner of Northwest Boundary Commission 13
died 12
left field 17
letter by, made use of 10, 11
text of letter 72
paper in final report 11
Clerk of commission appointed 14
Coast Survey cooperates 14
Commission, British, powers of 15
Commission, Northern Boundary, created 11
first meeting of joint 15
second meeting of joint 15
office of 17
plans for work of 15
Commissioner, American 14
British 15
Northern Boundary Commission 11
Coordinates, tables of 28, 29
Cost of Survey to United States 18
Custer, H., left field 17
topographer 14
Doolittle, C. L., acknowledgments to 13
statement regarding report of commission 12
Elevations, tables of 42–57
Expenses, American 18
British 19
Fossils, work on 61, 63
Gardner, G. C., acknowledgments to 12
appointed assistant astronomer 13
left field 17
paper in final report 11
Geographic coordinates 27
Geologist, service of 14
Gibbs, G., geologist and interpreter 14
left field 17
Gill, T., acknowledgments to 13
Guide, services of 14
Hawkins, J. S., commissioner for Great Britain, arrived 15
Harris, J. S., acknowledgments to 12

Page.

Harris, J. S., appointed assistant surgeon and naturalist 14
left field 17
paper in final report 11
Herbst, T., topographer 14
Indian names 58–61
Interpreter, services of 14
Kennerly, C. B. R., surgeon and naturalist 14
King, J. N., quartermaster 14
Line established 13
Location and longitudes of monuments, tables 30–39
Magnetics, tables of 40–42
Major, J. J., clerk of commission 14
left field 17
Maps, English 25, 26
American, detailed description of 19–25
copies in Library of Congress 23
copies in General Land Office 23
Meek, F. B., work on fossils 62
Message of President Johnson referred to 10
Monument at Point Roberts, cost of 19
Monuments, American and British, tables of location and longitudes of 30–39
Names, Indian 58–61
Naturalist, service of 14
Newberry, J.S., report on fossils referred to 63
Northwest boundary, definition of 9, 13
Office of commission in Washington 17
Pakenham, R., agent for Great Britain 13
Palliser, J., survey by 19
Parke, J. G., acknowledgments to 12
appointed chief astronomer 13
left field 17
paper by, in final report 11
report of progress 10
text of report 66
summary of work of, 1859 16
Peabody, R. V., guide 14
Plumper, British vessel 15
Point Roberts, cost of monument at 19
Prevost, J. C., British commissioner 15
Quartermaster, service of 14
Report of Boundary Commission, a description of 10, 11
called for by Senate 11
information regarding 12
not found 10
not published 17
notices of 11
reason for nonpublication 18
Richards, G. H., British astronomer 15

Page.
Satellite, British vessel 15
Scientific reports 61
Secretary of commission 14
Suckley, G., paper of, referred to 62
Surgeon and naturalist appointed 14
Survey of northwest boundary, cost of, to United States 18
history of 13, 17
Topographers 14
Treaty between United States and Great Britain, first article of 13
Vessels, American 14
Vessels, British 15
Warren, W. J., acknowledgments to 12
appointed secretary of commission 14
left field 17
Water boundary, arbitration before William I of Germany 9
Wheeler, G. M., extract from report 11
report made use of 10
William I of Germany, arbiter of water boundary 9
Wurdemann, information from 13
left field 17

O

ADVERTISEMENT.

[Bulletin 174.]

The statute approved March 3, 1879, establishing the United States Geological Survey, contains the following provisions:

"The publications of the Geological Survey shall consist of the annual report of operations, geological and economic maps illustrating the resources and classification of the lands, and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the Director, but otherwise in ordinary octavos. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization; and the money resulting from the sale of such publications shall be covered into the Treasury of the United States."

Except in those cases in which an extra number of any special memoir or report has been supplied to the Survey by resolution of Congress or has been ordered by the Secretary of the Interior, this office has no copies for gratuitous distribution.

ANNUAL REPORTS.

I. First Annual Report of the United States Geological Survey, by Clarence King. 1880. 8°. 79 pp. 1 map.—A preliminary report describing plan of organization and publications.

II. Second Annual Report of the United States Geological Survey, 1880–'81, by J. W. Powell. 1882. 8°. lv, 588 pp. 62 pl. 1 map.

III. Third Annual Report of the United States Geological Survey, 1881–'82, by J. W. Powell. 1883. 8°. xviii, 564 pp. 67 pl. and maps.

IV. Fourth Annual Report of the United States Geological Survey, 1882–'83, by J. W. Powell. 1884. 8°. xxxii, 473 pp. 85 pl. and maps.

