

The land border between the US and Canada¹ west of the Great Lakes was settled by a series of treaties between Great Britain and the United States. The provisional treaty of 1782 established the boundary as a line running due west of the most north western point of the lake of the woods to the Mississippi river then south along the river to the 31st degree of latitude and by various courses to the Atlantic Ocean. The definite treaty of 1783 defined the boundary in similar terms. The treaty of London, 1794 noted that it was not certain that the Mississippi river extended so far to the northward as to be intersected by a line drawn due west from the lake of the woods and stipulated that the two parties will proceed by amicable negotiations, to regulate the boundary line in that quarter. The Louisiana purchase of 1803 extended the territories of the United States to include the entire basin the Mississippi and its tributaries. The conflicting claims to the territories west of the Great Lakes were resolved by the Convention with Great Britain of 1818 which recommended the boundary line be extended westward along the 49th parallel to the Rocky Mountains and provided that the country beyond these mountains should for 10 years remain open to both parties. Since the exact location on the most northwestern point of the Lake of the Woods was not known it was stipulated that a line be drawn either due north or due south until it intersects the 49th astronomical parallel and that line defines the boundary from the most northwestern point of the Lake of the Woods to the 49th parallel. The location of the most northwestern point of the Lake of the Woods was determined in 1824 by Dr. J. L. Tiarks, astronomer, and David Thompson, surveyor, who were appointed by Great Britain and was approved by the United States commissioners. This point was located in a swamp 27.5 miles north of the 49th parallel. The Webster-Ashburton Treaty, 1842 ratified this line and the treaty of 1846 extended the line westward along the 49th astronomical parallel to the coast at the Strait (or Gulf) of Georgia at Point Roberts.

Other than locating the north west corner of the Lake of the Woods no action was taken to locate the boundary on the ground until August 11, 1856 when Congress passed an act providing for the appointment of a commissioner and chief astronomer and surveyor on the part of the United States to unite with similar officers to be appointed by Great Britain to survey the boundary and mark it with monuments. \$11000 was appropriated for annual salaries and \$60000 for provisions, transportation, and contingencies. The survey was to be limited to the northern boundary of Washington, which extended from the Pacific coast to the summit of the Rocky mountains.

On Feb., 14, 1857 the Northwest Boundary Commission was formed with Mr. Archibald Campbell as commissioner and Lieut. John G. Parke, Corps of Engineers, U.S.A. as astronomer and surveyor. Parke immediately started to obtain the instruments

¹ A summary of the negotiations between the United States and Great Britain is given by Edward M. Douglas, Boundaries, Areas, Geographic Centers and Altitudes of the Several States, United States Department of the Interior Bulletin 817, United States Government Printing Office, Washington: 1932 and Preliminary Inventories #170, Records pertaining to International Boundaries, National Archives, Washington: 1968

required for the survey. During the first quarter of 1857 the Commission purchased a portable transit for \$425 and a Zenith telescope for \$585 from J. C. Woodruff². There is no record of a J. C. Woodruff as a Mathematical or Astronomical Instrument Dealer in the Washington DC area. The first initial is probably a misprint. A Isaac C. Woodruff Cpt. Topl. Engs U.S.A. is listed in the 1858 DC directory. Thus these instruments were probably purchased from the US Corps of Engineers and I. C. Woodruff signed the receipt for the Corps. During the second quarter the Commission borrowed a number of unspecified instruments from The Dept. of the Interior. The Navy Dept. and The Topographical office

Over the next five years the Commission purchased the following major astronomical and surveying instruments (price over \$100) from William Würdmann²

Second quarter 1857

1 8 inch transit theodolite, with illuminating apparatus, stands etc.	330.00	
1 6 inch transit theodolite, vertical circle		300.00
2 Sextants at \$115	230.00	

Second quarter 1858

1-zenith telescope	710.00	
1-astronomer's transit	437.50	
2-theodolites	660.00	
1-theodolite	300.00	
1-transit theodolite	640.00	
1-(plane) table instruments with compass and scale	200.00	
1-45 inch astronomical telescope with folding stand	250.00	

Third quarter 1860

1 6 inch magnetometer, with stand and attachments	235.00	
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First quarter 1861

1-magnetic dip circle with 3 needles	160.00	
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\$4442.00

In addition to these major instruments an additional \$773 was paid to Würdmann for small scientific instruments and parts, drawing instruments and supplies, packing boxes, repair of instruments and other services. (for a full listing see ref. (??)). The only other suppliers of major instruments to the commission were

² Northwest Boundary Commission House of Representatives 40th Congress, 3d Session Ex. Doc. No. 86 This interesting document which is described on page 2 as a "Detailed statement of disbursements on account of northwest boundary survey, from February 14, 1857 to December 31, 1868, including salaries of employee's and contingent expenses, as appears by accounts in the office of the Fifth Auditor of the Treasury" is worth reading by itself. It lists every expenditure from Campbell's salary of \$3000.00 per year down to 75 cents paid to Mrs. Ann Denny for a chicken and in this detailed fashion accounts for a total of \$594,189.49 spent over a period of almost 12 years.

