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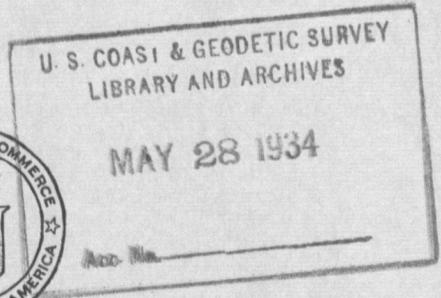
Special Publication No. 179

FIRST-ORDER TRIANGULATION IN KANSAS

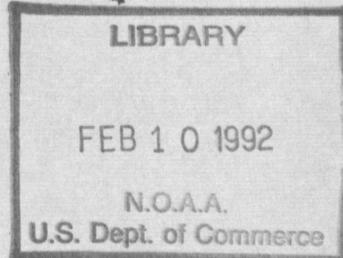
(1927 DATUM)

By

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UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON: 1934

QB
275
.435
no. 179
1934

National Oceanic and Atmospheric Administration

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January 1, 2006

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FIRST-ORDER TRIANGULATION IN KANSAS (1927 DATUM)

GENERAL STATEMENT

This volume contains the results of all triangulation in Kansas that has been executed by the Coast and Geodetic Survey. The geographic positions contained herein are on a new datum and supersede the positions in Kansas, which appeared in appendix 6 of the Report for 1901, appendix 8 of the Report for 1902 and Special Publication No. 70.

Both the transcontinental triangulation, extending from the Atlantic to the Pacific along the thirty-ninth parallel, and the ninety-eighth meridian triangulation, cross Kansas almost through its center. These two arcs are an important part of the main framework for the control of all triangulation in the United States.

The portion of the transcontinental triangulation within the limits of the State of Kansas was commenced in 1884 and finished in 1896, having been in progress during this whole interval except during 1886, 1894, and 1895. A full account of the transcontinental triangulation has been published insofar as the features of special interest to scientists are concerned.¹ Only the first-order positions were included, however, and but few of the descriptions. The present publication contains the positions of all stations in Kansas, including the subsidiary stations, computed on the North American datum of 1927, and contains also all available descriptions of the stations.

The portion of the ninety-eighth meridian triangulation which lies in Kansas and to the northward of the transcontinental triangulation was executed in 1897 and 1898. That portion which lies in Kansas to the southward of the transcontinental arc was executed during the years 1899-1902. The work was completed in 1902 by the occupation of three stations near the Kansas-Oklahoma line, which served to finish the connection with the Anthony base.

READJUSTMENT OF TRIANGULATION

The triangulation of the United States has been built up by continually adding new arcs to those already measured, and for many years in adjusting the triangulation the method was followed of fitting the new arcs of triangulation to the old ones which had been previously adjusted. This method was the only one that could have been followed up to the time that the western half of the triangulation net of the country had been extended to such a degree that the arcs formed many closed loops, a condition reached in the year 1926.

It then became necessary, in order to secure what may be called standard or final geographic positions to the westward of the ninety-

¹See Transcontinental Triangulation (U. S. Coast and Geodetic Survey, Special Publication No. 4).

eighth meridian, to make an adjustment of the net as a whole. This was done by a method devised in the office of the Coast and Geodetic Survey² and the resulting geographic positions for all the western first-order triangulation are now available to surveyors and other engineers who may wish to have final geographic positions for their operations.

Upon the completion of the adjustment of the western half of the country, work was immediately begun upon the eastern half. The adjustment of the main scheme points of this part of the net was finished in August 1932 and final geographic positions on the new datum are now available throughout the United States. In Kansas, that portion of the thirty-ninth parallel arc from the Missouri line to the Salina base net, was included in the eastern adjustment. All the remaining triangulation of the State formed a part of the western adjustment.

This volume is the fourth of a series of publications, each of which will contain the geographic positions on the new datum and the descriptions and other data, for all first-order triangulation of a State or occasionally of two States. Volumes previously published contain data for Colorado, Alaska, and Oregon.

NORTH AMERICAN DATUM OF 1927

The original adjustment of the triangulation included in this publication was computed upon the Clarke spheroid of 1866, on what was called at that time the North American datum. In the readjustment of the triangulation in the western part of the United States the same spheroid was used as surface of reference, but only one station was held in position. The station, Meades Ranch, in Kansas, was assigned the same position that it had in the original United States standard datum, later called the North American datum. This position of Meades Ranch is as follows:

$$\begin{aligned}\phi &= 39^{\circ}13'26''.686 \\ \lambda &= 98\ 32\ 30\ .506\end{aligned}$$

This position was held in the new datum because it had been found to be best in accord with the country as a whole in the extensive investigation that was carried out at the time of the adoption of the original datum. If any are interested in the procedure followed in the establishment of this former datum, an account of it can be found in any one of the following publications, which contain triangulation and traverse data based on the datum in use prior to 1927: Special Publications Nos. 11, 13, 16, 17, 19, 24, 30, 31, 43, 46, 54, 62, 70, 74, 76, 78, 79, 86, 88, 101, and 114.

The orientation in the new adjustment is controlled by the various Laplace azimuths distributed throughout the network of arcs. The position of Meades Ranch, together with the Laplace azimuths included in the arcs, serve to define the North American datum of 1927. The date is appended to the name of the new datum to distinguish it from the old North American datum. A station is said to be on this North American datum of 1927 when it is rigidly adjusted to the scheme of the readjusted triangulation.

² For a description of the method used see Special Publication No. 159.

ARCS INCLUDED IN THIS PUBLICATION

The triangulation included in this volume consists of two first-order arcs, one extending east and west across the State along the thirty-ninth parallel and the other north and south across the State along the ninety-eighth meridian. Two or more stations in each of the adjoining States have been included so that all data required for surveys in Kansas, even near the boundaries, might be available in one volume.

GENERAL DESCRIPTION OF TABLES AND SKETCHES

The tables of geographic positions, on pages 13 to 36, also contain the distances between contiguous triangulation stations in meters and feet, the logarithms of the distances in meters, and the azimuths of the lines joining these stations. The distances are corrected for elevation above mean sea level, and the azimuths are referred to the true south. Anyone who wishes to obtain the actual distances between the triangulation stations should use the formula given on page 12, by which the true distance at the mean elevation of the stations can be derived from the distance at sea level. The descriptions of the stations, given on pages 40 to 60, are designed to enable the engineer to recover and identify the station mark after he has visited the general locality of the station. There will be times when the description, so far as witness and other marks are concerned, will have become out of date from changes by nature or by the work of man. Any engineer who may visit a station and find that the description does not truly represent the present conditions, or who finds the mark destroyed or mutilated, should report the facts to the Director of the Coast and Geodetic Survey, at Washington, D.C., in order that the files of this office may be kept up to date. The engineer should realize that the triangulation extended over the country by the Coast and Geodetic Survey is a public survey, made for the use of the people. The stations really belong to the States in which they are located, and the engineer who is so fortunate as to find one of these stations located near his work should help to perpetuate the monuments in order that they may be of continuous service and value to his locality. The Coast and Geodetic Survey officials will, from time to time, visit the stations established and will re-mark and re-describe them if necessary.

At most of the stations there are reference and witness marks that were established to assist in locating the station. The distance and azimuth from the station to each of these additional marks are usually given in the description of the station, and the measurements are supposed to be so carefully made, at least to the reference marks, that if the station mark becomes lost or destroyed the station can be relocated accurately enough for use in third-order and local surveys.

Near the back of this publication will be found a number of sketches which show graphically the approximate locations of the stations, especially with reference to State and county boundaries, and the lines over which the main-scheme observations were made. It is suggested that if one should wish to learn whether there are triangulation stations in the vicinity of his work he should first consult the sketches. He can obtain from them the names of the stations that

may be of help to him; then he should turn to the index on page 67 of this volume, from which he can find the pages upon which the descriptions and geographic positions of the stations appear.

OTHER PUBLICATIONS OF VALUE TO THE ENGINEER

If an engineer wishes to compute geographic positions for the stations of any triangulation that he may execute, he should procure a copy of Coast and Geodetic Survey Special Publication No. 8 from the Superintendent of Documents, Washington, D.C. The cost of this publication is 25 cents. If he is interested in knowing the length in meters of the degrees, minutes, and seconds of latitude and longitude in the region in which he is working, he can obtain them from Special Publication No. 5, which can be purchased at a cost of 20 cents from the Superintendent of Documents. Condensed tables for the latitude of Kansas are shown on pages 9 and 10.

In order to make geodetic control data of greater use to engineers and surveyors, an effort is being made to establish one or more plane-coordinate systems in each of the 48 States. When this work has been completed the data for each triangulation station in a State will include its x and y coordinates as well as its latitude and longitude. A brief explanation of plane-coordinate systems is contained in Serial 562 of this Bureau. A more detailed publication will be issued in the near future.

The Coast and Geodetic Survey has issued a number of manuals on the various classes of its work. The ones that would be of value to an engineer in connection with triangulation, including base measurements, are Special Publication No. 120, Manual of First-Order Triangulation, cost 40 cents; Special Publication No. 145, Manual of Second and Third Order Triangulation and Traverse, cost 60 cents; and Special Publication No. 137, Manual of First-Order Traverse, cost 30 cents. An engineer, interested in the determination of azimuth to a high degree of accuracy, should procure a copy of Special Publication No. 14, Determination of Time, Longitude, Latitude, and Azimuth, cost 35 cents. If he is interested only in the determination of approximate azimuths, he should secure a copy of Serial No. 166, Directions for Magnetic Measurements, cost 15 cents.

In computing his triangulation the engineer will find that Special Publication No. 138, Manual of Triangulation Computation and Adjustment, cost 50 cents, will be of great assistance to him.

The reader can secure from the Director of the United States Coast and Geodetic Survey, free of charge, several leaflets which describe geodetic surveying and which also show how triangulation can be used in connection with the boundary surveys of private and public property.

CLASSIFICATION OF TRIANGULATION

Triangulation is divided into different classes according to accuracy. Four classes of triangulation are now defined by the Federal Board of Surveys and Maps, viz, first, second, third, and fourth orders. The first three of these are, respectively, equal in accuracy to the classes primary, secondary, and tertiary as formerly defined and used by the Coast and Geodetic Survey.

The ultimate criterion applied in classifying the different grades of triangulation is the actual error in the length of any line. This is

indicated by the discrepancy between the measured length of a base line and its length as computed through the triangulation from the last preceding base. In first-order triangulation such discrepancies must not exceed 1 part in 25,000, in second-order triangulation 1 part in 10,000, and in third-order triangulation 1 part in 5,000. Before making the comparison between the computed and measured lengths the adjustment of the triangulation should be carried to the point where the side and angle equations have been satisfied. It is also necessary to take into consideration the maximum actual error in the measurement of the base lines.

To secure the accuracy indicated above, certain standards are adopted for the field work, the most important one of which relates to the closing errors of the triangles or the discrepancy between the sum of the measured angles in a triangle and 180° plus the spherical excess of the triangle. In first-order triangulation the average closing error of the triangles must not be greatly in excess of 1 second, in second-order it should not be more than 3 seconds, and in third-order not more than about 5 seconds. The shape of the figures in the triangulation scheme, the frequency of bases, the size and type of instrument, and the number and kind of observations are all selected with due regard to the accuracy desired.

Under certain conditions the proportionate error in the length of a line as specified above may be found to be exceeded in any class of triangulation. Where two points are fairly close together as compared with the size of the triangulation scheme, the distance between those points may be in error in excess of that indicated by the class of triangulation of the scheme. The accuracy of the computed length of any line can be estimated by computing the ΣR , in accordance with the formula for the strength of figures as given in Coast and Geodetic Survey Special Publication No. 145. In any class of triangulation the subsidiary stations will be located with a less degree of accuracy than the main-scheme stations.

CHARACTERISTICS OF FIRST-ORDER TRIANGULATION

The triangulation contained in this volume is of the first order. First-order triangulation is done with such accuracy that the average closing error of the triangles is about 1 second or less. In order that the angles may have this high degree of accuracy, large theodolites are used. The theodolite, as is well known, is similar in its appearance to the surveyor's transit. The main differences are in the excellence of the workmanship, the accuracy of graduation of the circle, in having micrometer microscopes for reading this circle, and in having a telescope with a high resolving power. Observations are made either on heliotropes, by which the light of the sun is reflected toward the observer, or on acetylene or electric signal lamps. The heliotrope, or lamp, and the theodolite must be centered directly over the station marks.

At certain intervals, depending upon the shape of the triangles, base lines are measured. A base is necessarily a side of one of the triangles. The ends of the base must be intervisible from the ground or from towers that may be erected over them. In the early years of the Coast and Geodetic Survey's existence the base lines were measured with metal bars, but near the beginning of the present century steel tape lines began to be used in the measurements. Since 1907 all

of the bases of the Survey have been measured with invar tapes. The probable error of a measured base is about 1 part in 1,000,000 of its length. This accuracy meets all the requirements of engineering and science.

The azimuths of the triangulation depend upon what are called Laplace azimuths, or azimuths determined by observations on Polaris, which have been corrected for the deflection of the vertical at each Laplace station. These deflections are due to the attraction of mountain or plateau masses that are comparatively near the place at which the observations are made. The probable error of a Laplace azimuth is about ± 0.3 second.

If one is interested in the accuracy with which the triangulation of the Coast and Geodetic Survey is done and the reliability of the geographic positions which are given in this publication, he should refer to Special Publication No. 159, *The Bowie Method of Triangulation Applied to the First Order Net in the Western*

There is only one point on the earth's surface at the intersection of any one parallel of latitude and any one meridian of longitude, and therefore there can be no dispute as to the meaning of such a geographic definition of the location of a point, even though all the original triangulation station marks used in its determination, together with the chart on which its position was originally plotted, have been totally destroyed.

In the case of the destruction of an original triangulation station mark, or any other point defined by a geographic position, a competent geodetic engineer can reestablish its exact location by means of a new system of triangulation connecting with other distant triangulation marks which have not been destroyed.

There are a number of instances where corporations owning large tracts of land have attempted to make surveys of their boundaries and of subdivisions of property by means of traverse. This method can be used if certain precautions are taken, but most of these corporations have found it advisable to use the method of triangulation for the determination of relative positions of their boundary monuments and of other points which lie within those boundaries. If the triangulation in question is connected with the triangulation system of the Coast and Geodetic Survey, then true geographic positions can be obtained as well as the relative ones.

In a section of the country covered by adequate geodetic control the data are available to the engineer for any of the following operations, in addition to their possible future use as a basis for cadastral surveys:

1. Extensive mapping.—The topographer needs as initial data for beginning a topographic survey the distance and direction between two points and the geographic position of one of them in latitude and longitude. His local triangulation or traverse, based on this control, will prevent the accumulation of excessive errors as he carries on his mapping operations. In the event that the available first-order triangulation in that region has lines of too great length to join to conveniently, he can measure a base and azimuth at some place visible from a first- or second- order triangulation station and connect his base to the station by triangulation, thus obtaining proper geographic positions for his local surveys. On recent triangulation special azimuth marks have been set. (See p. 12.)