V. Fifth Annual Report of the United States Geological Survey, 1883–'84, by J. W. Powell. 1885. 8°. xxxvi, 469 pp. 58 pl. and maps.

VI. Sixth Annual Report of the United States Geological Survey, 1884–'85, by J. W. Powell. 1885. 8°. xxix, 570 pp. 65 pl. and maps.

VII. Seventh Annual Report of the United States Geological Survey, 1885–'86, by J. W. Powell. 1888. 8°. xx, 656 pp. 71 pl. and maps.

VIII. Eighth Annual Report of the United States Geological Survey, 1886–'87, by J. W. Powell. 1889. 8°. 2 pt. xix, 474, xii pp., 53 pl. and maps; 1 p. l., 475–1063 pp., 54–76 pl. and maps.

IX. Ninth Annual Report of the United States Geological Survey, 1887–'88, by J. W. Powell. 1889. 8°. xiii, 717 pp. 88 pl. and maps.

X. Tenth Annual Report of the United States Geological Survey, 1888–'89, by J. W. Powell. 1890. 8°. 2 pt. xv, 774 pp., 98 pl. and maps; viii, 123 pp.

XI. Eleventh Annual Report of the United States Geological Survey, 1889–'90, by J. W. Powell. 1891. 8°. 2 pt. xv, 757 pp., 66 pl. and maps; ix, 351 pp., 30 pl.

XII. Twelfth Annual Report of the United States Geological Survey, 1890–'91, by J. W. Powell. 1891. 8°. 2 pt. xiii, 675 pp., 53 pl. and maps; xviii, 576 pp., 146 pl. and maps.

XIII. Thirteenth Annual Report of the United States Geological Survey, 1891–'92, by J. W. Powell. 1893. 8°. 3 pt. vii, 240 pp., 2 maps; x, 372 pp., 105 pl. and maps; xi, 486 pp., 77 pl. and maps.

XIV. Fourteenth Annual Report of the United States Geological Survey, 1892–'93, by J. W. Powell. 1893. 8°. 2 pt. vi, 321 pp., 1 pl.; xx, 597 pp., 74 pl.

XV. Fifteenth Annual Report of the United States Geological Survey, 1893–'94, by J. W. Powell. 1895. 8°. xiv, 755 pp. 48 pl.

XVI. Sixteenth Annual Report of the United States Geological Survey, 1894–'95, Charles D. Walcott, Director. 1895. (Part I, 1896.) 8°. 4 pt. xxii, 910 pp., 117 pl. and maps; xix, 598 pp., 43 pl. and maps; xv, 646 pp., 23 pl.; xix, 735 pp., 6 pl.

XVII. Seventeenth Annual Report of the United States Geological Survey, 1895–'96, Charles D. Walcott, Director. 1896. 8°. 3 pt. in 4 vol. xxii, 1076 pp., 67 pl. and maps; xxv, 864 pp., 113 pl. and maps; xxiii, 542 pp., 8 pl. and maps; iii, 543–1058 pp., 9–13 pl.

XVIII. Eighteenth Annual Report of the United States Geological Survey, 1896–'97, Charles D. Walcott, Director. 1897. (Parts II and III, 1898.) 8°. 5 pt. in 6 vol. 440 pp., 4 pl. and maps; v, 653 pp., 105 pl. and maps; v, 861 pp., 118 pl. and maps; x, 756 pp., 102 pl. and maps; xii, 642 pp., 1 pl.; 643–1400 pp.

XIX. Nineteenth Annual Report of the United States Geological Survey, 1897–'98, Charles D. Walcott, Director. 1898. (Parts II, III, and V, 1899.) 8°. 6 pt. in 7 vol. 422 pp., 2 maps; v, 958 pp., 172 pl. and maps; v, 785 pp., 99 pl. and maps; viii, 814 pp., 118 pl. and maps; xvii, 400 pp., 110 pl. and maps; viii, 651 pp., 11 pl.; viii, 706 pp.

XX. Twentieth Annual Report of the United States Geological Survey, 1898–'99, Charles D. Walcott, Director. 1899. (Parts II, III, IV, V, and VII, 1900.) 8°. 7 pt. in 8 vol. 551 pp.; 2 maps; v, 953 pp., 193 pl. and maps; v, 595 pp., 78 pl. and maps; vii, 660 pp., 75 pl. and maps; xix, 498 pp., 159 pl. and maps; viii, 616 pp.; xi, 804 pp., 1 pl.; v, 509 pp., 38 pl. and maps.

MONOGRAPHS.

I. Lake Bonneville, by Grove Karl Gilbert. 1890. 4°. xx, 438 pp. 51 pl. 1 map. Price $1.50.

II. Tertiary History of the Grand Cañon District, with Atlas, by Clarence E. Dutton, Capt. U. S. A. 1882. 4°. xiv, 264 pp. 42 pl. and atlas of 24 sheets folio. Price $10.00.

