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DEPARTMENT OF THE INTERIOR,

General Land Office,

Terre Haute, Ind., April 21, 1902.

The Honorable Commissioner of the
General Land Office,
Washington, D.C.

Sir:

In accordance with my detail by the Department dated May 31, 1901, and your direction dated February 4, 1902, I have the honor to state that I have made the necessary observations and calculations and established and witnessed a suitable monument of stone on the ground at the point of intersection of the true one-hundredth meridian with Red River under the provisions of the act of January 15, 1901 (31 Stat.;731).

I was assisted in this determination by Augustus Mac Connel, Astronomer, Elmira, N. Y., and together we made the fixation of the intersection by the most accurate and scientific astronomical methods, both direct and thorough.

In accordance with your directions dated April 7, 1902, I have the honor to submit the following synopsis report of our general plan of operations and description of the monument established by me marking the astronomical point desired to be determined:

The meridian at Greenwich having been adopted as the initial point to which all longitudes in the United States are referred, the determination of the longitude of any point consists in the determination of the difference of longitude of that point

and of Greenwich, or of some observatory whose longitude is accurately known as referred to Greenwich, the difference resolving into the difference in local sidereal time between the two points. The observatory at Washington University, St. Louis, Mo., was chosen as the reference observatory, the equipment of that observatory used by us was their Fauth transit instrument, Warner and Swazey chronograph, and their large sidereal break-circuit clock.

The first step in the determination was a visit to the old initial monument on the Texas-Oklahoma boundary from which point a random meridian was projected southward across Red River fourteen miles to an intersection with the Ft. Worth and Denver City Railway. This point of intersection was unfavorable for astronomical observations and a point for the Red River observatory was chosen on a hill near the railroad a little less than one-half a mile east of the above intersection.

At the assumed point for the Red River observatory a concrete pier was built for the transit instrument and a small shed opening in the meridian was constructed to protect the instruments, the equipment of which consisted of a Wurdemann meridian telescope, a Saegmuller chronograph, and a Bond & Son's sidereal break-circuit chronometer, property of the General Land Office.

On the meridian county line between Childress and Hardeman Counties, Texas, there is a sandstone 10 X 12 X 18" above ground marked C.C. on west face and H. C. on east face, this stone being a few hundred feet north of the Ft. W. & D.C.

Ry., from this stone our astronomical pier bears N 77° 24' W., 39.54 chs. distant, the pier being in Childress Co.

The observatory was established by us on February 18, 1902, and placed in running order as rapidly as possible, after which Mr. MacConnel was left in charge of this observatory and I returned to St. Louis to conduct the first half of the observation. The equipment for the determination, in addition to the instruments mentioned, was a telegraphic connection by direct wire from the St. Louis to the Red River observatories, a full set of telegraphic instruments and the assistance of expert telegraphers at each observatory, made possible by the kind co-operation of the Western Union Telegraph Co. The nightly program consisted in the determination of the error of each local sidereal time piece so as to ascertain the absolute sidereal time at each station at the epoch of exchanging time signals.

A carefully prepared list of twelve stars were chosen for observation, the same stars being observed at both observatories. The star list was divided into two parts of six stars each and each part contained five time stars and one azimuth star. Between the two halves of the star list direct wire service was opened from one observatory to the other one and the St. Louis clock was compared with the Red River chronometer by double electric exchanges consisting first of thirty arbitrary signals at intervals of two seconds by breaking the circuit with the key at Red River, the breaks being at once registered on the Red River chronograph and also registered on the St. Louis chronograph as soon as the electric impulse reached that observatory.

Thirty similar signals were then sent by the operator at St. Louis. The first exchange giving a difference of time too great, and the second too little, the difference between the two exchanges being double the transmission time of the electric signals, and an average of them eliminating errors due to this cause. The transit instruments were reversed in their Y's to observe the second half of the star program, enabling an elimination of errors due to inequality of the pivots and also enabling an accurate computation of the collimation error or "c" factor for the evening. The azimuth error or "a" factor was computed for each half-set by solving an equation involving the results obtained from the time stars as compared with a similar result obtained from the slow-moving azimuth star of that set. The level errors or "b" factors were obtained from sixteen readings of accurate striding levels, four readings in double direct and reversed position of the level were taken as the beginning and end of each half-set of the observing program.

In the reductions to compute the error in each time piece for the epoch of exchange the corrections were introduced in the following order:

- (1) Rate to epoch of exchange
- (2) Aberration
- (3) Level
- (4) Right ascension
- (5) Collimation
- (6) Azimuth

An average of the clock errors as thus obtained for the ten time stars was used for the final correction to the clock reading at the epoch of exchange to give the absolute sidereal time for that epoch.

This program was satisfactorily followed for five evenings. I then returned to the Red River observatory and Mr. MacConnel proceeded to St. Louis and the program was followed for five more evenings. The average of ten such results enabling an elimination of errors due to our relative personal equation in observing.