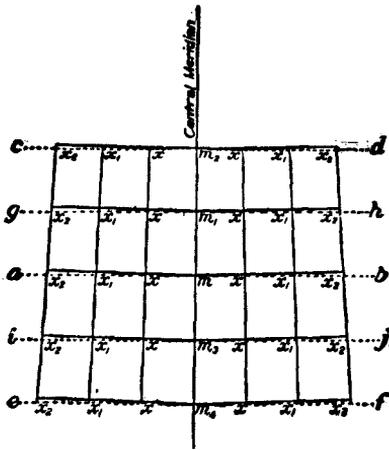
2. Boundary lines.—If it is desired to locate or to delimit accurately and permanently the boundaries of political subdivisions, such as States, counties, or cities, the methods indicated in the preceding paragraph may be followed. Whenever possible, a line of the adjusted triangulation or traverse should be used as a basis for local surveys rather than a point, since a line gives the three essentials of position, length, and direction.

3. Local intensive surveys.—The necessity for such surveys arises most frequently in connection with extensive improvements over a considerable area or as a basis for city planning, where the needs of a city are being anticipated for a number of years. Here the requirements are somewhat different from those in the two preceding operations, for it is often necessary to extend first- or second- order control in considerable detail over the entire area affected, third-order triangulation or traverse then being used to furnish additional points for the survey. Such a control survey should invariably be started from a line of adjusted triangulation or traverse.

While it may be noted in the preceding paragraphs that the azimuth and length of one line and the geographic position of one end of that line constitute the essential data for the complete utilization of old

work as a basis for new work, there is always grave danger in depending upon this minimum of data. There may be failure to identify the true station mark, or the mark, though genuine, may have been tampered with or otherwise disturbed in position. This will, of course, introduce an error into the new work based on these stations. It is the present practice in this Survey, unless unusual conditions render it unnecessary, to establish the integrity of the recovered points by using at least 3 old stations as a basis for new work, the third station serving as a check for the 2 stations on which the new work may actually depend.

In local surveys where the area is of limited extent it is usually desirable to use a system of plane coordinates. Such systems are now being established for each of the States. (See p. 4.) The Coast and Geodetic Survey will be glad to give advice on any problem arising out of the use of its control points or on any proposed extension of triangulation or traverse from them.



EXPLANATION OF TABLE FOR POLYCONIC MAP PROJECTION

The engineer or surveyor who makes use of the data in this publication may find it desirable to construct a map covering the territory he is surveying. He may wish to show on this map the meridians and parallels so as to be able to plot the positions of the triangulation stations included in the area and show the details of his survey in the correct geographic positions. To enable him to do this with the least possible difficulty, the following table, reprinted in an abbreviated form from Coast and Geodetic

FIGURE 1.—Sketch showing construction of polyconic map projection.
NOTE.—In this figure the angle made at the central meridian by the parallels is grossly exaggerated. In an actual projection the parallels appear practically as straight lines.

Survey Special Publication No. 5, has been inserted. This table may also be used to interpret in terms of degrees, minutes, and seconds of arc any relatively short distance measured along a meridian or parallel. The method of using the table is described below.

To make a projection for a large-scale map (1 to 20,000 and larger), first draw a straight line for a central meridian and a construction line *ab* perpendicular thereto, each to be as central to the sheet as the selected interval of latitude and longitude will permit. (See fig. 1 above.) On the central meridian lay off, on the desired scale, the distances $m m_2$ and $m m_4$, using the length of 1 minute along the meridian for the latitude of m , as given in the table in the column headed "Arc of the meridian, 1'," and multiplying this length by the number of minutes for the interval between the central parallel and the extreme parallels. Through m_2 and m_4 draw straight lines, *cd* and *ef*, parallel to the line *ab*. On the lines *ef*, *ab*, and *cd* lay off to the scale of the map the distances $m_4 x_2$, $m x_2$, and $m_2 x_2$ on both sides of the central meridian, taking the values from the column

headed "Arc of the parallel, 1'," corresponding to the latitude of m_1 , m , and m_2 , respectively. The value of 1 minute as taken from the table must be multiplied by the number of minutes out from the central meridian. Draw straight lines through the points thus determined for the extreme meridians—that is, through the x_2 points.

At the two points designated x_2 on the line ab lay off along the meridians the value of Y as given in the table under "Y coordinate of curvature," using as argument the interval in minutes between the central meridian and the extreme meridian. Draw straight lines from these points to the point m for the middle parallel, and from the points of intersection with the extreme meridians lay off distances along these meridians, above and below, equal to the distances $m m_2$ and $m m_1$ to locate points in the extreme parallels.

Subdivide each of the 3 meridians and 3 parallels already determined into parts corresponding with the projection interval and join the corresponding points of subdivision by straight lines to complete the projection.

The method outlined above may be used for all large-scale maps regardless of the number of meridians and parallels shown. For small-scale maps the method is somewhat more complicated, and it becomes necessary to make use of Special Publication No. 5, which may be obtained for 20 cents from the Superintendent of Documents, Washington, D.C.

Polyconic map projection table

Latitude		Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 36°
		1"	1'	1"	1'		
°	'	Meters	Meters	Meters	Meters	°	'
36	00	25.046	1,502.8	30.821	1,849.27	0	01
	05	25.020	1,501.2	30.822	1,849.30		03
	10	24.933	1,499.6	30.822	1,849.32		05
	15	24.907	1,498.0	30.822	1,849.35		07
	20	24.940	1,496.4	30.823	1,849.37		10
	25	24.914	1,494.8	30.823	1,849.40		15
	30	24.887	1,493.2	30.824	1,849.43		20
	35	24.800	1,491.6	30.824	1,849.45		25
	40	24.834	1,490.0	30.825	1,849.48		30
	45	24.807	1,488.4	30.825	1,849.51		40
	50	24.780	1,486.8	30.826	1,849.53		50
	55	24.753	1,485.2	30.826	1,849.56	1	00

Latitude		Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 37°
		1"	1'	1"	1'		
°	'	Meters	Meters	Meters	Meters	°	'
37	00	24.726	1,483.6	30.826	1,849.58	0	01
	05	24.699	1,481.9	30.827	1,849.61		03
	10	24.672	1,480.3	30.827	1,849.64		05
	15	24.645	1,478.7	30.828	1,849.66		07
	20	24.618	1,477.1	30.828	1,849.69		10
	25	24.590	1,475.4	30.829	1,849.72		15
	30	24.563	1,473.8	30.829	1,849.74		20
	35	24.536	1,472.2	30.829	1,849.77		25
	40	24.509	1,470.5	30.830	1,849.80		30
	45	24.481	1,468.9	30.830	1,849.82		40
	50	24.454	1,467.2	30.831	1,849.85		50
	55	24.426	1,465.6	30.831	1,849.88	1	00

Polyconic map projection table—Continued

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 38°
	1"	1'	1"	1'		
° /	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	° /	<i>Meters</i>
38 00	24.399	1,463.9	30.832	1,849.90	0 01	0.1
05	24.371	1,462.3	30.832	1,849.93	03	1.2
10	24.343	1,460.6	30.833	1,849.95	05	3.3
15	24.315	1,458.9	30.833	1,849.98	07	6.4
20	24.288	1,457.3	30.833	1,850.01	10	13.1
25	24.260	1,455.6	30.834	1,850.03	15	29.5
30	24.232	1,453.9	30.834	1,850.06	20	52.4
35	24.204	1,452.2	30.835	1,850.09	25	81.9
40	24.176	1,450.6	30.835	1,850.11	30	118.0
45	24.148	1,448.9	30.836	1,850.14	40	209.8
50	24.120	1,447.2	30.836	1,850.17	50	327.7
55	24.092	1,445.5	30.837	1,850.20	1 00	471.9

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 39°
	1"	1'	1"	1'		
° /	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	° /	<i>Meters</i>
39 00	24.063	1,443.8	30.837	1,850.22	0 01	0.1
05	24.035	1,442.1	30.837	1,850.25	03	1.2
10	24.007	1,440.4	30.838	1,850.28	05	3.3
15	23.979	1,438.7	30.838	1,850.30	07	6.5
20	23.950	1,437.0	30.839	1,850.33	10	13.2
25	23.922	1,435.3	30.839	1,850.36	15	29.7
30	23.893	1,433.6	30.840	1,850.38	20	52.9
35	23.865	1,431.9	30.840	1,850.41	25	82.6
40	23.836	1,430.2	30.841	1,850.44	30	118.9
45	23.807	1,428.4	30.841	1,850.46	40	211.5
50	23.779	1,426.7	30.842	1,850.49	50	330.4
55	23.750	1,425.0	30.842	1,850.52	1 00	475.8

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature	
	1"	1'	1"	1'		Lat. 40°	Lat. 41°
° /	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	° /	<i>Meters</i>	<i>Meters</i>
40 00	23.721	1,423.3	30.842	1,850.54	0 01	0.1	0.1
05	23.692	1,421.5	30.843	1,850.57	03	1.2	1.2
10	23.663	1,419.8	30.843	1,850.60	05	3.3	3.3
15	23.634	1,418.1	30.844	1,850.63	07	6.5	6.6
20	23.605	1,416.3	30.844	1,850.65	10	13.3	13.4
25	23.576	1,414.6	30.845	1,850.68	15	29.9	30.1
30	23.547	1,412.8	30.845	1,850.71	20	53.2	53.5
35	23.518	1,411.1	30.846	1,850.73	25	85.2	85.6
40	23.489	1,409.3	30.846	1,850.76	30	119.8	120.4
45	23.460	1,407.6	30.846	1,850.79	40	212.9	214.1
50	23.430	1,405.8	30.847	1,850.81	50	332.6	334.5
55	23.401	1,404.1	30.847	1,850.84	1 00	479.0	481.7

CONVERSION TABLE

In nearly all recent triangulation publications of this Bureau, complete tables have been printed for the conversion of feet to meters and meters to feet. As these tables require eight pages, it seemed advisable in the interests of economy to substitute for them the condensed table shown below. This table can be used readily for converting a rather large number of one unit to the corresponding number in the other unit by simply taking the conversion value for each digit of the first number, moving the decimal point if necessary, and

adding the values together. For example, to convert 24.6 feet to meters we take from the table the value in meters corresponding to 2 feet and move the decimal point one number to the right. We then take the value for 4 feet as given in the table, and next the value for 6 feet, and move the decimal point one number to the left. This gives, by rounding off the third decimal place, $6.096 + 1.219 + 0.183 = 7.498$ meters.

Meters	Feet	Feet	Meters
1	3.280833	1	0.3048006
2	6.561667	2	0.6096012
3	9.842500	3	0.9144018
4	13.123333	4	1.2192024
5	16.404167	5	1.5240030
6	19.685000	6	1.8288037
7	22.965833	7	2.1336043
8	26.246667	8	2.4384049
9	29.527500	9	2.7432055
10	32.808333	10	3.0480061

EXPLANATION OF TABLE OF POSITIONS

In the tables of positions the latitude and longitude of each point are given on the North American datum of 1927, and there are also given the length and azimuth of each line observed over, whether in one or both directions. No lengths and azimuths are repeated, and for a given line the length and azimuth will be found opposite the position of one or the other of the two stations involved.

To aid in the use of the tables, a column of the logarithms of the lengths in meters is given. It must be remembered that it is the logarithm which is derived first from the computation, the lengths given in the table being then derived from the corresponding logarithms. A final column gives these lengths reduced to feet, the reduction being made from the lengths in meters.

The rule followed in recent publications of this Office has been to give the latitudes and longitudes of the stations to thousandths of seconds for all points, the positions of which are fixed by fully adjusted triangulation. Points the positions of which are given to hundredths of seconds only are marked by footnotes as being without check (not occupied and observed from two stations only) or checked by verticals only.

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

The tables may be conveniently consulted by using as finders the sketches and the index at the end of this publication. In the third column of the index will be found for each point a reference to the page on which its description is given, in the fourth column the page on which the elevation of the station is given, and finally in the fifth column the number of the sketch on which it appears.

EXPLANATION OF LENGTHS

The lengths as given in the tables are all reduced to sea level. If the actual length of a line on the ground reduced only to the horizontal is desired—that is, its length in its actual elevation on the surface of the earth—it may be obtained by adding to the sea-level length as given in meters the following correction,

$$\text{Cor.} = \frac{Sh_m}{6,370,000}$$

in which S is the length of the line in meters and h_m is the mean elevation of the two ends of the line in meters. The correction for the length in feet can also be found by the same formula if S is taken in feet, but h_m must still be kept in meters, since the denominator is the approximate length of the radius of the earth in meters.

AZIMUTH AND BACK AZIMUTH

The azimuth of a line of triangulation is its true direction reckoned clockwise from true south. The cardinal points of the compass on this system are as follows: South is 0° (or 360°), west 90° , north 180° , and east 270° .

Because of the convergence of the meridians, the azimuth and the back azimuth of a line do not differ by exactly 180° , the amount of the divergence varying with the latitude and the difference of longitude of the two ends of the line. To illustrate from the tables on page 22, the azimuth from Blue Hill to Allen is $311^\circ 11' 18''.94$, while the back azimuth, or the azimuth from Allen to Blue Hill, is $131^\circ 19' 53''.45$.

The azimuths of the triangulation lines offer a very convenient and accurate means of testing the deflection of the magnetic needle on a surveyor's transit, and even the azimuth over such short distances as those between a station mark and its reference mark may be used for this purpose with fair accuracy, provided the distance is greater than 100 feet. On all recent triangulation, a special azimuth mark has been set for each station at a distance of not less than one fourth mile. The azimuth of the line from the station to this mark has been very accurately determined and may be used as the starting azimuth for traverse lines and other local surveys.