III. Geology of the Comstock Lode and the Washoe District, with Atlas, by George F. Becker. 1882. 4°. xv, 422 pp. 7 pl. and atlas of 21 sheets folio. Price $11.00.

IV. Comstock Mining and Miners, by Eliot Lord. 1883. 4°. xiv, 451 pp. 3 pl. Price $1.50.

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150. The Educational Series of Rock Specimens Collected and Distributed by the United States Geological Survey, by Joseph Silas Diller. 1898. 8°. 400 pp. 47 pl. Price 25 cents.

151. The Lower Cretaceous Gryphæas of the Texas Region, by R. T. Hill and T. Wayland Vaughan. 1898. 8°. 139 pp. 35 pl. Price 15 cents.

152. A Catalogue of the Cretaceous and Tertiary Plants of North America, by F. H. Knowlton. 1898. 8°. 247 pp. Price 20 cents.

153. A Bibliographic Index of North American Carboniferous Invertebrates, by Stuart Weller. 1898. 8°. 653 pp. Price 35 cents.

154. A Gazetteer of Kansas, by Henry Gannett. 1898. 8°. 246 pp. 6 pl. Price 20 cents.

155. Earthquakes in California in 1896 and 1897, by Charles D. Perrine, Assistant Astronomer in Charge of Earthquake Observations at the Lick Observatory. 1898. 8°. 47 pp. Price 5 cents.

156. Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for the Year 1897, by Fred Boughton Weeks. 1898. 8°. 130 pp. Price 15 cents.

157. The Gneisses, Gabbro-Schists, and Associated Rocks of Southwestern Minnesota, by Christopher Webber Hall. 1899. 8°. 160 pp. 27 pl. Price 45 cents.

158. The Moraines of Southeastern South Dakota and their Attendant Deposits, by James Edward Todd. 1899. 8°. 171 pp. 27 pl. Price 25 cents.

159. The Geology of Eastern Berkshire County, Massachusetts, by B. K. Emerson. 1899. 8°. 139 pp. 9 pl. Price 20 cents.

160. A Dictionary of Altitudes in the United States (Third Edition), compiled by Henry Gannett. 1899. 8°. 775 pp. Price 40 cents.

161. Earthquakes in California in 1898, by Charles D. Perrine, Assistant Astronomer in Charge of Earthquake Observations at the Lick Observatory. 1899. 8°. 31 pp. 1 pl. Price 5 cents.

162. Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for the Year 1898, by Fred Boughton Weeks. 1899. 8°. 163 pp. Price 15 cents.

163. Flora of the Montana Formation, by Frank Hall Knowlton. 1900. 8°. 118 pp. 19 pl. Price 15 cents.

164. Reconnaissance in the Rio Grande Coal Fields of Texas, by Thomas Wayland Vaughan, including a Report on Igneous Rocks from the San Carlos Coal Field, by E. C. E. Lord. 1900. 8°. 100 pp. 11 pl. and maps. Price 20 cents.

165. Contributions to the Geology of Maine, by Henry S. Williams and Herbert E. Gregory. 1900. 8°. 212 pp. 14 pl. Price 25 cents.

166. A Gazetteer of Utah, by Henry Gannett. 1900. 8°. 43 pp. 1 map. Price 15 cents.

167. Contributions to Chemistry and Mineralogy from the Laboratory of the United States Geological Survey; Frank W. Clarke, Chief Chemist. 1900. 8°. 166 pp. Price 15 cents.

168. Analyses of Rocks, Laboratory of the United States Geological Survey, 1880 to 1899, tabulated by F. W. Clarke, Chief Chemist. 1900. 8°. 308 pp. Price 20 cents.

169. Altitudes in Alaska, by Henry Gannett. 1900. 8°. 13 pp. Price 5 cents.

170. Survey of the Boundary Line between Idaho and Montana from the International Boundary to the Crest of the Bitterroot Mountains, by Richard Urquhart Goode. 1900. 8°. 67 pp. 14 pl. Price 15 cents.

171. Boundaries of the United States and of the Several States and Territories, with an Outline of the History of all Important Changes of Territory (Second Edition), by Henry Gannett. 1900. 8°. 142 pp. 53 pl. Price 30 cents.

172. Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for the Year 1899, by Fred Boughton Weeks. 1900. 8°. 141 pp. Price 15 cents.

173. Synopsis of American Fossil Bryozoa, including Bibliography and Synonymy, by John M. Nickles and Ray S. Bassler. 1900. 8°. 663 pp. Price 40 cents.