William Bond and sons, New York	5 Chronometers	1480.00
E. & G. W. Blunt New York	2 Chronometers	800.00
	1 Photographic apparatus	213.23
Edmund Draper Philadelphia	1 small theodolite and stand	128.90
William Schmolz San Francisco	Astronomical and surveying instruments	338.00

The total of all purchases by the commission of instruments and stationary amounted to \$15300.19 and thus Würdmann received just over one third of all of the money spent by the Commission for goods in this category.

On the 18th of April 1857 Mr. G. C. Gardner, assistant astronomer and surveyor arrived at the Chiloweyuck depot Washington Territory and began making time and latitude observations with a Zenith telescope and transit instrument. A second party under Mr. Joseph S. Harris listed as general assistant also as { } started East on May 19. Parke arrived at the Chiloweyuck depot on June 3. Before the spring [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. A British party arrived in 1858 and collaborated in the remainder of the survey. The survey was continued eastward for as much of the year as weather permitted until the summit of the rockies a distance of 418.5 miles from the coast was reached in 1860. Because of the difficult nature of the land only selected points were located on the boundary and the trees were cleared and the boundary marked for a distance of only 190 miles. By mid 1861 everyone had returned and the Civil war was on.

An office was established above a store at the SE corner of Pennsylvania and Twentieth street in Washington and maps showing the boundary and the surrounding land were prepared. A manuscript of the final report was prepaid but as an economy measure was never published. In Oct. 1869 after a total expenditure of nearly \$600,000 the office was closed the manuscript, maps and other records deposited in the State department and the commission was dissolved. The manuscript was subsequently lost.

In 1861 41 cases of instruments records and supplies were returned to Washington³. Some of the instruments were sent to William Würdmann to be repaired as noted a receipt dated Sept. 18, 1867 the following notation
Received from Archibald Campbell U. S. Com'r N. W. Boundary Survey, the following Instruments, to be put in proper order, packed in boxes for transportation and turned over to the State Department.

Some 23 instruments are listed. The major instruments listed are:

- 1 6 in Magnetometer
- 1 Magnetic Dip Circle / with tripod
- 1 Silver pocket chronometer
- 2 Sextants
- 1 Solar compass / with tripod

³ U. S. National Archives, RG 76

- 1 Zenith telescope
- 1 Sidereal Chronometer

on the back is noted

The solar compass was received from the Bureau of Topographical Engineers U.S.A.

The Zenith Telescope was received from the Navy Department

The Sidereal Chronometer was received the { ? } Department.

All of the other instruments were purchased out of the money appropriated for the expenses of the Boundary Commission

Archibald Campbell

Comm'r. NW Boundary Survey

On Oct. 30 1869 The Office of the Chief of Engineers acknowledge the receipt from Archibald Campbell U. S. Commissioner of the N. W. Boundary Survey, of some 49 instruments⁴. Include are the following instruments:

- 3 8 inch Theodolite with illuminating apparatus
- 2 6 inch Theodolite Vertical circle much used
- 1 45 inch Astronomical Field Glass with folding Stand
- 1 25 inch Transit with extra head, good order
- 1 25 inch Transit with extra head, worn
- 1 32 inch Zenith Telescope, good order
- 1 32 inch Zenith Telescope, worn

Some of the original field books of the survey have survived and are contained in RG 76 at the national Archives. E204 Triangulation Data, 1857-59 contains an entry by Joseph S. Harris of some observations made using a Würdmann 8 inch Theodolite serial number 62² presumable the instrument purchased in 1857. E 199 Special Survey Books 1857-60 contains references to the following instruments with serial numbers⁵

Würdmann	#58	theodolite
Würdmann	#62	8" theodolite
Würdmann	#73	theodolite
Würdmann	#74	theodolite
Würdmann	#2	Transit instrument
Würdmann	#17?	Transit instrument

⁴ U. S. National Archives, RG 76

⁵ It is not known exactly how Würdmann assigned serial numbers to his instruments. It appears that he assigned consecutive numbers to his small 6 and 8 inch theodolites, the astronomical instruments zenith telescopes and transits were assigned numbers from a different sequence and some instruments such as levels and alidades were not assigned numbers.