GEOGRAPHIC POSITIONS

Meades Ranch to Missouri State line

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points</i>													
Meades Ranch, 1891.....	39	13	26.686										
	98	32	30.506										
Waldo, 1892.....	39	09	55.626	255	17	12.64	75	28	09.64	Meades Ranch.....	4.4113352	25,783.11	84,590.1
	98	49	50.121										
Bunker Hill, 1891.....	38	52	16.425	161	42	50.25	341	38	07.14	Waldo.....	4.5366549	34,407.64	112,885.7
	98	42	20.437	199	51	24.27	19	57	35.91	Meades Ranch.....	4.6197308	41,661.11	136,683.2
Wilson, 1891.....	38	51	50.916	92	26	54.96	272	18	42.37	Bunker Hill.....	4.2773929	18,940.56	62,140.8
	98	29	15.469	138	30	06.84	318	17	09.59	Waldo.....	4.6506421	44,734.45	146,766.3
				173	19	19.79	353	17	16.93	Meades Ranch.....	4.6045754	40,232.35	131,995.6
Golden Belt, 1891.....	38	58	42.887	51	02	52.48	230	56	03.48	Wilson.....	4.3049773	20,182.61	66,215.8
	98	18	24.461	143	21	13.28	323	12	19.68	Meades Ranch.....	4.5314959	34,001.33	111,552.7
Lincoln, 1891.....	39	05	29.212	53	17	18.08	233	02	37.72	Wilson.....	4.6241919	42,091.26	138,094.4
	98	05	55.908	55	13	45.40	235	05	53.96	Golden Belt.....	4.3411360	21,934.92	71,964.8
				111	10	32.47	290	53	45.54	Meades Ranch.....	4.6129954	41,019.97	134,579.7
Heath, 1890.....	38	50	40.475	93	24	22.40	273	07	52.91	Wilson.....	4.5808577	38,094.10	124,980.4
	98	02	58.206	123	46	03.09	303	36	21.29	Golden Belt.....	4.4284626	26,820.24	87,992.7
				134	49	07.79	314	30	31.61	Meades Ranch.....	4.7776682	59,933.30	196,631.2
				171	08	35.68	351	06	43.93	Lincoln.....	4.4430713	27,737.76	91,003.0
Thompson, 1890.....	39	04	14.841	37	21	23.05	217	13	03.72	Heath.....	4.4991880	31,563.71	103,555.3
	97	49	44.050	76	15	28.11	255	57	22.84	Golden Belt.....	4.6297346	42,631.89	139,868.1
				95	41	32.44	275	31	19.76	Lincoln.....	4.3705480	23,471.89	77,007.4
Iron Mound, 1886.....	38	48	30.003	95	05	28.38	274	45	12.13	Heath.....	4.6710833	46,890.33	153,839.4
	97	30	41.503	136	44	10.24	316	32	12.15	Thompson.....	4.6028824	40,075.82	131,482.1
Vine Creek, 1886.....	39	06	06.435	18	02	19.30	197	57	42.92	Iron Mound.....	4.5347049	34,253.50	112,380.0
	97	23	21.900	63	40	53.08	243	15	58.47	Heath.....	4.8057323	63,934.06	209,757.0
				84	58	02.81	264	41	25.28	Thompson.....	4.5818489	38,181.14	125,266.0

Meades Ranch to Missouri State line—Continued

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
North Pole Mound, 1890.....	38 57 09.931	72 42 16.86	252 25 40.31	Heath.....	4.6029766	40,064.51	131,510.6						
	97 36 31.205	124 33 16.22	304 24 57.15	Thompson.....	4.3644044	23,142.19	75,925.7						
		228 51 45.23	49 00 02.25	Vine Creek.....	4.4011081	25,183.03	82,621.3						
		332 14 11.00	152 17 50.51	Iron Mound.....	4.2580021	18,113.49	59,427.3						
Salina west base, 1895.....	38 51 07.736	177 28 51.55	357 28 38.73	North Pole Mound.....	4.0484285	11,179.66	36,678.6						
	97 36 10.799	301 27 09.44	121 30 35.91	Iron Mound.....	3.9691274	9,313.81	30,557.1						
Salina east base, 1895.....	38 52 25.176	345 46 14.89	165 47 02.68	Iron Mound.....	3.8739678	7,481.14	24,544.4						
	97 31 57.715	68 38 56.22	248 36 17.42	Salina west base.....	3.8164035	6,552.446	21,497.48						
		143 08 21.74	323 05 29.94	North Pole Mound.....	4.0405304	10,978.18	36,017.6						
Taylor, 1889.....	38 52 58.530	79 26 50.54	259 07 51.94	Iron Mound.....	4.6488806	44,553.37	146,172.2						
	97 00 26.204	126 23 37.78	306 09 12.17	Vine Creek.....	4.6134848	41,066.23	134,731.5						
Frey, 1890.....	39 01 27.251	317 26 27.53	137 32 42.93	Taylor.....	4.3279653	21,279.69	69,815.1						
	97 10 23.326	50 52 08.23	230 39 22.99	Iron Mound.....	4.5785406	37,891.39	124,315.3						
		114 46 02.43	294 37 51.79	Vine Creek.....	4.3139415	20,603.52	67,596.7						
Wilmer, 1889.....	39 07 16.327	353 59 48.15	174 01 00.78	Taylor.....	4.4248374	26,597.29	87,261.3						
	97 02 21.612	47 07 54.38	227 02 50.76	Frey.....	4.1989436	15,810.43	51,871.4						
		86 02 20.15	265 49 05.12	Vine Creek.....	4.4822431	30,355.90	99,592.6						
Robbins, 1889.....	38 58 52.096	59 00 30.16	238 52 37.83	Taylor.....	4.3249774	21,133.79	69,336.4						
	96 47 54.567	126 47 28.08	306 38 21.83	Wilmer.....	4.4151208	26,008.83	85,330.6						
Erricssen, 1889.....	39 11 26.164	17 51 29.11	197 48 12.90	Robbins.....	4.3878686	24,426.92	80,140.7						
	96 42 43.359	74 52 09.46	254 39 45.47	Wilmer.....	4.4671771	29,320.89	96,197.0						
White City, 1888.....	38 48 10.573	110 16 39.75	290 06 11.80	Taylor.....	4.4103896	25,727.03	84,406.1						
	96 43 44.981	163 06 33.41	343 03 56.71	Robbins.....	4.3154786	20,676.58	67,836.4						
Reinhard, 1888.....	38 52 07.152	62 59 57.50	242 53 46.08	White City.....	4.2052130	16,040.32	52,625.6						
	96 33 52.694	121 41 44.73	301 32 55.78	Robbins.....	4.3768675	23,815.93	78,136.1						
		160 23 34.27	340 18 00.09	Erricssen.....	4.5792300	37,951.59	124,512.8						
Humboldt, 1889.....	39 01 22.829	340 24 30.48	160 27 09.48	Reinhard.....	4.2597309	18,185.74	59,664.4						
	96 38 05.635	71 53 31.98	251 47 21.34	Robbins.....	4.1735987	14,914.16	48,930.9						
		160 17 37.27	340 14 42.09	Erricssen.....	4.2959160	19,765.87	64,848.5						
Zean Dale, 1888.....	39 05 12.413	29 04 57.22	208 59 05.98	Reinhard.....	4.4424075	27,695.39	90,864.0						
	96 24 34.294	70 07 29.81	249 58 58.61	Humboldt.....	4.3170919	20,753.53	68,088.9						
		113 52 35.63	293 41 08.21	Erricssen.....	4.4560972	28,582.30	93,773.8						
Meyer, 1888.....	38 55 39.729	73 53 20.24	253 43 32.02	Reinhard.....	4.3711808	23,506.11	77,119.6						
	96 18 15.950	152 45 45.91	332 41 47.77	Zean Dale.....	4.2981509	19,868.12	65,184.0						
Clark, 1888.....	38 51 59.044	90 30 40.29	270 13 57.97	Reinhard.....	4.5855521	38,508.10	126,338.7						
	96 07 15.430	113 12 20.41	293 05 25.66	Meyer.....	4.2383250	17,311.11	56,794.9						
		134 27 47.13	314 16 53.68	Zean Dale.....	4.5438699	34,984.03	114,776.8						
Adams, 1888.....	39 02 41.078	11 46 08.81	191 44 21.24	Clark.....	4.3058309	20,222.32	66,346.1						
	96 04 24.342	57 04 57.71	236 56 14.52	Meyer.....	4.3777209	23,862.77	78,289.8						
		99 13 13.09	279 00 30.56	Zean Dale.....	4.4692427	29,460.68	96,655.6						
Powell, 1887.....	38 55 29.725	68 49 46.00	248 42 30.29	Clark.....	4.2538241	17,940.07	58,858.4						
	95 55 41.519	136 38 04.03	316 32 35.12	Adams.....	4.2627046	18,310.68	60,074.3						
Elevation, 1887.....	38 58 59.213	65 59 04.60	245 52 46.97	Powell.....	4.1997632	15,840.29	51,969.4						
	95 45 40.865	67 33 04.25	247 19 30.87	Clark.....	4.5285209	33,769.21	110,791.1						
		104 18 08.89	284 06 21.65	Adams.....	4.4453227	27,881.92	91,475.9						
Mabon, 1887.....	38 47 49.589	104 55 02.25	284 42 26.06	Clark.....	4.4784000	30,088.46	98,715.2						
	95 47 09.455	139 01 01.80	318 55 40.51	Powell.....	4.2743486	18,808.26	61,706.8						
		185 53 44.31	5 54 39.93	Elevation.....	4.3172047	20,758.92	68,106.6						
Kanwaka, 1887.....	38 59 34.443	57 23 53.63	237 09 12.33	Mabon.....	4.6042897	40,205.89	131,908.8						
	95 23 45.890	88 08 56.03	267 55 08.70	Elevation.....	4.5006049	31,666.85	103,893.7						
Simmons, 1887.....	38 47 04.765	92 42 05.90	272 28 53.19	Mabon.....	4.4852813	30,569.01	100,291.8						
	95 26 04.122	127 56 27.88	307 44 09.18	Elevation.....	4.5552629	35,913.93	117,827.6						
		188 11 18.96	8 12 45.74	Kanwaka.....	4.3684029	23,356.24	76,627.9						
Eckman, 1885.....	39 02 32.587	52 49 00.97	232 32 42.46	Simmons.....	4.6738753	47,192.75	154,831.5						
	95 00 06.346	80 59 09.31	260 44 15.62	Kanwaka.....	4.5389467	34,589.69	113,483.0						
Bebe Mound, 1887.....	38 46 17.438	92 41 24.99	272 27 22.47	Simmons.....	4.5119443	32,504.56	106,642.0						
	95 03 38.892	130 17 43.46	310 05 05.80	Kanwaka.....	4.5807436	38,084.09	124,947.6						
		189 38 48.63	9 41 02.12	Eckman.....	4.4843453	30,603.19	100,075.9						
Thomas, 1885.....	38 50 24.624	62 16 11.43	242 09 55.68	Bebe Mound.....	4.2135896	16,352.71	53,650.5						
	94 53 39.300	157 29 00.20	337 24 56.93	Eckman.....	4.3857201	24,306.37	79,745.1						
Marty, 1884.....	38 59 22.923	49 29 02.98	229 20 37.78	Thomas.....	4.4067826	25,514.24	83,708.0						
	94 40 15.047	101 38 16.88	281 25 46.91	Eckman.....	4.4661409	29,251.01	95,967.7						
Haskin, 1885.....	38 44 23.753	96 14 44.28	276 00 37.79	Bebe Mound.....	4.5163825	32,838.44	107,737.4						
	94 41 06.668	121 33 28.09	301 25 36.59	Thomas.....	4.3284181	21,301.89	69,888.0						
		182 33 55.94	2 34 28.33	Marty.....	4.4433413	27,755.01	91,059.6						
Berry (Mo.), 1884.....	38 49 14.136	50 43 24.78	230 38 41.07	Haskin.....	4.1502151	14,132.37	46,366.0						
	94 33 33.696	152 46 47.65	332 42 35.59	Marty.....	4.3246406	21,117.41	69,282.7						

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Meades Ranch to Missouri State line—Continued