174. Survey of the Northwestern Boundary of the United States, 1857-1861, by Marcus Baker. 1900. 8°. 78 pp. 1 pl. Price 10 cents.

In press:

175. Triangulation and Spirit Leveling in Indian Territory, by C. H. Fitch.

176. Some Principles and Methods of Rock Analysis, by W. F. Hillebrand.

In preparation:

—. Bibliography and Catalogue of the Fossil Vertebrata of North America, by Oliver Perry Hay.

WATER-SUPPLY AND IRRIGATION PAPERS.

By act of Congress approved June 11, 1896, the following provision was made:

"*Provided*, That hereafter the reports of the Geological Survey in relation to the gauging of streams and to the methods of utilizing the water resources may be printed in octavo form, not to exceed one hundred pages in length and five thousand copies in number; one thousand copies of which shall be for the official use of the Geological Survey, one thousand five hundred copies shall be delivered to the Senate, and two thousand five hundred copies shall be delivered to the House of Representatives, for distribution."

Under this law the following papers have been published:

1. Pumping Water for Irrigation, by Herbert M. Wilson. 1896. 8°. 57 pp. 9 pl.
2. Irrigation near Phœnix, Arizona, by Arthur P. Davis. 1897. 8°. 97 pp. 31 pl.
3. Sewage Irrigation, by George W. Rafter. 1897. 8°. 100 pp. 4 pl.
4. A Reconnoissance in Southeastern Washington, by Israel Cook Russell. 1897. 8°. 96 pp. 7 pl.
5. Irrigation Practice on the Great Plains, by Elias Branson Cowgill. 1897. 8°. 39 pp. 12 pl.
6. Underground Waters of Southwestern Kansas, by Erasmuth Haworth. 1897. 8°. 65 pp. 12 pl.
7. Seepage Waters of Northern Utah, by Samuel Fortier. 1897. 8°. 50 pp. 3 pl.
8. Windmills for Irrigation, by E. C. Murphy. 1897. 8°. 49 pp. 8 pl.
9. Irrigation near Greeley, Colorado, by David Boyd. 1897. 8°. 90 pp. 21 pl.
10. Irrigation in Mesilla Valley, New Mexico, by F. C. Barker. 1898. 8°. 51 pp. 11 pl.
11. River Heights for 1896, by Arthur P. Davis. 1897. 8°. 100 pp.
12. Underground Waters of Southeastern Nebraska, by N. H. Darton. 1898. 8°. 56 pp. 21 pl.
13. Irrigation Systems in Texas, by William Ferguson Hutson. 1898. 8°. 67 pp. 10 pl.
14. New Tests of Pumps and Water-Lifts used in Irrigation, by O. P. Hood. 1898. 8°. 91 pp. 1 pl.
15. Operations at River Stations, 1897, Part I. 1898. 8°. 100 pp.
16. Operations at River Stations, 1897, Part II. 1898. 8°. 101-200 pp.
17. Irrigation near Bakersfield, California, by C. E. Grunsky. 1898. 8°. 96 pp. 16 pl.
18. Irrigation near Fresno, California, by C. E. Grunsky. 1898. 8°. 94 pp. 14 pl.
19. Irrigation near Merced, California, by C. E. Grunsky. 1899. 8°. 59 pp. 11 pl.

20. Experiments with Windmills, by T. O. Perry. 1899. 8°. 97 pp. 12 pl.
21. Wells of Northern Indiana, by Frank Leverett. 1899. 8°. 82 pp. 2 pl.
22. Sewage Irrigation, Part II, by George W. Rafter. 1899. 8°. 100 pp. 7 pl.
23. Water-right Problems of the Bighorn Mountains, by Elwood Mead. 1899. 8°. 62 pp. 7 pl.
24. Water Resources of the State of New York, Part I, by G. W. Rafter. 1899. 8°. 99 pp. 13 pl.
25. Water Resources of the State of New York, Part II, by G. W. Rafter. 1899. 8°. 101-200 pp. 12 pl.
26. Wells of Southern Indiana (Continuation of No. 21), by Frank Leverett. 1899. 8°. 64 pp.
27. Operations at River Stations for 1898, Part I. 1899. 8°. 100 pp.
28. Operations at River Stations for 1898, Part II. 1899. 8°. 101-200 pp.
29. Wells and Windmills in Nebraska, by Erwin H. Barbour. 1899. 8°. 85 pp. 27 pl.
30. Water Resources of the Lower Peninsula of Michigan, by Alfred C. Lane. 1899. 8°. 97 pp. 7 pl.
31. Lower Michigan Mineral Waters, by Alfred C. Lane. 1899. 8°. 97 pp. 4 pl.
32. Water Resources of Puerto Rico, by Herbert M. Wilson. 1899. 8°. 48 pp. 17 pl.
33. Storage of Water on Gila River, Arizona, by Joseph B. Lippincott. 1900. 8°. 98 pp. 33 pl.
34. Geology and Water Resources of SE. South Dakota, by J. E. Todd. 1900. 8°. 34 pp. 19 pls.
35. Operations at River Stations, 1899, Part I. 1900. 8°. 100 pp.
36. Operations at River Stations, 1899, Part II. 1900. 8°. 101-198 pp.
37. Operations at River Stations, 1899, Part III. 1900. 8°. 199-298 pp.
38. Operations at River Stations, 1899, Part IV. 1900. 8°. 299-396 pp.
39. Operations at River Stations, 1899, Part V. 1900. 8°. 397-471 pp.