The following are our results for the difference in time between St. Louis and Red River:

MacConnel at Red River, Kidder at St. Louis -

Date		s
1902	39m	12.19
(1)- March 5	39	12.09
	39	11.90
(2)- March 14.	39	11.77
	39	11.89
(3)- March 16.	39	11.78
	39	12.07
(4)- March 17.	39	11.97
	39	12.07
(5)- March 18.	39	11.98

-MacConnel at St. Louis, Kidder at Red River -

(6)- March 26	^m 39	^s 12.07
	39	11.96
(7)- 30	39	12.07
	39	11.97
(8)- April 4	39	12.10
	39	11.92

Q 5

(9)- April 6	39	12.07
	39	11.96
(10)- 7	39	12.06
	39	11.85

	^m	^s
Mean	39	11.99

The slight difference noted in the transmission time from night to night being due to weather conditions along the thousand miles of wire connecting the two observatories.

On April 4" and 7" the circuit was made up via Kansas City and Dallas; on the other nights direct via Dallas.

The service furnished by the Western Union Telegraph Co. was perfect in every way.

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	h	m	s	
Longitude of St. Louis	6	00	49.16	
Difference to Red River		<u>39</u>	<u>11.99</u>	

Longitude of assumed Red River Astronomical pier	h	m	s
	6	40	1.15
= 100° 0' 17"			.25.

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A stake was set on a hill as nearly as possible in the true meridian 1 mi. 32.155 chs. distant north of the Red River transit for a meridian mark and reversals were made on this stake as a reference point, an average was then taken of the "a" fac-

tors for the Red River transit for the various nights observations which gave the error for that pointing of $+0s.42 = +6".3$, the line bearing $N 0^{\circ} 0' 6".3 W$. The offset of 0.225 ft. was then made to the east to give the true meridian. From the latter point I projected the astronomical meridian northward by direct and reversed sights, using G. L. O. Young Son's light mountain transit No.7058, using one rear flagman and two front flagmen, one of whom carried field glasses to enable precise settings of the flag. Sights averaging one-fourth to one-half mile were made and stakes firmly set at every sight. The meridian was projected in this way northward across Red River to a point due east of the old initial monument on the Texas-Oklahoma Boundary, which is:

A combination gypsum-sandstone 5 X 12 X 18 inches above ground, in a small mound of stone; marked 100 W on east face, and I M on west face.

A careful measurement was next made from the old initial monument true east to our astronomical meridian, the measurement being made with a 200-ft. steel tape with attached spring-balance and thermometer. This measurement reduced to standard conditions gives 2257.1 ft. distant west from our astronomical meridian to the initial monument, equivalent at this latitude and altitude to 26".99.

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Longitude astronomical meridian . .	100° 0'	17".25
Difference to initial monument . .		<u>26.99</u>

176° 3'
5 2/8°

Correct longitude of old
initial monument on the Texas-
Oklahoma boundary 100° 0' 44".24

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The difference of 17".25 from our astronomical meridian to the true one-hundredth meridian is equivalent to a distance of 1442.6 ft. at this latitude and altitude. This measurement was next made to the east of our astronomical meridian and on a parallel of latitude passing exactly through the old initial monument, the measurement was reduced to standard conditions for the tape and a monument set to mark the intersection of the true one-hundredth meridian with Red River as follows:

✓ A grey sandstone 10 X 14 X 45 inches, set 24 inches in the ground, marked 100 W. L. 1902 on the N face; witnessed by pits 36 X 36 X 12 inches S of stone 4 ft. distant and N of stone 10 ft. distant, and a mound of earth 5 ft. base 2½ ft. high 5 ft. N of stone, there being no suitable bearing trees.

(Note?) From this monument the old initial monument bears due east 3699.7 ft.

From this monument due south to the left bank of Red River is 1563 ft.

The monument is set in the pasture belonging to Mr. Frank Kloskey, whose address is Olympus, Tex.; the S. E. cor. of his house bears N 43°45' W from the monument, 314.5 ft. dis.

Q A

From the monument the pipe of Mr. Kloskey's wind mill bears N 76°36' W, 280 ft. distant.

The field work of this determination was completed on April 16, 1902.

The full report of this determination will contain, in addition to this synopsis, the star list, all observations, and all reductions and calculations upon which the fixation of the 100th meridian is based. ✓

Very respectfully,

Arthur D. Kidder

U.S. Examiner of Surveys.

Subscribed and sworn to before me this 26th day of April, 1902.

William C. Durham,

Notary Public.

State of Indiana,
County of Vigo.

Lippincott 2
Arthur D. Redders
Report on Survey of
100° Meridian
dated April, 21, 1902,

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from the monument the pipe of Mr. Klonke's wind mill
bearing N 76° 30' W, 280 ft. distant.
The field work of this determination was completed on
April 16, 1902.
The full report of this determination will contain
in addition to this synopsis, a list of observations,
and a full description and calculations of the position of

Very respectfully,

Arthur D. Redders

U.S. Examiner of Surveys.

Subscribed and sworn to before me this 26th day of

William C. Durham,

Notary Public.

County of Alagoa,
State of Indiana.

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