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Bowler (Mo.), 1884.....	38	53	16.213	62	31	45.52	242	25	32.80	Berry.....	4.2082831	16,154.11	52,998.9
	94	23	39.574	115	20	17.51	295	09	51.86	Marty.....	4.4233795	26,508.15	86,968.8
Fulton (Mo.), 1883.....	38	38	43.731	107	54	15.75	287	40	10.36	Haskin.....	4.5355741	34,322.12	112,605.2
	94	18	34.362	131	54	10.92	311	44	48.21	Berry.....	4.4646392	29,150.04	95,636.4
				164	42	34.73	344	39	23.62	Bowler.....	4.4455186	27,894.50	91,517.2
<i>Supplementary points</i>													
Blue Hill (U.S.G.S.), 1891 ¹	39	20	29.65	325	49	20	145	57	36	Lincoln.....	4.525527	33,537.2	110,630
	98	18	59.84	358	47	22	178	47	44	Golden Belt.....	4.605379	40,306.9	132,240
Small peak, 1891.....	39	15	22.394	64	59	41.9	244	56	20.4	Meades Ranch.....	3.925966	8,432.7	27,666
	98	27	11.911	300	44	02.8	120	57	28.8	Lincoln.....	4.552380	35,676.3	117,048
				337	36	21.2	157	41	54.0	Golden Belt.....	4.522776	33,325.4	109,335
Turkey Point, 1891.....	38	56	17.355	112	08	55.3	292	04	06.9	Golden Belt.....	4.076416	11,923.8	39,120
	98	10	45.649	202	14	58.1	22	18	00.5	Lincoln.....	4.264582	18,390.0	60,335
				244	00	51.8	64	14	05.9	Thompson.....	4.528133	33,739.1	110,692
Lincoln College, cupola, 1891.....	39	01	59.828	66	18	04.4	246	12	03.3	Golden Belt.....	4.178393	15,079.7	49,474
	98	08	50.817	121	58	12.8	301	43	16.8	Meades Ranch.....	4.603615	40,143.5	131,704
				337	54	08.8	157	57	50.4	Heath.....	4.354202	22,604.9	74,163
Sugar Loaf Mound, rock pile, 1890.....	38	49	28.412	102	10	46.5	282	06	18.0	Heath.....	4.023852	10,564.6	34,661
	97	55	49.995	153	50	13.0	333	43	52.1	Lincoln.....	4.518844	33,025.1	108,350
				197	30	12.6	17	54	02.6	Thompson.....	4.458184	28,720.0	94,226
Lone tree (cottonwood), 1891 ¹	39	03	36.34	71	27	49	251	16	06	Golden Belt.....	4.452116	28,321.5	92,918
	97	59	48.91	111	33	48	291	29	56	Lincoln.....	3.976979	9,483.7	31,114
Soldier Cap Mound, 1890 ¹	38	42	58.51	176	04	38	356	08	28	Thompson.....	4.596052	39,450.5	129,431
	97	47	51.78	247	34	16	67	45	01	Iron Mound.....	4.429643	26,893.2	88,232
New Cambria church (stone), white spire, 1890 ¹	38	52	44.11	2	57	13	182	57	02	Iron Mound.....	3.894658	7,846.2	25,742
	97	30	24.75	132	54	25	312	50	35	North Pole Mound.....	4.080687	12,047.2	39,525
Section 13, T. 11 S., R. 1 W., northwest corner, stone, 1886. ¹	39	06	52.16	352	19	43	172	19	43	Vine Creek.....	2.15305	142.2	467
	97	23	22.69										
Salina west base, latitude station, 1896 ¹	38	51	07.74	90			270			Salina west base.....	0.89597	7.87	25.8
	97	36	10.47										
Salina paper mill, tall brick chimney, 1895.....	38	50	54.355	138	41	33.3	318	41	23.8	Salina west base.....	2.739813	549.3	1,802
	97	35	55.762	175	47	07.8	355	46	45.5	North Pole Mound.....	4.064941	11,612.9	38,100
				300	23	39.3	120	26	56.3	Iron Mound.....	3.944022	8,790.7	28,841
Salina, St. John's Military College, vane on tower, 1890.....	38	51	45.603	87	08	04.7	266	51	28.9	Heath.....	4.583493	38,326.0	125,741
	97	36	30.959	140	29	54.8	320	21	36.1	Thompson.....	4.476726	29,972.7	98,335
				305	33	26.1	125	37	05.2	Iron Mound.....	4.015542	10,364.3	34,004
Salina, Phillips' house, dome, 1890.....	38	50	20.327	91	01	21.1	270	43	44.0	Heath.....	4.609079	40,651.7	133,371
	97	34	52.795	140	15	08.5	320	05	46.2	Thompson.....	4.525145	33,507.7	109,933
				299	16	44.0	119	19	21.5	Iron Mound.....	3.842065	6,951.3	22,806
Abilene Catholic College, cupola, 1890.....	38	56	35.324	139	27	18.8	319	20	43.8	Vine Creek.....	4.365394	23,195.0	76,099
	97	12	54.420	201	59	03.9	22	00	39.0	Frey.....	3.987172	9,708.9	31,853
				290	16	55.1	110	24	45.1	Taylor.....	4.283898	19,226.4	63,079
Junction City, Grand View schoolhouse, belfry, 1889.....	39	01	07.827	49	30	27.9	229	22	47.6	Taylor.....	4.365598	23,205.9	76,135
	96	48	14.018	119	13	20.4	299	04	26.2	Wilmer.....	4.367923	23,330.4	76,543
				353	37	03.3	173	37	15.6	Robbins.....	3.624450	4,211.6	13,818
Hollinger's house, cupola, 1889 ¹	38	53	58.05	58	28	14	238	26	56	Taylor.....	3.545166	3,508.9	11,512
	96	58	22.12	166	50	47	346	48	16	Wilmer.....	4.402809	25,281.9	82,946
Fort Riley reservoir, top, 1889.....	39	04	14.738	207	14	58.1	27	17	58.3	Erricssen.....	4.175175	14,068.4	49,109
	96	47	28.936	291	19	24.2	111	25	19.1	Humboldt.....	4.162756	14,546.4	47,724
				3	32	53.7	183	32	37.5	Robbins.....	3.998627	9,968.4	32,705
White City Baptist Church, spire, 1889.....	38	47	37.048	112	51	02.5	292	40	48.2	Taylor.....	4.408553	25,618.5	84,050
	96	44	06.748	165	14	35.4	345	12	12.4	Robbins.....	4.333005	21,528.1	70,630
				240	35	45.1	60	42	10.1	Reinhard.....	4.230259	16,992.6	55,750
White City schoolhouse, cupola, 1889.....	38	47	49.446	111	51	04.4	291	40	43.6	Taylor.....	4.409095	25,703.7	84,330
	96	43	56.416	164	19	52.0	344	17	22.5	Robbins.....	4.326839	21,224.6	69,634
				241	19	30.9	61	25	49.4	Reinhard.....	4.219820	16,589.0	54,426
Dwight Methodist Church, cupola, 1888 ¹	38	50	42.69	68	21	01	248	15	55	White City.....	4.103471	12,690.3	41,635
	96	35	36.17	223	45	33	43	46	38	Reinhard.....	3.557122	3,606.8	11,833
Dwight windmill, 1888 ¹	38	50	55.82	67	41	01	247	35	40	White City.....	4.126900	13,393.7	43,942
	96	35	11.49	220	48	39	40	49	27	Reinhard.....	3.463390	2,906.6	9,536
United Brethren Church, cupola, 1889 ¹	38	56	33.82	1	58	02	181	57	55	Reinhard.....	3.915288	8,227.9	26,994
	96	33	40.98	144	28	01	324	25	15	Humboldt.....	4.039602	10,954.7	35,941
Abernathy's windmill, 1888.....	38	51	26.434	118	36	34.6	298	35	34.7	Reinhard.....	3.418755	2,622.7	8,605
	96	32	17.186	203	35	18.9	23	40	10.1	Zean Dale.....	4.444068	27,801.5	91,212
				248	51	24.6	69	00	12.8	Meyer.....	4.336984	21,726.2	71,280

¹ No check on this position.

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Newbury Catholic Church, spire, 1888 ¹	39	05	05.51	297	00	42	117	04	30	Adams.....	3.991062	9,796.3	32,140
	96	10	27.26	90	40	23	270	31	29	Zean Dale.....	4.308757	20,359.0	66,794
Moss Springs, Morgan's barn, ventilator, 1888.....	38	53	30.853	46	51	28.2	226	50	16.5	Reinhard.....	3.576784	3,773.8	12,381
	96	31	58.474	206	15	24.6	26	20	04.1	Zean Dale.....	4.382576	24,131.0	79,170
				258	35	20.9	78	43	57.5	Meyer.....	4.305619	20,212.5	66,314
St. Mary's Catholic Church, spire, 1888.....	39	11	31.210	311	16	52.8	131	28	23.3	Elevation.....	4.545083	35,081.9	115,098
	96	03	56.177	2	22	21.1	182	22	08.3	Adams.....	4.213837	16,302.0	53,681
				68	39	41.1	248	26	39.6	Zean Dale.....	4.504431	31,947.1	104,813
Buffalo Mound, azimuth mark, 1888.....	39	03	42.906	95	31	21.7	275	18	39.3	Zean Dale.....	4.465521	29,209.3	95,831
	96	04	24.608	287	50	22.6	108	02	10.1	Elevation.....	4.453529	28,413.8	93,221
				359	48	29.1	179	48	29.2	Adams.....	3.280900	1,909.4	6,264
Small house, 1888.....	38	53	26.669	12	39	38.9	192	39	23.2	Clark.....	3.442378	2,769.4	9,066
	96	06	50.253	191	35	53.0	11	37	24.8	Adams.....	4.241880	17,453.4	57,262
				256	41	23.7	76	48	23.7	Powell.....	4.218896	16,553.7	54,310
Eskridge schoolhouse, cupola, 1888 ¹	38	51	26.26	123	39	41	303	39	01	Clark.....	3.261116	1,824.4	5,986
	96	06	12.44	243	40	02	63	46	38	Powell.....	4.229375	16,953.0	55,636
Stenger, 1887.....	38	49	53.758	36	47	51.5	216	46	37.1	Mabon.....	3.679510	4,780.9	15,685
	95	45	10.787	124	19	34.2	304	12	58.3	Powell.....	4.264766	18,397.8	60,360
Burlingame schoolhouse, cupola, 1888.....	38	45	11.970	117	15	20.5	297	04	45.2	Clark.....	4.439201	27,491.7	90,196
	95	50	21.716	220	47	11.8	40	50	26.5	Stenger.....	4.059973	11,480.8	37,667
				223	39	42.2	43	41	42.6	Mabon.....	3.827387	6,720.3	22,048
White house on hill, center chimney, 1888.....	38	50	57.807	159	24	50.9	339	23	28.8	Powell.....	3.952191	8,957.6	29,388
	95	53	30.771	217	17	18.7	37	22	13.8	Elevation.....	4.271123	18,669.1	61,250
				279	15	29.7	99	20	43.3	Stenger.....	4.087036	12,219.0	40,089
Stone house, center, 1888.....	38	59	12.288	53	09	12.9	233	05	14.1	Powell.....	4.058275	11,436.0	37,520
	95	49	21.609	106	35	29.9	286	26	01.6	Adams.....	4.355114	22,652.4	74,319
				274	19	13.8	94	21	32.7	Elevation.....	3.726586	5,328.3	17,481
Topeka First Presbyterian Church, spire, 1887.....	39	02	57.219	44	10	15.4	224	07	09.0	Elevation.....	4.009792	10,228.0	33,556
	95	40	44.764	89	17	19.9	269	02	25.6	Adams.....	4.533277	34,141.1	112,011
Martins Hill, 1888.....	39	03	48.063	0	04	34.4	180	04	34.1	Elevation.....	3.949746	8,907.3	29,223
	95	45	40.372	75	04	25.2	234	50	50.8	Clark.....	4.580708	38,081.0	124,937
				85	43	39.7	265	31	51.5	Adams.....	4.433048	27,104.9	88,927
				282	24	49.3	102	27	55.6	Topeka First Presbyterian Church, spire.....	3.862048	7,278.6	23,880
Knox Knob, top, 1888.....	39	00	34.820	36	19	17.3	216	18	20.6	Elevation.....	3.563340	3,658.8	12,004
	95	44	10.827	64	37	21.0	244	22	50.8	Clark.....	4.567568	36,946.1	121,214
				97	42	12.5	277	29	28.3	Adams.....	4.469067	29,448.8	96,617
Topeka, State House, west wing, cupola, 1887 ¹	39	02	53.64	44	55	15	224	52	07	Elevation.....	4.008793	10,204.5	33,479
	95	40	41.49	103	10	17	283	07	09	Martins Hill.....	3.868051	7,379.9	24,212
Topeka, State House, west wing, flagstaff, 1887 ¹	39	02	53.83	44	50	02	224	46	54	Elevation.....	4.008491	10,197.4	33,456
	95	40	42.15	103	09	18	283	06	10	Martins Hill.....	3.867056	7,363.0	24,157
Topeka Methodist Church, spire, 1887 ¹	39	03	09.57	43	14	43	223	11	33	Elevation.....	4.025055	10,593.9	34,757
	95	40	39.31	99	20	22	279	17	12	Martins Hill.....	3.865419	7,335.3	24,066
Topeka Insane Asylum, cupola, 1887 ¹	39	03	54.52	25	43	59	205	42	04	Elevation.....	4.004649	10,107.6	33,161
	95	42	38.54	87	24	27	267	22	32	Martins Hill.....	3.641097	4,376.2	14,358
Scranton schoolhouse, south end, cupola, 1888 ¹	38	46	54.31	110	05	49	290	03	48	Mabon.....	3.695933	4,965.2	16,290
	95	43	56.23	161	59	52	341	59	06	Stenger.....	3.764820	5,818.6	19,060
Prominent windmill, 1888 ¹	38	47	38.81	92	06	21	272	02	22	Mabon.....	3.963390	9,191.6	30,156
	95	40	48.83	123	23	02	303	20	18	Stenger.....	3.878933	7,567.2	24,827
Carbondale schoolhouse (stone), cupola, 1887.....	38	49	07.219	74	26	57.7	254	23	14.8	Mabon.....	3.949961	8,911.7	29,238
	95	41	13.685	104	06	21.2	284	03	52.5	Stenger.....	3.770617	5,896.8	19,346
				119	29	23.4	299	20	18.7	Powell.....	4.380513	24,016.7	78,795
Kellam's house, chimney, 1887.....	38	56	22.753	54	41	38.2	234	31	58.2	Mabon.....	4.436571	27,325.7	89,651
	95	31	45.380	103	33	38.1	283	24	52.7	Elevation.....	4.315680	20,686.2	67,868
				334	24	50.1	154	28	24.2	Simmons.....	4.280403	19,072.3	62,573
Roberts' windmill, 1887.....	38	59	58.364	85	08	44.3	264	59	31.5	Elevation.....	4.326742	21,219.8	69,619
	95	31	02.410	273	58	42.9	94	03	17.5	Kanwaka.....	4.022453	10,530.6	34,549
				343	12	13.8	163	15	21.1	Simmons.....	4.396456	24,914.7	81,741
Big Springs, windmill, 1887 ¹	39	00	41.14	285	56	01	105	59	09	Kanwaka.....	3.873930	7,480.5	24,542
	95	28	44.78	82	45	49	262	35	10	Elevation.....	4.391864	24,652.7	80,881
LeCompton (U.S.G.S.), 1889 ¹	39	00	01.50	313	03	57	133	04	20	Kanwaka.....	3.087062	1,222.0	4,009
	95	24	22.98	5	49	10	185	48	06	Simmons.....	4.381577	24,075.6	78,988
Carson, 1887.....	38	54	22.192	238	30	13.6	58	41	00.7	Eckman.....	4.462691	29,019.6	95,208
	95	17	15.249	43	26	34.9	223	21	03.2	Simmons.....	4.268664	18,563.7	60,904
				135	42	07.4	315	38	01.8	Kanwaka.....	4.129083	13,461.2	44,164

¹ No check on this position.