TOPOGRAPHIC MAP OF THE UNITED STATES.

When, in 1882, the Geological Survey was directed by law to make a geologic map of the United States, there was in existence no suitable topographic map to serve as a base for the geologic map. The preparation of such a topographic map was therefore immediately begun. About one-fifth of the area of the country, excluding Alaska, has now been thus mapped. The map is published in atlas sheets, each sheet representing a small quadrangular district, as explained under the next heading. The separate sheets are sold at 5 cents each when fewer than 100 copies are purchased, but when they are ordered in lots of 100 or more copies, whether of the same sheet or of different sheets, the price is 2 cents each. The mapped areas are widely scattered, nearly every State being represented. About 900 sheets have been engraved and printed; they are tabulated by States in the Survey's "List of Publications," a pamphlet which may be had on application.

The map sheets represent a great variety of topographic features, and with the aid of descriptive text they can be used to illustrate topographic forms. This has led to the projection of an educational series of topographic folios, for use wherever geography is taught in high schools, academies, and colleges. Of this series the first two folios have been issued, viz:

1. Physiographic types, by Henry Gannett, 1898, folio, consisting of the following sheets and 4 pages of descriptive text: Fargo (N. Dak.-Minn.), a region in youth; Charleston (W. Va.), a region in maturity; Caldwell (Kans.), a region in old age; Palmyra (Va.), a rejuvenated region; Mount Shasta, (Cal.), a young volcanic mountain; Eagle (Wis.), moraines; Sun Prairie (Wis.), drumlins; Donaldsonville (La.), river flood plains; Boothbay (Me.), a fiord coast; Atlantic City (N. J.), a barrier-beach coast.

2. Physiographic types, by Henry Gannett, 1900, folio, consisting of the following sheets and 11 pages of descriptive text: Norfolk (Va.-N. C.), a coast swamp; Marshall (Mo.), a graded river; Lexington (Nebr.), an overloaded stream; Harrisburg (Pa.), Appalachian ridges; Poteau Mountain (Ark.-Ind. T.), Ozark ridges; Marshall (Ark.), Ozark Plateau; West Denver (Colo.), hogbacks; Mount Taylor (N. Mex.), volcanic peaks, plateaus, and necks; Cucamonga (Cal.), alluvial cones; Crater Lake special (Oreg.), a crater.

GEOLOGIC ATLAS OF THE UNITED STATES.

The Geologic Atlas of the United States is the final form of publication of the topographic and geologic maps. The atlas is issued in parts, or folios, progressively as the surveys are extended, and is designed ultimately to cover the entire country.

Under the plan adopted the entire area of the country is divided into small rectangular districts (designated *quadrangles*), bounded by certain meridians and parallels. The unit of survey is also the unit of publication, and the maps and descriptions of each rectangular district are issued as a folio of the Geologic Atlas.

Each folio contains topographic, geologic, economic, and structural maps, together with textual descriptions and explanations, and is designated by the name of a principal town or of a prominent natural feature within the district.

Two forms of issue have been adopted, a "library edition" and a "field edition." In both the sheets are bound between heavy paper covers, but the library copies are permanently bound, while the sheets and covers of the field copies are only temporarily wired together.