Würdmann	#7	Zenith Telescope
*	#4	Zenith Telescope
*	#13	Zenith Telescope
*	#13	Transit instrument
*		5" transit

* No makers name given

Würdmann #58 is probably the 6 inch theodolite purchased in 1857 and #73 and #74 are probably two of the three theodolites (one 6 inch and two 8 inch) purchased in 1858. The third instrument of this group although not listed in any of the records in RG 76 did survive since it is listed among the instruments transferred to the corps of Engineers in 1869.

William Würdmann In addition to supplying most of the major instruments used by the Commission made a further contribution, his son J. V. Würdmann worked on the survey from 1857 to 1861 as instrument tender, recorder and assistant computer.

No effort was made to locate the remainder of the boundary until March, 19 1872 when Congress passed an act authorizing the survey and marking of the boundary between the United States and the possessions of Great Britain from the Lake of the Woods to the summit of the Rocky Mountains. A joint commission with the government of Great Britain was formed with Archibald Campbell as commissioner and Major Farquhar as Chief Astronomer representing the United States . The British and American parties met on the line on Sept. 1 1872. The old monument at the north west corner of the Lake of the Woods was recovered and several latitude stations were set up near the eastern end of the line. Because of a lack of funds the parties did not stay on the field during the winter of 72-73. In the spring of 1873 Capt. W. F. Twining replaced Major Farquhar as chief Astronomer and the survey continued until the summit of the Rockies some 853.32 miles from the lake of the woods was reached at the end of August 1874. The line was marked with 382 monuments, a final report was prepared and published and the Commission adjourned on May 29, 1876.

The report of the Survey of the Northern Boundary⁶ lists the following instruments used by the American parties; three Zenith telescopes #7, #11, and #20 and two 8 inch theodolites #71 and #87 all made by William Würdmann. The British parties used Troughton and Simms instruments. Zenith telescopes #7 (listed on page 288 as #9) and # 11 are described as of 25 inch focal length and as having been used on the northwest boundary survey. These are may be the two instruments transferred to the Corps of Engineers in 1869 and incorrectly listed on the receipt as of 32 inch focal length. Zenith telescope # 20 is described as a new instrument of 32 inch focal length purchased in 1872 for use on the survey. Theodolite #71 is one of the two 8 inch theodolites purchased in 1858 at \$330 each and transferred to the Chief of Engineers in 1869. Judging from the serial number # 87 was made in the early 1860's and was probably purchased directly by

⁶Survey of the Northern Boundary of the United States from the Lake Of The Woods to the Summit Of the Rocky Mountains. 44th Congress, 2d Session. Senate Ex. Doc. No. 41 February 23, 1887

the Office of the Chief of Engineers for general use. In addition to these major instruments several 6 inch theodolites made by Würdmann were used for topographical work.

In addition to the NWB instruments used on the northern boundary. The report of the Wheeler Expedition lists the following instruments Zenith Telescope and Würdmann Transit #18 with the notation used on Northwest Boundary Survey in use at the observatory at Santa Fe New Mexico in 1873

Caption to Fig 1

Eight inch Theodolite marked

No 71
Wm. Würdmann Washington D. C.
NWB

The two micrometers mounted above the horizontal circle were not on the instrument when made in 1857-8 but were added sometime after 1873-4 when the instrument was used on the Northern Boundary. Probably by Fauth and Co. of Washington DC.

Caption to Fig 2

Thirty two inch Zenith Telescope

This instrument was purchased by Saul Moskowitz from Buff and Buff and sold at Christies Auction on June 18 1992. The box has a brass Buff and Buff tag and in addition is marked with paint "To Bausch and Lomb". The instrument was probably purchased by Fauth and Co. as government surplus, shipped to Bausch and Lomb by George N. Saegmuller after the merger of Fauth and Co. and Bausch and Lomb in 1905, and subsequently purchased by Buff and Buff.

The base and horizontal circle which would normally carry the makers name and serial number, if any, are missing. The box and details of construction of the instrument are typical of the work of Wm. Würdmann. The value of the micrometer constant of this instrument calculated from the measured focal length of the objective lens 32 inches and the measured pitch of the micrometer screw 102.5 turns per inch is equal to 62.8 seconds per turn. In reference 88 four series of measurements performed in 1874 on stars of the micrometer constant of Zenith Telescope Würdmann No. 20 are reported. The mean of these measurements is 62.14 seconds per turn with a standard deviation of 0.07 seconds. The agreement of these numbers *suggests that this is a Zenith Telescope Würdmann No. 20 or was made by Würdmann from the same lot of objective lens and micrometer screws as No. 20.*