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Lawrence water tower, pole, 1887.....	38 57 39.046	40 32 26.7	220 25 12.1	Simmons.....	4.410171	25,714.1	84,364						
	95 14 31.641	246 25 40.6	66 34 45.2	Eckman.....	4.356104	22,704.1	74,488						
Lawrence, Kansas State University, north dome, anemometer, 1887.....	38 57 25.762	40 54 05.2	220 46 54.3	Bebe Mound.....	4.419242	26,256.8	86,144						
	95 14 37.461	245 37 52.0	143 14 00.7	Simmons.....	4.403330	25,312.2	83,045						
Blue Mound, 1887.....	38 54 15.956	225 30 06.1	45 36 54.1	Eckman.....	4.361700	22,998.5	75,454						
	95 10 55.053	285 51 14.6	142 26 43.2	Bebe Mound.....	4.415235	26,015.7	85,353						
Edgerton Presbyterian Church, spire, 1887 ¹	38 45 54.90	99 20 29	279 18 40	Thomas.....	4.339893	21,872.2	71,759						
	95 00 43.59	230 52 23	50 56 49	Thomas.....	4.414431	25,967.6	85,195						
Hesper schoolhouse, belfry, 1885 ¹	38 53 56.58	199 53 29	19 56 00	Bebe Mound.....	4.258193	18,121.5	59,454						
	95 04 05.78	293 20 47	113 27 20	Thomas.....	3.632346	4,288.9	14,071						
Gardner Catholic Church, spire, 1887 ¹	38 48 33.88	70 09 17	250 04 15	Thomas.....	4.120269	13,190.7	43,276						
	94 55 36.96	219 43 25	39 44 38	Eckman.....	4.228499	16,923.8	55,524						
Gardner Methodist Church, spire, 1887.....	38 48 33.741	70 26 36.0	250 21 29.6	Thomas.....	4.216338	16,456.5	53,991						
	94 55 29.799	165 34 56.6	345 32 02.8	Eckman.....	4.092321	12,368.6	40,579						
Spring Hill Presbyterian Church, spire, 1887.....	38 44 36.567	98 48 23.5	278 39 38.5	Thomas.....	3.647425	4,440.4	14,568						
	94 49 40.341	151 46 12.8	331 43 43.1	Bebe Mound.....	4.092321	12,368.6	40,579						
Spring Hill Methodist Church, spire, 1887.....	38 44 34.459	98 59 58.3	278 51 14.1	Thomas.....	4.047425	4,440.4	14,568						
	94 49 41.630	152 02 34.0	332 00 05.1	Eckman.....	4.092321	12,368.6	40,579						
Ochiltree church, cupola, 1887 ¹	38 46 06.92	90 57 14	270 48 06	Haskin.....	4.311430	20,484.7	67,207						
	94 49 02.54	285 26 03	105 31 01	Thomas.....	4.085787	12,183.9	39,973						
Dennis barn, cupola, 1885.....	38 51 58.566	61 20 45.4	241 18 27.6	Haskin.....	4.093837	12,411.9	40,721						
	94 49 59.626	143 17 05.2	323 10 43.7	Bebe Mound.....	4.310989	20,463.9	67,139						
Olathe Deaf and Dumb Asylum, new chimney, 1887 ¹	38 52 59.10	60 10 58	240 01 38	Thomas.....	4.087306	12,226.6	40,113						
	94 48 45.79	137 14 37	317 07 29	Haskin.....	4.094861	12,411.2	40,818						
Olathe high school, 1885.....	38 52 42.129	57 56 13.0	237 53 17.0	Bebe Mound.....	4.325486	21,158.6	69,418						
	94 48 58.821	138 37 25.0	318 30 25.2	Eckman.....	4.076385	11,923.0	39,117						
Lenexa Methodist Church, spire, 1885.....	38 57 45.373	44 44 49.7	224 38 59.2	Thomas.....	4.395324	24,849.9	81,528						
	94 44 21.185	111 21 35.8	291 11 40.9	Eckman.....	4.382171	24,108.5	79,096						
Section line 1, 1885 ¹	38 59 35.18	37 55 13	217 55 05	Marty.....	3.902112	7,982.0	26,188						
	94 40 02.82	145 45 51	325 45 43	Marty.....	4.385364	24,286.4	79,680						
Section line 2, 1885 ¹	38 59 08.97	145 45 51	325 45 43	Thomas.....	4.281713	19,129.9	62,762						
	94 40 02.88	145 45 51	325 45 43	Eckman.....	4.281498	19,120.4	62,731						
Marty's house, lightning rod, 1884 ¹	38 59 36.41	275 46 38	95 46 48	Eckman.....	4.387511	24,406.8	80,075						
	94 40 18.44	348 54 34	168 54 36	Marty.....	3.822483	6,644.8	21,800						
Base 1, 1885 ¹	38 59 27.62	345 31 14	165 33 21	Marty.....	2.680348	479.0	1,572						
	94 36 56.18	88 17 01	268 14 56	Marty.....	2.716289	520.3	1,707						
Base 2, 1885 ^{1 2}	38 59 18.82	198 43 06	18 43 08	Section line 1.....	2.577260	377.8	1,239						
	94 37 00.00	198 43 06	18 43 08	Marty.....	2.627201	423.8	1,390						
State line 2, 1885 ^{1 2}	38 59 09.48	110 31 45	290 31 25	Berry.....	4.290854	19,536.8	64,097						
	94 36 28.02	129 32 32	309 32 14	Marty.....	3.680168	4,788.2	15,709						
State line 1, 1885 ¹	38 53 01.94	328 59 26	149 01 16	Base 1.....	2.457094	286.5	940						
	94 36 28.69	22 47 35	202 44 41	Base 2.....	2.914843	821.9	2,697						
Olathe Methodist Episcopal Church, spire, 1885 ¹	38 52 50.69	55 26 07	235 23 17	Base 1.....	2.943949	878.9	2,884						
	94 49 08.39	226 40 38	46 46 13	Berry.....	3.913528	8,194.6	26,885						
Belton South Methodist Church, spire (Mo.), 1885.....	38 48 32.894	116 55 47.2	296 54 42.1	Haskin.....	4.238778	17,329.2	56,854						
	94 31 49.890	233 29 49.4	53 34 56.9	Thomas.....	3.899498	7,934.1	26,030						
State line 3, stake, 1885.....	38 46 20.907	61 36 42.3	241 33 49.2	Marty.....	4.246599	17,644.1	57,887						
	94 36 30.107	167 20 53.0	347 18 31.7	Bowler.....	3.448526	2,808.8	9,215						
Harrisonville, Cumberland Presbyterian Church, spire (Mo.), 1885.....	38 39 15.063	135 30 37.1	315 22 45.9	Fulton.....	4.167357	14,701.3	48,233						
	94 21 00.634	171 35 56.4	105 17 23.5	Fulton.....	4.422337	26,444.6	86,760						
Westport, College of Redemptorist Fathers (Mo.), 1884.....	39 04 01.682	319 41 24.9	139 48 45.2	Haskin.....	3.880374	7,592.3	24,909						
	94 35 19.556	354 40 08.8	219 33 34.8	Marty.....	4.392988	24,716.6	81,091						
				Berry.....	3.834460	6,830.6	22,410						
				Bowler.....	4.413701	25,923.9	85,052						
				Fulton.....	4.418630	26,219.3	86,023						
				Berry.....	3.564271	3,666.7	12,030						
				Bowler.....	4.416280	26,078.3	85,559						
				Berry.....	4.439136	27,487.6	90,182						
				Marty.....	4.047433	11,154.1	36,595						

¹ No check on this position.

² See description of Base 2, p. 49.

Meades Ranch to Missouri State line—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>							
Independence courthouse, high cupola or tower (Mo.), 1884.	39 05 32.874 94 24 57.620	355 15 59.1 62 44 19.2	175 16 48.2 242 34 41.4	Bowler..... Marty.....	4.357819 4.395127	22,793.9 24,838.6	74,783 81,491
Kansas City Catholic Cathedral, Eleventh Street between Broadway and Washington (Mo.), 1884.	39 06 03.255 94 35 20.444	273 31 38.3 324 26 48.4 29 52 35.5	93 38 11.1 144 34 09.4 209 49 29.9	Independence courthouse, high cupola or tower (Mo.). Bowler..... Marty.....	4.175981 4.463162 4.153314	14,996.2 29,051.1 14,233.6	49,200 95,312 46,698
Kansas City Second Presbyterian Church, spire (Mo.), 1885.	39 05 55.948 94 35 13.450	272 41 55.2 30 55 27.5 80 13 08.5	92 48 23.5 210 52 17.5 259 57 27.5	Independence courthouse, high cupola or tower (Mo.). Marty..... Eckman.....	4.170736 4.149665 4.561487	14,816.2 14,124.2 36,432.3	48,609 46,339 119,528
Kansas City, astronomical station, 1882.....	39 05 50.54 94 35 22.16						
Missouri-Kansas State line 1, stone (Mo.), 1885 ^{1 2}	38 53 01.70 94 36 28.11	117 32 54	297 32 54	State line 1.....	1.19931	15.82	51.9
Missouri-Kansas State line 2, stone 1884 ^{1 2}	38 59 09.57 94 36 27.99	11 08 31	191 08 31	State line 2.....	0.4617	2.90	9.5
Missouri-Kansas State line 3, stone, 1885 ^{1 2}	38 46 03.00 94 36 30.10	179 59 23	359 59 23	State line 3.....	2.74207	552.16	1811.5

Meades Ranch to Colorado State line

<i>Principal points</i>							
Allen, 1892.....	38 49 35.667 98 52 18.661	185 24 53.65 250 59 01.19	5 26 27.12 71 05 16.44	Waldo..... Bunker Hill.....	4.5773694 4.1833810	37,789.35 15,253.90	123,980.6 50,045.5
Blue Hill, 1892.....	38 58 57.273 99 05 57.906	228 48 17.89 240 45 26.98 289 46 38.28 311 11 18.94	48 58 27.91 61 06 33.10 110 01 28.92 131 19 53.45	Waldo..... Meades Ranch..... Bunker Hill..... Allen.....	4.4896332 4.7418210 4.5600604 4.4192965	30,876.87 55,185.00 36,312.86 26,260.11	101,301.9 181,052.8 119,136.4 86,155.0
Fairmount, 1892.....	38 40 30.133 99 00 16.597	166 28 18.03 214 24 41.15 229 55 54.80	346 24 44.03 34 29 40.31 50 07 08.74	Blue Hill..... Allen..... Bunker Hill.....	4.5455363 4.3096364 4.5302012	35,118.53 20,400.29 33,900.12	115,218.0 66,930.0 111,220.6
Hays, 1892.....	38 54 51.792 99 16 16.739	243 01 00.14 285 34 47.07 318 49 32.26	63 07 29.15 105 49 49.56 138 59 33.82	Blue Hill..... Allen..... Fairmount.....	4.2230931 4.5564544 4.5472110	16,714.49 36,012.60 35,254.21	54,837.5 118,151.3 115,663.2
La Crosse, 1892.....	38 35 37.890 99 16 09.963	179 44 16.43 198 50 42.24 248 34 20.61	359 44 12.20 18 57 05.67 68 44 15.85	Hays..... Blue Hill..... Fairmount.....	4.5512274 4.6590580 4.3937082	35,581.76 45,609.78 24,757.58	116,737.8 149,638.1 81,225.5
Smoky Hill, 1893.....	38 43 35.020 99 32 53.625	228 57 46.65 276 42 14.57 301 06 27.21	49 08 11.58 97 02 38.21 121 18 54.19	Hays..... Fairmount..... La Crosse.....	4.5029916 4.6779081 4.4529802	31,841.36 47,633.02 28,377.90	104,466.2 156,276.0 93,103.2
Trego, 1893.....	38 53 55.478 99 38 15.877	266 45 27.89 337 51 23.10	86 59 16.38 157 54 45.08	Hays..... Smoky Hill.....	4.5028662 4.3149594	31,832.17 20,651.87	104,436.0 67,755.3
Skaggs, 1893.....	38 39 28.054 99 45 14.875	200 40 34.89 246 54 19.12 279 23 36.02	20 44 57.31 67 02 02.50 99 41 45.24	Trego..... Smoky Hill..... La Crosse.....	4.4563058 4.2892666 4.6314530	28,596.03 19,465.55 42,800.91	93,818.8 63,863.2 140,422.7
Big Creek, 1893.....	38 55 39.318 99 54 22.440	277 44 41.81 336 06 38.12	97 54 48.95 156 14 21.18	Trego..... Skaggs.....	4.3711862 4.5150203	23,506.41 32,735.60	77,120.6 107,400.0
Schmidt, 1893.....	38 41 46.395 100 03 17.122	206 37 20.99 238 02 49.35 279 10 02.25	26 42 56.11 58 18 29.99 99 21 18.58	Big Creek..... Trego..... Skaggs.....	4.4585129 4.6297846 4.4233464	28,741.73 42,636.90 26,506.13	94,296.8 139,884.2 86,962.2
Indian Creek, 1891.....	38 52 01.954 100 28 32.606	262 05 42.78 297 17 34.78	82 27 10.14 117 33 24.02	Big Creek..... Schmidt.....	4.6977337 4.6150141	49,857.86 41,211.09	163,575.3 135,206.7
Canyon, 1891.....	38 39 25.230 100 26 14.665	171 53 20.91 236 46 30.19 262 25 58.57	351 51 54.54 57 06 28.20 82 40 19.43	Indian Creek..... Big Creek..... Schmidt.....	4.3723711 4.7408597 4.5261083	23,570.63 55,062.97 33,582.13	77,331.3 180,652.4 110,177.4
Beaver, 1891.....	38 43 24.508 100 51 47.365	244 30 56.01 281 07 53.69	64 45 29.88 101 23 51.90	Indian Creek..... Canyon.....	4.5711225 4.5771469	37,249.63 37,769.99	122,210.0 123,917.0
Monument, 1891.....	38 53 56.307 100 53 05.589	275 32 37.09 304 29 41.44 354 27 35.89	95 48 01.73 124 46 30.38 174 28 24.92	Indian Creek..... Canyon..... Beaver.....	4.5524009 4.6744968 4.2916689	35,678.03 47,290.34 19,573.52	117,053.7 155,053.3 64,217.5
Sheridan, 1891.....	38 51 33.383 101 21 16.857	263 40 56.61 289 17 21.06	83 58 38.19 109 35 49.65	Monument..... Beaver.....	4.6128316 4.6559790	41,004.51 45,287.57	134,529.0 148,581.0
Gopher, 1891.....	38 59 27.283 101 09 29.915	293 12 31.13 319 06 52.06 49 25 40.22	113 22 49.85 139 17 58.69 229 18 16.04	Monument..... Beaver..... Sheridan.....	4.4117626 4.5934484 4.3510235	25,808.49 39,214.66 22,440.03	84,673.4 128,656.8 73,622.0

¹ No check on this position.

² See description of Base 2, p. 49.