Under the law a copy of each folio is sent to certain public libraries and educational institutions. The remainder are sold at 25 cents each, except such as contain an unusual amount of matter, which are priced accordingly. Prepayment is obligatory. The folios ready for distribution are here listed:

No.	Name of sheet.	State.	Limiting meridians.	Limiting parallels.	Area, in square miles.	Price, in cents.
1	Livingston	Montana	110°-111°	45°-46°	3,354	25
2	Ringgold	Georgia Tennessee	85°-85° 30′	34° 30′-35°	980	25
3	Placerville	California	120° 30′-121°	38° 30′-39°	932	25
4	Kingston *a*	Tennessee	84° 30′-85°	35° 30′-36°	969	25
5	Sacramento	California	121°-121° 30′	38° 30′-39°	932	25
6	Chattanooga	Tennessee	85°-85° 30′	35°-35° 30′	975	25
7	Pikes Peak *a*	Colorado	105°-105° 30′	38° 30′-39°	932	25
8	Sewanee	Tennessee	85° 30′-86°	35°-35° 30′	975	25
9	Anthracite-Crested Butte.	Colorado	106° 45′-107° 15′	38° 45′-39°	465	50
10	Harpers Ferry	Virginia West Va. Maryland	77° 30′-78°	39°-39° 30′	925	25
11	Jackson	California	120° 30′-121°	38°-38° 30′	938	25
12	Estillville	Virginia Kentucky Tennessee	82° 30′-83°	36° 30′-37°	957	25
13	Fredericksburg	Maryland Virginia	77°-77° 30′	38°-38° 30′	938	25
14	Staunton	Virginia West Va.	79°-79° 30′	38°-38° 30′	938	25
15	Lassen Peak	California	121°-122°	40°-41°	3,634	25
16	Knoxville	Tennessee N.Carolina	83° 30′-84°	35° 30′-36°	925	25
17	Marysville	California	121° 30′-122°	39°-39° 30′	925	25
18	Smartsville	California	121°-121° 30′	39°-39° 30′	925	25
19	Stevenson	Alabama Georgia Tennessee	85° 30′-86°	34° 30′-35°	980	25
20	Cleveland	Tennessee	84° 30′-85°	35°-35° 30′	975	25
21	Pikeville	Tennessee	85°-85° 30′	35° 30′-36°	969	25
22	McMinnville	Tennessee	85° 30′-86°	35° 30′-36°	969	25
23	Nomini	Maryland Virginia	76° 30′-77°	38°-38° 30′	938	25
24	Three Forks	Montana	111°-112°	45°-46°	3,354	50
25	Loudon	Tennessee	84°-84° 30′	35° 30′-36°	969	25
26	Pocahontas	Virginia West Va.	81°-81° 30′	37°-37° 30′	951	25
27	Morristown	Tennessee	83°-83° 30′		963	25
28	Piedmont	Maryland West Va.	79°-79° 30′	39°-39° 30′	925	25
29	Nevada City:					
	Nevada City	California	121° 00′ 25″-121° 03′ 45″	39° 13′ 50″-39° 17′ 16″	11.65	50
	Grass Valley		121° 01′ 35″-121° 05′ 04″	39° 10′ 22″-39° 13′ 50″	12.09	
	Banner Hill		120° 57′ 05″-121° 00′ 25″	39° 13′ 50″-39° 17′ 16″	11.65	
30	Yellowstone National Park:					
	Gallatin Canyon Shoshone Lake	Wyoming	110°-111°	44°-45°	3,412	75
31	Pyramid Peak	California	120°-120° 30′	38° 30′-39°	932	25
32	Franklin	Virginia West Va.	79°-79° 30′	38° 30′-39°	932	25
33	Briceville	Tennessee	84°-84° 30′	36′-36° 30′	963	25
34	Buckhannon	West Va.	80°-80° 30′	38° 30′-39°	932	25
35	Gadsden	Alabama	86°-86° 30′	34°-34° 30′	986	25
36	Pueblo	Colorado	104° 30′-105°	38°-38° 30′	938	50
37	Downieville	California	120° 30′-121°	39° 30′-40°	919	25
38	Butte Special	Montana	112° 29′ 30″-112° 36′ 42″	45° 59′ 28″-46° 02′ 54″	22.80	50
39	Truckee	California	120°-120° 30′	39°-39° 30′	925	25
40	Wartburg	Tennessee	84° 30′-85°	36°-36° 30′	963	25
41	Sonora	California	120°-120° 30′	37° 30′-38°	944	25
42	Nueces	Texas	100°-100° 30′	29° 30′-30°	1,035	25
43	Bidwell Bar	California	121°-121° 30′	39° 30′-40°	918	25
44	Tazewell	Virginia West Va.	81° 30′-82°	37°-37° 30′	950	25
45	Boise	Idaho	116°-116° 30′	43° 30′-44°	864	25
46	Richmond	Kentucky	84°-84° 30′	37° 30′-38°	944	25
47	London	Kentucky	84°-84° 30′	37°-37° 30′	950	25
48	Tenmile District Special.	Colorado	106° 8′-106° 16′	39° 22′ 30″-39° 30′ 30″	55	25
49	Roseburg	Oregon	123°-123° 30′	43°-43° 30′	871	25
50	Holyoke	Mass Conn	72° 30′-73°	42°-42° 30′	885	50
51	Big Trees	California	120°-120° 30′	38°-38° 30′	938	25
52	Absaroka:					
	Crandall Ishawooa	Wyoming	109° 30′-110°	44°-44° 30′	1,706	25
53	Standingstone	Tennessee	85°-85° 30′	36°-36° 30′	963	25

a Out of stock.