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
Principal points—Continued													
Teeters Hill, 1891.....	39	04	22.986	288	12	23.50	108	24	25.12	Gopher.....	4.4628554	29,030.56	95,244.4
	101	28	35.787	335	57	34.71	156	02	10.73	Sheridan.....	4.4146132	25,978.45	85,231.0
Wallace Bluffs, 1891.....	38	50	56.185	200	14	11.25	20	18	11.21	Teeters Hill.....	4.4235998	26,521.60	87,012.9
	101	34	57.408	246	40	53.67	66	56	53.30	Gopher.....	4.6023989	40,031.23	131,335.8
				266	36	38.16	86	45	12.92	Sheridan.....	4.2970821	19,819.02	65,022.9
Turtle, 1891.....	39	01	17.715	256	40	27.59	76	51	03.84	Teeters Hill.....	4.3970760	24,950.31	81,857.8
	101	45	25.765	297	11	02.70	117	26	13.36	Sheridan.....	4.5940895	39,272.59	128,846.8
				321	38	56.40	141	45	31.29	Wallace Bluffs.....	4.3877604	24,420.83	80,120.7
Curlew, 1891.....	38	50	25.881	186	12	33.05	6	13	30.17	Turtle.....	4.3057658	20,219.28	66,336.1
	101	46	56.672	225	39	48.54	45	51	20.70	Teeters Hill.....	4.5681976	36,999.65	121,389.7
				266	51	13.33	86	58	44.46	Wallace Bluffs.....	4.2398229	17,370.92	56,991.1
McLane, 1891.....	39	01	54.168	273	31	51.75	93	39	39.97	Turtle.....	4.2533832	17,921.86	58,798.6
	101	57	49.351	301	25	59.82	121	40	22.10	Wallace Bluffs.....	4.5885400	38,773.95	127,210.9
				323	25	03.28	143	31	53.46	Curlew.....	4.4218005	26,411.95	86,653.2
Arapahoe (Colo.), 1891.....	38	46	01.280	201	13	18.64	21	18	16.61	McLane.....	4.4987257	31,530.12	103,445.1
	102	05	43.859	225	58	59.78	46	11	44.60	Turtle.....	4.6100968	40,747.11	133,684.5
				253	12	12.61	73	23	58.97	Curlew.....	4.4532615	28,396.28	93,163.5
Monotony (Colo.), 1891.....	39	01	44.503	269	13	13.12	89	24	01.29	McLane.....	4.3937367	24,759.21	81,230.8
	102	14	58.628	297	10	20.23	117	27	57.24	Curlew.....	4.6589314	45,696.49	149,594.5
				335	15	59.01	155	21	47.37	Arapahoe.....	4.5052886	32,010.96	106,022.6
Supplementary points													
Russell northwest base, 1892.....	38	53	36.915	179	02	11.0	359	01	57.7	Waldo.....	4.479791	30,185.0	99,032
	98	49	28.977	283	28	27.3	103	32	56.3	Bunker Hill.....	4.026257	10,623.2	34,853
Russell southeast base, 1892.....	38	51	22.264	140	43	01.0	320	41	32.6	Russell northwest base.....	3.729528	5,364.5	17,600
	98	47	08.039	173	32	02.0	353	30	20.0	Waldo.....	4.538486	34,553.0	113,363
				256	26	15.1	76	29	15.6	Bunker Hill.....	3.853219	7,132.1	23,399
Russell, north school, tall cupola, 1892.....	38	53	53.977	184	43	09.0	4	44	13.2	Waldo.....	4.473572	29,755.8	97,624
	98	51	32.092	280	02	41.1	100	03	58.4	Russell northwest base.....	3.479030	3,013.2	98,858
				282	41	59.7	102	47	46.0	Bunker Hill.....	4.134569	13,632.3	44,725
Russell, high school, cupola, pole, 1892.....	38	53	19.489	184	55	38.2	4	56	47.7	Waldo.....	4.489008	30,832.4	101,156
	98	51	40.431	216	30	06.0	36	42	10.6	Meades Ranch.....	4.666250	46,371.4	152,137
				278	08	57.5	98	14	49.6	Bunker Hill.....	4.134735	13,637.5	44,742
Russell, tripod, 1892.....	38	54	39.498	177	18	55.0	357	18	20.3	Waldo.....	4.451510	28,282.0	92,789
	98	48	54.942	214	09	48.1	34	20	08.6	Meades Ranch.....	4.623781	42,051.5	137,964
				294	51	30.1	114	55	37.8	Bunker Hill.....	4.020422	10,481.5	34,388
Bunker Hill, flouring mill, iron chimney, 1892.....	38	52	30.781	49	27	19.5	229	16	07.8	Fairmount.....	4.533013	34,120.3	111,943
	98	42	24.003	69	25	00.5	249	18	47.6	Allen.....	4.185332	15,322.6	50,271
				161	37	00.0	341	32	19.2	Waldo.....	4.530972	33,960.3	111,418
Bunker Hill, schoolhouse, cupola, 1892.....	38	52	34.800	69	41	46.7	249	35	19.5	Allen.....	4.200815	15,878.7	52,095
	98	42	01.298	160	40	48.3	340	35	53.1	Waldo.....	4.531734	34,020.0	111,614
				274	07	31.8	94	15	32.3	Wilson.....	4.267446	18,511.7	60,734
Bunker Hill, Methodist Church, spire, 1892.....	38	52	34.281	69	31	56.8	249	25	34.0	Allen.....	4.196230	15,711.9	51,548
	98	42	06.429	160	57	40.7	340	52	50.0	Waldo.....	4.531205	33,978.6	111,478
				274	02	13.9	94	10	18.9	Wilson.....	4.271423	18,682.0	61,293
Bunker Hill, water tower, 1892.....	38	52	15.470	161	38	30.6	341	33	46.0	Waldo.....	4.537228	34,453.1	113,035
	98	42	18.128	199	46	17.0	19	52	27.2	Meades Ranch.....	4.619823	41,670.0	136,712
				272	13	47.1	92	21	58.2	Wilson.....	4.276089	18,883.8	61,955
German Lutheran Church, spire, 1892 ¹	38	42	53.92	61	07	39	241	04	12	Fairmount.....	3.962558	9,174.0	30,098
	98	54	44.26	195	49	40	15	51	11	Allen.....	4.109818	12,877.1	42,248
Russell southeast base, astronomical station, 1892 ¹	38	51	22.28	90			270			Russell southeast base.....	0.78958	6.16	20.2
	98	47	07.78										
Section 31, T. 13 S., R. 12 W., southwest corner, stone, 1891. ¹	38	52	15.00	232	53	32	52	53	34	Bunker Hill.....	1.86096	72.6	238
	98	42	22.84										
Section 22, T. 14 S., R. 14 W., northwest corner, stone, 1892. ¹	38	49	38.04	302	27	06	122	27	09	Allen.....	2.13413	136.2	447
	98	52	23.42										
Walker, schoolhouse, cupola, 1892.....	38	52	09.680	106	22	47.9	286	15	23.0	Hays.....	4.250214	17,791.6	58,371
	99	04	28.241	170	15	25.0	350	14	28.7	Blue Hill.....	4.105612	12,753.0	41,840
				285	02	33.6	105	10	11.3	Allen.....	4.260631	18,223.5	59,788
Gorham, elevator, 1892.....	38	52	52.668	33	59	42.3	213	50	26.3	La Crosse.....	4.584904	38,450.7	126,150
	99	01	21.629	294	50	35.8	114	56	16.4	Allen.....	4.159362	14,433.2	47,353
				356	04	20.5	176	05	01.2	Fairmount.....	4.360790	22,950.4	75,296
Katherinestadt, Catholic Church, spire, 1892.....	38	55	38.168	73	18	12.8	253	16	08.6	Hays.....	3.696585	4,972.6	16,314
	99	12	59.044	238	46	10.3	58	50	35.1	Blue Hill.....	4.073878	11,854.4	38,892
				326	37	31.4	146	45	29.2	Fairmount.....	4.525094	33,503.8	109,920

¹ No check on this position.

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Victoria, stable cupola west of, 1892.....	38 50 48.950	131 15 40.9	311 11 58.3	Hays.....	4.055442	11,361.7	37,276						
	99 10 22.244	202 54 06.5	22 56 52.6	Blue Hill.....	4.213505	16,349.5	53,640						
		322 28 59.9	142 35 19.0	Fairmount.....	4.380941	24,040.4	78,873						
Hertzog, Catholic Church, tower, 1892.....	38 51 22.995	19 35 53.3	199 31 25.1	La Crosse.....	4.490353	30,928.1	101,470						
	99 09 01.318	121 33 58.3	301 29 25.0	Hays.....	4.090333	12,312.1	40,394						
		327 46 25.6	147 51 54.1	Fairmount.....	4.376320	23,785.9	78,038						
Round Top Mound, 1893.....	38 54 59.005	93 15 41.3	273 05 57.8	Big Creek.....	4.350379	22,406.8	73,513						
	99 38 53.741	270 16 17.0	90 30 29.5	Hays.....	4.514465	32,693.8	107,263						
		335 01 28.6	155 01 52.4	Trego.....	3.334649	2,161.0	7,090						
Ellis, schoolhouse, tower, 1893 ¹	38 55 58.53	274 36 31	94 47 24	Hays.....	4.399988	25,118.2	82,409						
	99 33 35.94	60 39 41	240 36 45	Trego.....	3.888646	7,738.3	25,388						
State Forestry station, large windmill, 1893 ¹	38 59 37.23	316 26 17	136 30 39	Trego.....	4.162404	14,534.6	47,686						
	99 45 11.53	61 06 03	241 00 16	Big Creek.....	4.180638	15,157.9	49,731						
Wakeeney courthouse, cupola, 1893 ¹	39 01 34.28	303 34 25	123 43 40	Trego.....	4.407087	25,532.1	83,767						
	99 52 58.65	10 26 53	190 26 00	Big Creek.....	4.046506	11,130.3	36,517						
Ransom schoolhouse, cupola, 1893 ¹	38 38 03.88	123 14 45	303 10 14	Schmidt.....	4.097879	12,527.9	41,102						
	99 56 03.56	260 32 56	80 39 41	Skaggs.....	4.201409	15,900.4	52,167						
Ransom gristmill, smokestack, 1893 ¹	38 37 59.40	123 43 29	303 38 57	Schmidt.....	4.101036	12,619.3	41,402						
	99 56 02.81	260 02 52	80 09 36	Skaggs.....	4.201550	15,905.6	52,184						
Castle Rock, 1890.....	38 51 23.196	250 46 26.6	70 56 19.3	Big Creek.....	4.381717	24,083.4	79,014						
	100 10 06.485	330 54 31.1	150 58 47.5	Schmidt.....	4.308497	20,346.8	66,754						
		46 38 33.5	226 28 27.4	Canyon.....	4.507813	32,196.8	105,632						
Bluff, 1890.....	38 51 32.489	253 19 24.4	73 30 30.2	Big Creek.....	4.425968	26,666.6	87,489						
	100 12 02.928	324 52 27.7	144 57 57.0	Schmidt.....	4.344084	22,084.3	72,455						
		42 35 47.3	222 26 54.0	Canyon.....	4.483268	30,427.6	99,828						
Hill, 1890.....	38 40 10.977	100 34 40.3	280 20 44.2	Beaver.....	4.516722	32,864.1	107,822						
	100 29 30.036	126 48 16.9	306 33 30.2	Monument.....	4.629441	42,603.1	139,774						
		183 36 49.2	3 37 25.1	Indian Creek.....	4.341777	21,967.3	72,071						
Russell Springs schoolhouse, cupola, 1891 ¹	38 54 48.15	68 18 52	248 12 20	Sheridan.....	4.209908	16,214.7	53,198						
	101 10 51.96	192 55 08	12 55 59	Gopher.....	3.946030	8,831.4	28,974						
Russell Springs courthouse, cupola, 1891 ¹	38 54 44.46	68 48 46	248 42 11	Sheridan.....	4.211180	16,262.2	53,354						
	101 10 47.98	192 09 22	12 10 11	Gopher.....	3.950450	8,921.7	29,271						
Russell Springs church, spire, 1891 ¹	38 54 58.06	68 23 44	248 16 50	Sheridan.....	4.232965	17,098.8	56,098						
	101 10 17.51	187 51 21	7 51 51	Gopher.....	3.923273	8,380.6	27,495						
Winona old schoolhouse, cupola, 1891 ¹	39 03 43.28	317 41 23	137 44 31	Gopher.....	4.028182	10,670.4	35,008						
	101 14 28.37	93 30 49	273 21 55	Teeters Hill.....	4.309827	20,409.2	66,959						
Winona new schoolhouse, tower, 1891.....	39 03 45.078	93 25 01.0	273 16 16.5	Teeters Hill.....	4.301899	20,040.1	65,748						
	101 14 43.612	316 27 55.8	136 31 13.3	Gopher.....	4.039837	10,960.7	35,960						
		22 47 54.7	202 43 47.4	Sheridan.....	4.388619	24,469.2	80,279						
Sheridan Butte, 1891.....	39 00 35.964	128 07 41.0	308 03 47.1	Teeters Hill.....	4.054874	11,346.8	37,227						
	101 22 24.479	276 24 54.6	96 33 02.0	Gopher.....	4.273199	18,758.5	61,544						
		354 26 02.9	174 26 45.3	Sheridan.....	4.225581	16,810.5	55,152						
McAllaster schoolhouse, spire, 1891.....	38 59 54.291	45 20 48.3	225 13 31.2	Wallace Bluffs.....	4.372629	23,584.6	77,377						
	101 23 21.669	137 40 07.8	317 36 50.0	Teeters Hill.....	4.049722	11,213.0	36,788						
		348 58 30.1	168 59 48.5	Sheridan.....	4.196900	15,736.2	51,628						
Pond, 1891.....	38 58 51.883	17 09 05.6	197 07 00.2	Curlew.....	4.212934	16,328.0	53,569						
	101 43 37.018	244 42 05.0	64 51 32.5	Teeters Hill.....	4.379535	23,962.7	78,618						
		319 28 36.5	139 34 03.0	Wallace Bluffs.....	4.285208	19,284.5	63,269						
Gilbert, 1891.....	38 51 39.281	174 13 10.5	354 12 35.2	Pond.....	4.127372	13,408.2	43,990						
	101 42 40.914	276 44 26.1	96 49 16.9	Wallace Bluffs.....	4.051348	11,255.1	36,926						
Wallace, latitude station, 1885.....	38 54 44.133	353 19 47.8	173 20 09.2	Wallace Bluffs.....	3.849845	7,076.9	23,218						
	101 35 31.495	61 11 37.6	241 07 08.0	Gilbert.....	4.072459	11,815.7	38,765						
		123 12 12.7	303 07 07.4	Pond.....	4.145099	13,966.9	45,823						
Wallace, railway office, chimney, 1891.....	38 54 43.663	285 47 23.8	105 56 21.6	Sheridan.....	4.331712	21,464.1	70,420						
	101 35 33.481	352 55 50.9	172 56 13.6	Wallace Bluffs.....	3.849314	7,068.3	23,190						
		64 17 38.0	244 10 29.2	Curlew.....	4.262133	18,286.6	59,995						
Wallace church, spire, 1891.....	38 54 56.725	286 48 15.9	106 57 14.2	Sheridan.....	4.334361	21,595.4	70,851						
	101 35 34.272	353 09 56.7	173 10 19.9	Wallace Bluffs.....	3.873344	7,470.4	24,509						
		63 08 27.2	243 01 18.9	Curlew.....	4.265947	18,447.9	60,524						
Wallace schoolhouse, cupola, 1891.....	38 55 03.759	287 23 16.7	107 32 13.8	Sheridan.....	4.334818	21,618.1	70,925						
	101 35 32.490	353 40 35.6	173 40 57.6	Wallace Bluffs.....	3.885416	7,681.0	25,200						
		62 36 16.0	242 29 06.5	Curlew.....	4.269163	18,585.0	60,974						
Sharon Springs church, spire, 1891.....	38 53 49.620	24 00 26.6	203 59 13.8	Curlew.....	3.837397	6,877.0	22,562						
	101 45 00.659	192 11 16.8	12 12 09.3	Pond.....	3.979365	9,536.0	31,286						
		290 08 20.7	110 14 39.3	Wallace Bluffs.....	4.190177	15,494.5	50,835						

¹ No check on this position.