No.	Name of sheet.	State.	Limiting meridians.	Limiting parallels.	Area, in square miles.	Price, in cents.
54	Tacoma	Washington.	122°-122° 30′	47°-47° 30′	812	25
55	Fort Benton	Montana	110°-111°	47°-48°	3,273	25
56	Little Belt Mts	Montana	110°-111°	46°-47°	3,295	25
57	Telluride	Colorado	107° 45′-108°	37° 45′-38°	236	25
58	Elmoro	Colorado	104°-104° 30′	37°-37° 30′	950	25
59	Bristol	Virginia, Tennessee	82°-82° 30′	36° 30′-37°	957	25
62	Menominee Special	Michigan	87° 44′-88° 09′	45° 44′-45° 55′	254	25

STATISTICAL PAPERS.

Mineral Resources of the United States, 1882, by Albert Williams, jr. 1883. 8°. xvii, 813 pp. Price 50 cents.

Mineral Resources of the United States, 1883 and 1884, by Albert Williams, jr. 1885. 8°. xiv, 1016 pp. Price 60 cents.

Mineral Resources of the United States, 1885. Division of Mining Statistics and Technology. 1886. 8°. vii, 576 pp. Price 40 cents.

Mineral Resources of the United States, 1886, by David T. Day. 1887. 8°. viii, 813 pp. Price 50 cents.

Mineral Resources of the United States, 1887, by David T. Day. 1888. 8°. vii, 832 pp. Price 50 cents.

Mineral Resources of the United States, 1888, by David T. Day. 1890. 8°. vii, 652 pp. Price 50 cents.

Mineral Resources of the United States, 1889 and 1890, by David T. Day. 1892. 8°. viii, 671 pp. Price 50 cents.

Mineral Resources of the United States, 1891, by David T. Day. 1893. 8°. vii, 630 pp. Price 50 cents.

Mineral Resources of the United States, 1892, by David T. Day. 1893. 8°. vii, 850 pp. Price 50 cents.

Mineral Resources of the United States, 1893, by David T. Day. 1894. 8°. viii, 810 pp. Price 50 cents.

On March 2, 1895, the following provision was included in an act of Congress:

"*Provided*, That hereafter the report of the mineral resources of the United States shall be issued as a part of the report of the Director of the Geological Survey."

In compliance with this legislation the following reports have been published:

Mineral Resources of the United States, 1894, David T. Day, Chief of Division. 1895. 8°. xv, 646 pp., 23 pl.; xix, 735 pp., 6 pl. Being Parts III and IV of the Sixteenth Annual Report.

Mineral Resources of the United States, 1895, David T. Day, Chief of Division. 1896. 8°. xxiii, 542 pp., 8 pl. and maps; iii, 543-1058 pp., 9-13 pl. Being Part III (in 2 vols.) of the Seventeenth Annual Report.

Mineral Resources of the United States, 1896, David T. Day, Chief of Division. 1897. 8°. xii, 642 pp., 1 pl.; 643-1400 pp. Being Part V (in 2 vols.) of the Eighteenth Annual Report.

Mineral Resources of the United States, 1897, David T. Day, Chief of Division. 1898. 8°. viii, 651 pp., 11 pl.; viii, 706 pp. Being Part VI (in 2 vols.) of the Nineteenth Annual Report.

Mineral Resources of the United States, 1898, by David T. Day, Chief of Division. 1899. 8°. viii, 616 pp.; ix, 804 pp., 1 pl. Being Part VI (in 2 vols.) of the Twentieth Annual Report.

The money received from the sale of the Survey publications is deposited in the Treasury, and the Secretary of the Treasury declines to receive bank checks, drafts, or postage stamps; all remittances, therefore, must be by MONEY ORDER, made payable to the Director of the United States Geological Survey, or in CURRENCY—the exact amount. Correspondence relating to the publications of the Survey should be addressed to—

THE DIRECTOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D. C.

WASHINGTON, D. C., *August, 1900.*

LIBRARY CATALOGUE SLIPS.

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Series.

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Department of the interior | — | Bulletin | of the | United States | geological survey | no. 174 | [Seal of the department] |
Washington | government printing office | 1900
Second title: United States geological survey | Charles D. Walcott, director | — | Survey | of the | northwestern boundary of the United States | 1857–1861 | by | Marcus Baker | [Vignette] |
Washington | government printing office | 1900
8°. 78 pp. 1 pl.

Author.

Baker (Marcus).
United States geological survey | Charles D. Walcott, director | — | Survey | of the | northwestern boundary of the United States | 1857–1861 | by | Marcus Baker | [Vignette] |
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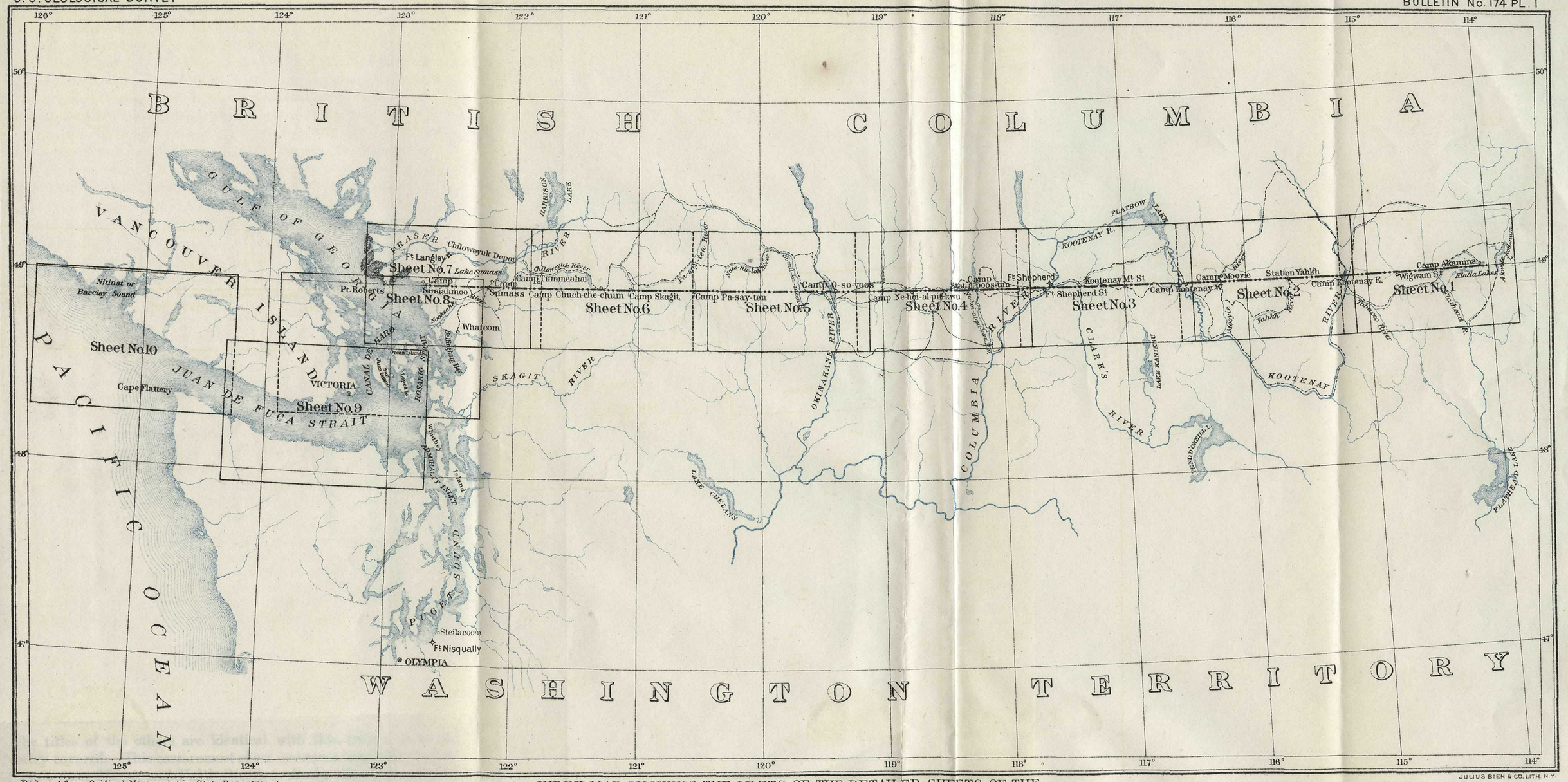

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INDEX MAP SHOWING THE LIMITS OF THE DETAILED SHEETS OF THE
U. S. NORTH WESTERN BOUNDARY SURVEY

Scale of Statute Miles

10 8 6 4 2 0 10 20 30 40 50 60 70 80 90 100 MILES

JULIUS BIEN & CO. LITH. N.Y.