Meades Ranch to Colorado State line—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>							
Sharon Springs schoolhouse, cupola, 1891.....	38 54 01.068	21 49 28.5	201 48 19.3	Curlew.....	3.854148	7,147.4	23,449
	101 45 06.496	178 01 42.2	358 01 30.1	Turtle.....	4.129458	13,472.8	44,202
		291 10 03.2	111 16 25.5	Wallace Bluffs.....	4.197298	15,750.6	51,675
Kansas-Colorado boundary mark 68, 1891.....	39 00 22.404	98 13 40.8	278 05 58.9	Monotony.....	4.251110	17,828.3	58,492
	102 02 45.067	248 17 00.0	68 20 06.2	McLane.....	3.884013	7,656.2	25,119
		308 45 23.5	128 55 19.3	Curlew.....	4.467330	29,331.2	96,231
Kansas-Colorado boundary mark 73½, 1891.....	38 55 30.792	13 55 59.0	193 54 05.8	Arapahoe.....	4.257504	18,092.7	59,359
	102 02 43.407	123 08 05.8	303 00 23.3	Monotony.....	4.324673	21,119.0	69,288
		292 18 39.0	112 28 33.2	Curlew.....	4.392353	24,680.4	80,972
Kansas-Colorado boundary mark, 83, 1891.....	38 47 09.054	64 35 10.9	244 33 16.9	Arapahoe.....	3.687257	4,867.0	15,968
	102 02 41.772	179 51 14.8	359 51 13.8	Kansas-Colorado boundary mark 73½.....	4.189540	15,471.8	50,760
		255 00 45.4	75 10 37.7	Curlew.....	4.372839	23,596.0	77,415
Weskan schoolhouse, cupola, 1891.....	38 51 56.434	46 05 39.2	226 00 44.0	Arapahoe.....	4.198122	15,780.5	51,773
	101 57 52.917	126 22 27.2	306 11 42.4	Monotony.....	4.486323	30,642.4	100,533
		279 57 00.3	100 03 51.9	Curlew.....	4.205979	16,068.6	52,718
Kansas-Colorado boundary mark 78, 1891 ¹	38 51 29.91	23 22 22	203 20 28	Arapahoe.....	4.042903	11,038.3	36,215
	102 02 42.48	179 49 37	359 49 36	Kansas-Colorado boundary mark 73½.....	3.870863	7,427.8	24,369

Meades Ranch to Nebraska State line

<i>Principal points</i>							
Dial, 1897.....	39 15 03.820	278 37 19.63	98 45 56.29	Meades Ranch.....	4.2970376	19,816.99	65,016.2
	98 46 07.311	29 22 34.73	209 20 13.88	Waldo.....	4.0376031	10,904.43	35,775.6
Kill Creek, 1897.....	39 16 51.315	286 31 04.56	106 35 58.91	Dial.....	4.0656352	11,631.49	38,161.0
	98 53 52.377	335 35 34.69	155 38 07.88	Waldo.....	4.1484410	14,074.76	46,176.9
Old Well 2, 1897.....	39 36 42.763	357 12 06.48	177 13 02.18	Meades Ranch.....	4.6345287	43,105.11	141,420.7
	98 33 58.231	23 35 14.91	203 27 31.83	Dial.....	4.6403733	43,689.12	143,336.7

Lawrence 2, 1897.....	39 31 13.073	247 48 52.09	68 00 00.51	Old Well 2.....	4.4319091	27,033.93	88,693.8
	98 51 27.598	345 35 19.56	165 38 42.80	Dial.....	4.4893690	30,858.09	101,240.2
Brown, 1898.....	39 46 37.140	327 00 58.65	147 06 17.02	Old Well 2.....	4.3392980	21,842.28	71,660.9
	98 42 16.701	24 47 35.33	204 41 43.81	Lawrence 2.....	4.4966505	31,379.83	102,952.0
Lebanon, 1897.....	39 49 41.511	7 58 22.25	187 56 52.14	Old Well 2.....	4.3847294	24,250.98	79,563.4
	98 31 37.225	69 33 42.92	249 26 53.56	Brown.....	4.2106041	16,240.68	53,283.0
Lipps, 1898.....	39 59 40.648	331 25 06.54	151 31 01.12	Brown.....	4.4394172	27,505.35	90,240.5
	98 51 29.634	359 56 49.52	179 56 50.82	Lawrence 2.....	4.7215098	52,663.51	172,780.2
Cooper, 1898.....	39 58 41.957	342 04 23.36	162 06 48.82	Lebanon.....	4.2434574	17,516.91	57,470.1
	98 35 23.954	23 43 35.79	203 39 11.17	Brown.....	4.3875981	24,411.70	80,090.7
Herrick (Nebr.), 1898.....	40 14 55.761	335 19 26.06	155 25 40.60	Cooper.....	4.5190351	33,089.63	108,397.5
	98 45 05.260	17 54 25.77	197 50 18.08	Lipps.....	4.4721137	29,656.08	97,296.7
Blue Hill (Nebr.), 1898.....	40 17 33.215	11 05 43.86	191 02 38.00	Cooper.....	4.5506768	35,553.04	116,643.6
	98 30 35.611	42 00 52.23	221 47 23.76	Lipps.....	4.6478427	44,447.02	145,823.3
<i>Supplementary points</i>		76 46 47.69	256 37 25.55	Herrick.....	4.3245603	21,113.50	69,269.9
Medicine Peak, 1897 ¹	39 21 37.39	47 51 33	227 45 39	Dial.....	4.257015	18,072.4	59,293
	98 36 48.46	70 18 26	250 07 38	Kill Creek.....	4.416077	26,068.2	85,519
Lawrence (U.S.G.S.), 1897 ¹	39 31 13.07	93 27 10	273 27 10	Lawrence 2.....	0.528531	3,377	11.08
	98 51 27.46						
Old Well (U.S.G.S.), 1897 ¹	39 36 42.81	272 52 30	92 52 30	Old Well 2.....	1.489607	30,875	101.30
	98 33 59.52						
Section 16, T. 5 S., R. 11 W., southeast corner, 1897 ¹	39 36 39.56	102 14 42	282 14 30	Old Well 2.....	2.668386	466.0	1,529
	98 33 39.14						
Smith Center courthouse, cupola, 1898 ¹	39 46 33.55	164 54 01	344 51 04	Lipps.....	4.400476	25,146.4	82,501
	98 46 53.51	269 00 48	89 03 45	Brown.....	3.818781	6,588.4	21,615
Tipton (U.S.G.S.), 1897.....	39 21 33.758	3 07 29.3	183 07 07.7	Meades Ranch.....	4.177333	15,042.9	49,353
	98 31 56.321	59 32 38.5	239 23 39.4	Dial.....	4.374225	23,671.5	77,662
Covert, 1897.....	39 21 40.572	122 38 04.7	302 25 40.6	Lawrence 2.....	4.521431	33,222.4	108,997
	98 42 27.773						
Hardilee (U.S.G.S.), 1897.....	39 50 52.794	205 48 53.7	25 52 26.7	Lipps.....	4.257423	18,089.4	59,348
	98 57 01.686	290 27 20.3	110 36 46.9	Brown.....	4.351765	22,478.4	73,748
		347 37 39.2	167 41 12.5	Lawrence 2.....	4.571060	37,244.3	122,192

¹ No check on this position.

Meades Ranch to Nebraska State line—Continued

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Smith Center, standpipe, 1898.....	39	46	39.884	13	46	27.1	193	43	19.9	Lawrence 2.....	4.468737	29,426.4	96,543
	98	46	34.279	163	46	42.4	343	43	33.0	Lipps.....	4.399361	25,081.9	82,290
				270	46	04.5	90	48	49.3	Brown.....	3.787492	6,130.4	20,113
Lebanon Methodist Church, spire, 1898.....	39	48	36.342	2	34	41.5	182	34	14.9	Old Well 2.....	4.343007	22,029.6	72,275
	98	33	16.691	74	04	48.4	253	59	02.8	Brown.....	4.125930	13,363.8	43,844
				229	38	21.4	49	39	25.1	Lebanon.....	3.491949	3,104.2	10,184
Kansas-Nebraska State line A, 1898.....	40	00	08.333	1	20	06.1	181	20	05.6	Lipps.....	2.931510	854.1	2,802
	98	51	28.794	198	19	13.9	18	23	21.2	Herrick.....	4.459967	28,838.1	94,613
				276	33	07.9	96	43	28.1	Cooper.....	4.362573	23,044.8	75,606
Kansas-Nebraska State line B, 1898.....	40	00	08.389	60	28	53.4	240	28	12.5	Lipps.....	3.239623	1,736.3	5,697
	98	50	25.945	195	28	36.6	15	32	03.4	Herrick.....	4.453364	28,403.0	93,186
				277	01	13.6	97	10	53.4	Cooper.....	4.333742	21,564.6	70,750
Lebanon schoolhouse, cupola, 1897 ¹	39	48	38.37	73	41	17	253	35	35	Brown.....	4.123005	13,274.1	43,550
	98	33	21.37	231	48	58	51	50	05	Lebanon.....	3.498436	3,150.9	10,338
Kansas-Nebraska State line 1, 1898 ¹	40	00	08.36	277	03	28	97	13	05	Cooper.....	4.331326	21,445.0	70,357
	98	50	20.87	90	33	18	270	23	15	Kansas-Nebraska State line B.....	2.080607	120.4	395
Kansas-Nebraska State line 2, 1898 ¹	40	00	08.35	269	07	13	89	07	15	Kansas-Nebraska State line B.....	1.972964	94.0	308.4
	98	50	29.90	276	59	10	97	08	52	Cooper.....	4.335611	21,657.6	71,055
Kansas-Nebraska State line C, 1898 ¹	40	00	08.63	25	27	52	205	27	18	Cooper.....	3.471416	2,960.8	9,714
	98	34	30.30	151	16	11	331	09	22	Herrick.....	4.494434	31,220.1	102,428
Red Cloud, standpipe (Nebr.), 1898 ¹	40	05	46.72	23	45	31	203	43	54	Cooper.....	4.155678	14,311.3	46,953
	98	31	20.97	68	36	03	248	23	06	Lipps.....	4.488497	30,796.2	101,037

Thirty-ninth parallel arc to Oklahoma State line

Station	Principal points			Azimuth			Back azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
Bossing, 1899.....	38	36	46.018	152	26	45.31	332	20	27.25	Wilson.....	4.4981446	31,487.96	103,306.7
	98	19	11.314	222	19	39.43	42	29	48.24	Heath.....	4.5422149	34,850.98	114,340.3
Loder, 1899.....	38	38	23.631	145	39	17.43	325	32	34.27	Heath.....	4.4399200	27,537.22	90,345.0
	97	52	13.995	238	58	19.31	59	11	47.86	Iron Mound.....	4.5610156	36,392.81	119,398.7
Sherman, 1899.....	38	34	20.174	99	14	57.51	279	02	57.82	Bossing.....	4.4515084	28,281.89	92,788.2
	97	59	57.552	127	29	35.10	307	11	15.53	Wilson.....	4.7276785	53,416.88	175,251.9
Little River, 1900.....	38	23	38.693	136	04	05.90	315	54	03.24	Heath.....	4.4848910	30,541.54	100,201.7
	98	03	03.279	192	48	19.05	12	50	14.62	Loder.....	4.1302297	13,496.77	44,280.7
Central, 1900.....	38	27	05.367	143	36	28.62	323	30	48.64	Bossing.....	4.3474332	22,255.29	73,015.9
	98	10	05.552	227	38	26.19	47	44	44.78	Sherman.....	4.2992522	19,918.30	65,348.6
Chase, 1900.....	38	20	43.454	197	00	51.26	17	04	44.88	Little River.....	4.0614869	12,063.88	39,579.6
	96	25	26.764	242	08	27.14	62	17	59.33	Bossing.....	4.4919747	31,043.79	101,849.5
Savage, 1901.....	38	09	23.371	146	14	22.13	326	08	24.57	Central.....	4.4025370	25,266.03	82,893.6
	98	15	49.226	215	09	17.60	35	17	12.06	Little River.....	4.5192807	33,058.31	108,458.8
Gilmore, 1901.....	38	10	00.982	87	39	13.87	267	27	43.73	Bossing.....	4.4020364	25,236.92	82,796.1
	97	57	12.283	115	49	30.22	295	32	01.03	Little River.....	4.5069592	32,281.91	106,911.6
Partridge, 1901.....	37	59	14.406	143	19	54.31	323	14	00.03	Savage.....	4.4348323	27,216.50	89,292.8
	98	06	14.702	213	30	15.88	33	35	50.40	Chase.....	4.6600448	45,713.54	149,978.5
Sunflower, 1901.....	37	51	40.332	122	57	10.68	302	48	05.63	Little River.....	4.4251563	26,616.83	87,325.4
	97	51	27.894	166	07	29.30	346	03	57.20	Savage.....	4.3696406	23,422.90	76,846.6
Arlington, 1901.....	37	52	33.817	170	06	55.29	350	06	38.55	Gilmore.....	4.3787714	23,920.56	78,479.4
	98	12	07.205	214	50	47.87	34	54	24.56	Partridge.....	4.4114448	25,789.61	84,611.4
Pretty Prairie, 1901.....	37	46	16.154	123	58	21.94	303	51	07.67	Gilmore.....	4.5435640	34,959.40	114,006.0
	98	00	19.042	232	22	58.51	52	28	24.17	Savage.....	4.4996047	31,594.01	103,654.7
Kingman, 1901.....	37	35	10.456	172	26	12.39	352	24	25.44	Partridge.....	4.1776744	15,054.78	49,392.2
	98	09	12.442	212	26	47.39	32	32	13.42	Sunflower.....	4.4819588	30,336.03	99,527.5
Cheney, 1901.....	37	40	37.504	70	31	06.04	250	19	20.15	Arlington.....	4.3195120	20,869.50	68,469.4
	97	49	56.348	124	27	01.93	304	20	40.93	Sunflower.....	4.2146115	16,391.23	53,776.9
Belmont, 1901.....	37	31	13.529	114	30	29.48	294	23	50.62	Kingman.....	4.5112214	32,450.50	106,464.7
	97	58	18.037	215	14	56.25	35	20	02.34	Pretty Prairie.....	4.3661812	24,332.19	79,829.9
Prairie, 1901.....	37	22	27.683	175	02	08.13	355	01	17.47	Kingman.....	4.4783818	30,087.20	98,711.1
	98	07	49.186	220	50	38.34	40	56	25.62	Pretty Prairie.....	4.2667310	18,491.23	60,633.8
									Sunflower.....	4.3129762	20,557.78	67,446.6	
									Kingman.....	4.2466370	17,645.62	57,892.3	
									Cheney.....	4.3284172	21,301.84	69,887.8	
									Kingman.....	4.3729993	23,604.74	77,443.2	
									Belmont.....	4.3313382	21,445.60	70,359.4	

¹ No check on this position.

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Sumner, 1901.....	37	24	25.121	82	57	11.94	262	45	18.95	Prairie.....	4.4640198	29,108.50	95,500.1
	97	48	15.056	130	24	16.56	310	18	09.79	Belmont.....	4.2888087	19,445.04	63,795.9
Quarry, 1901.....	37	14	28.375	136	32	21.16	316	26	35.95	Prairie.....	4.3090466	20,372.61	66,839.1
	97	58	19.634	218	55	34.99	39	01	41.56	Sumner.....	4.3740940	23,664.32	77,638.7
Fowler, 1902.....	37	07	35.913	132	11	55.50	312	06	11.32	Quarry.....	4.2775412	18,947.03	62,162.0
	97	48	50.157	181	35	21.78	1	35	43.03	Sumner.....	4.4930907	31,123.66	102,111.5
Rutherford, 1901.....	37	08	57.971	175	36	56.51	355	36	09.41	Prairie.....	4.3985404	25,034.59	82,134.3
	98	06	31.404	229	56	06.00	50	01	03.29	Quarry.....	4.1996991	15,837.96	51,961.7
Anthony northwest base, 1900.....	37	12	35.588	247	39	19.47	67	42	47.34	Fowler.....	4.4202002	26,314.81	86,334.5
	98	04	03.245	28	35	36.65	208	34	07.12	Quarry.....	3.9617433	9,156.79	30,041.9
Anthony southeast base, 1900.....	37	10	00.333	75	20	05.01	255	17	05.51	Rutherford.....	3.8797115	7,580.74	24,871.1
	98	01	34.221	142	29	19.08	322	27	49.00	Quarry.....	3.7806560	6,034.70	19,798.8
Miller, 1902.....	37	02	21.017	127	28	13.98	307	21	43.32	Anthony northwest base.....	3.9802433	9,555.28	31,349.3
	97	55	43.686	148	35	30.21	103	20	55.74	Quarry.....	4.2872279	19,374.88	63,564.1
Sand Hill (Okla.), 1902.....	36	52	26.080	181	44	19.68	1	44	42.32	Fowler.....	4.3569865	22,750.27	74,639.8
	98	07	09.017	222	41	47.43	46	29	29.16	Rutherford.....	4.1489380	14,090.88	46,228.8
Renfrow (Okla.), 1902.....	36	54	20.851	84	38	20.36	264	23	27.19	Rutherford.....	4.4855885	30,590.63	100,362.8
	97	42	21.102	126	46	31.73	42	48	39.46	Miller.....	4.3975296	24,976.39	81,943.4
Ellsworth water tower, pole, 1891.....	38	44	10.421	232	45	48.6	52	52	40.2	Sand Hill.....	4.5683511	37,012.73	121,432.6
	98	13	55.266	311	52	02.5	306	38	29.03	Miller.....	4.3937966	24,762.62	81,242.0
				29	10	05.5	338	32	29.50	Fowler.....	4.4204256	26,328.47	86,379.3
<i>Supplementary points</i>													
Ellsworth astronomical station, 1885.....	38	43	48.78							Heath.....	4.298920	19,903.1	65,299
	98	13	44.92							Sherman.....	4.435073	27,231.6	89,342
Ellsworth schoolhouse, cupola, 1891.....	38	43	50.08							Bossing.....	4.195598	15,689.1	51,473
	98	13	44.07										
German church, spire, 1899.....	38	49	15.499	12	17	17.3	192	15	07.2	Bossing.....	4.373848	23,650.9	77,595
	98	15	43.263	103	49	08.5	283	40	39.1	Wilson.....	4.304609	20,165.5	66,160
Oxide, 1899.....	38	41	26.523	261	51	05.2	81	59	05.1	Heath.....	4.270408	18,638.4	61,149
	98	13	21.828	44	21	55.2	224	18	16.9	Bossing.....	4.082519	12,092.6	39,674
Heath's barn, cupola, 1899.....	38	50	37.426	129	59	31.4	309	49	34.1	Wilson.....	4.477268	30,010.1	98,458
	98	03	12.931	303	58	49.5	124	07	11.6	Sherman.....	4.370684	23,479.2	77,031
Geneseo schoolhouse, tower, 1899.....	38	50	37.426	324	49	24.9	144	56	17.4	Loder.....	4.441896	27,662.8	90,757
	98	03	12.931	351	04	46.1	171	06	48.3	Sherman.....	4.484322	30,501.6	100,071
Lyons salt works, tower, 1899.....	38	31	04.350	42	09	54.5	221	59	54.9	Bossing.....	4.538351	34,542.3	113,328
	98	09	34.024	5	55	23.2	185	55	03.6	Central.....	3.869723	7,408.4	24,306
Butte, highest point, 1891.....	38	21	20.347	127	03	32.1	306	57	32.1	Bossing.....	4.243091	17,502.1	57,421
	98	11	34.644	246	33	37.9	66	39	37.1	Sherman.....	4.182135	15,210.2	49,902
Sterling College, tower, 1900.....	38	21	20.347	86	50	58.0	266	42	21.6	Chase.....	4.306157	20,237.5	66,396
	98	11	34.644	191	28	42.9	11	29	38.2	Central.....	4.035657	10,855.7	35,616
Hutchinson salt works, largest stack, 1900.....	38	39	59.688	250	59	25.2	71	04	42.6	Little River.....	4.118109	13,125.3	43,062
	97	41	30.976	79	16	13.5	259	09	31.9	Loder.....	4.199430	15,828.1	51,929
Table Mountain, cairn, 1899.....	38	32	47.09	122	33	23.9	302	19	58.2	Heath.....	4.566207	36,830.4	120,834
	97	49	50.14	224	51	10.3	44	57	56.8	Iron Mound.....	4.346720	22,218.8	72,896
Langley church, spire, 1899 ¹	38	13	16.446	34	23	34.0	214	21	29.1	Savage.....	3.939866	8,706.9	28,566
	98	12	27.216	215	29	01.7	35	34	51.4	Little River.....	4.372472	23,576.1	77,349
White Cliffs, cairn, 1899 ¹	38	02	25.282	285	04	04.3	105	13	30.1	Gilmore.....	4.362959	23,065.3	75,673
	97	57	16.629	65	53	47.0	245	48	15.6	Partridge.....	4.157899	14,384.6	47,193
Marquette church, spire, 1899 ¹	38	32	43.71	180	25	53.4	0	25	56.0	Gilmore.....	4.147696	14,050.6	46,098
	97	57	52.18	336	47	25.6	156	51	00.0	Sunflower.....	4.335075	21,630.9	70,967
Ellsworth schoolhouse, cupola, 1891.....	38	37	03.142	86	22	20.7	266	18	47.6	Bossing.....	3.917910	8,277.7	27,158
	98	13	29.862	265	17	29.5	85	30	46.0	Loder.....	4.490619	30,961.3	101,579
German church, spire, 1899.....	38	32	47.09	284	16	07.7	104	24	34.4	Sherman.....	4.307284	20,290.1	66,568
	97	49	50.14	101	05	43	280	59	24	Sherman.....	4.175633	14,984.2	49,161
Langley church, spire, 1899 ¹	38	32	43.71	161	27	58	341	26	28	Loder.....	4.039235	10,945.5	35,910
	97	57	52.18	134	25	37	314	24	19	Sherman.....	3.628380	4,249.9	13,943
White Cliffs, cairn, 1899 ¹	38	41	06.55	217	57	18	38	00	49	Loder.....	4.123792	13,298.2	43,629
	98	02	49.46	288	03	05	108	09	42	Loder.....	4.208556	16,164.3	53,032
				341	37	38	161	39	25	Sherman.....	4.120657	13,202.5	43,315

¹ No check on this position.

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
North Sherman, cairn, 1899 ¹	38 36 20.33 98 00 56.85	253 13 27 338 49 20	73 18 53 158 49 57	Loder..... Sherman.....	4. 120813 3. 599140	13, 207.3 3, 973.2	43, 331 13, 035						
Kanopolis salt works, center hoist, 1899 ¹	38 42 59.78 98 08 53.97	320 57 28 52 22 44	141 03 03 232 16 18	Sherman..... Bossing.....	4. 314191 4. 275476	20, 615.4 18, 857.1	67, 636 61, 867						
Bushton, elevator, 1899 ¹	38 30 53.47 98 23 42.49	211 06 24 289 20 06	31 09 14 109 37 34	Bossing..... Central.....	4. 103784 4. 322483	12, 699.4 21, 012.8	41, 665 68, 939						
Frederic, elevator, 1899 ¹	38 30 54.11 98 16 01.93	157 06 34 309 12 11	337 04 36 129 15 53	Bossing..... Central.....	4. 071141 4. 047337	11, 779.9 11, 151.6	38, 648 36, 586						
Windom, water tower, 1900 ¹	38 23 14.51 97 54 32.61	93 29 14 107 32 23	273 23 56 287 22 43	Little River..... Central.....	4. 093968 4. 375210	12, 415.6 23, 725.2	40, 733 77, 838						
Loder's house, chimney, 1899 ¹	38 38 18.18 97 55 03.69	267 38 17 44 07 13	87 40 03 224 04 10	Loder..... Sherman.....	3. 613588 4. 009384	4, 107.6 10, 218.4	13, 476 33, 525						
Hutchinson, courthouse, 1901 ¹	38 02 57.22 97 55 51.93	342 48 47 65 43 12	162 51 29 245 36 48	Sunflower..... Partridge.....	4. 339297 4. 221990	21, 842.2 16, 672.1	71, 661 54, 698						
Harper standpipe 1901.....	37 17 09.690 98 01 49.175	313 54 26.9 341 44 56.9 358 24 11.9	133 56 33.8 161 48 37.7 178 24 20.9	Quarry..... Miller..... Anthony southeast base.....	3. 855435 4. 460016 4. 121926	7, 168.6 28, 841.4 13, 241.2	23, 519 94, 624 43, 442						
Anthony Baptist Church, spire, 1902.....	37 09 18.730 98 01 46.532	193 19 32.8 279 19 38.8 325 08 14.6	13 19 40.1 99 27 27.6 145 11 53.4	Anthony southeast base..... Fowler..... Miller.....	3. 119909 4. 288285 4. 195555	1, 318.0 19, 421.6 15, 687.5	4, 324 63, 719 51, 468						
Anthony schoolhouse, tower, 1902.....	37 09 02.223 98 01 35.162	180 44 37.0 277 57 25.3 324 54 33.5	0 44 37.5 98 05 07.2 144 58 05.5	Anthony southeast base..... Fowler..... Miller.....	3. 253220 4. 280299 4. 179257	1, 791.5 19, 067.7 15, 109.7	5, 878 62, 558 49, 572						
Bluff City schoolhouse, belfry, 1902.....	37 04 14.338 97 52 34.680	53 13 06.4 128 43 52.6 221 43 19.8	233 11 12.5 308 38 27.0 41 45 35.2	Miller..... Anthony southeast base..... Fowler.....	3. 765817 4. 232084 3. 920534	5, 832.0 17, 064.1 8, 327.9	19, 134 55, 984 27, 322						
Anthony elevator, stack, 1901.....	37 09 10.447 98 02 10.013	86 36 35.3 156 10 47.3 209 51 55.8	266 33 57.4 336 09 38.8 29 52 17.4	Rutherford..... Anthony northwest base..... Anthony southeast base.....	3. 810353 3. 839686 3. 248803	6, 461.8 6, 913.3 1, 773.4	21, 200 22, 681 5, 818						
Anthony roller mill, stack, 1901.....	37 09 05.111 98 02 07.873	156 19 35.7 205 59 54.8 322 40 26.1	336 18 26.0 26 00 15.2 142 44 17.9	Anthony northwest base..... Anthony southeast base..... Miller.....	3. 850350 3. 277392 4. 194751	7, 065.2 1, 894.1 15, 658.5	23, 245 6, 214 51, 373						
Freeport gothic church, spire, 1902.....	37 12 01.310 97 51 20.477	19 59 06.6 76 12 45.0 335 36 05.1	199 56 27.8 256 06 34.1 155 37 35.9	Miller..... Anthony southeast base..... Fowler.....	4. 279491 4. 192888 3. 953415	19, 032.3 15, 591.5 8, 982.9	62, 442 51, 153 29, 471						
Freeport, east spire, 1902 ¹	37 12 01.16 97 51 14.55	336 26 43 76 21 25	156 28 10 256 15 11	Fowler..... Anthony southeast base.....	3. 950325 4. 196795	8, 919.2 15, 732.4	29, 262 51, 615						
Bluff City elevator (red), north gable, 1902 ¹	37 04 47.59 97 52 34.62	125 56 27 226 52 04	305 51 01 46 54 19	Anthony southeast base..... Fowler.....	4. 215997 3. 880377	16, 443.6 7, 592.4	53, 949 24, 909						
Bluff City mill, iron stack, 1902 ¹	37 04 46.60 97 52 25.40	125 34 04 225 30 06	305 28 32 45 32 16	Anthony southeast base..... Fowler.....	4. 221311 3. 872117	16, 646.0 7, 449.3	54, 613 24, 440						
Hinton elevator, north gable, 1902 ¹	37 10 01.14 97 55 24.53	294 40 06 89 52 33	114 44 04 269 48 50	Fowler..... Anthony southeast base.....	4. 029902 3. 960043	10, 712.8 9, 121.0	35, 147 29, 924						
Section 35, T. 18 S., R. 8 W., northwest corner, 1900 ¹	38 26 58.21 98 10 59.11	260 20	80 21	Central.....	3. 119751	1, 317.5	4, 322						
Section 24, T. 19 S., R. 7 W., northwest corner, 1900 ¹	38 23 27.77 98 03 11.29	209 59 45	29 59 50	Little River.....	2. 589637	388.7	1, 276						
Section 3, T. 20 S., R. 10 W., northwest corner, 1900 ¹	38 20 51.58 98 25 28.07	352 46 02	172 46 03	Chase.....	2. 402433	252.6	829						
Section 36, T. 34 S., R. 6 W., southwest corner, 1902 ¹	37 02 14.24 97 55 44.60	186 08 34	6 08 35	Miller.....	2. 322674	210.22	689.7						
Section 36, T. 33 S., R. 5 W., southwest corner, 1902 ¹	37 07 29.21 97 49 11.37	248 27 32	68 27 45	Fowler.....	2. 750493	562.98	1, 847.0						
Miller, eccentric, 1902.....	37 02 19.505 97 55 44.530	42 50 54.4 204 06 08.1 306 31 33.3	222 44 02.9 24 06 08.5 126 39 36.5	Sand Hill..... Miller..... Renfrow.....	4. 306688 1. 708013 4. 393603	24, 928.0 51, 052 24, 751.6	81, 785 167, 49 81, 206						
Section 13, T. 29 N., R. 7 W., northwest corner (Okla.), 1902.....	36 59 54.953 97 54 45.313	53 07 29.5 161 49 10.1 299 09 28.1	233 00 02.6 341 48 34.5 119 16 55.5	Sand Hill..... Miller, eccentric..... Renfrow.....	4. 362210 3. 671203 4. 324231	23, 025.6 4, 690.3 21, 097.5	75, 543 15, 388 69, 217						
Boundary stone 160, 1902.....	36 59 55.030 97 54 01.749	89 52 39.0	269 52 12.8 330 17 15.2	Section 13, T. 29 N., R. 7 W., northwest corner. Miller, eccentric.....	3. 032294 3. 709900	1, 077.2 5, 127.4	3, 534 16, 822						

¹ No check on this position.

Thirty-ninth parallel arc to Oklahoma State line—Continued

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Red barn near section 13, south gable, 1902.....	37	01	00.850	1	36	28.0	181	36	26.6	Boundary stone 160.....	3.307456	2,029.8	6,659
	97	53	59.446	29	10	33.4	209	10	05.8	Section 13, T. 29 N., R. 7 W., northwest corner.	3.366699	2,326.5	7,633
First auxiliary, 1902.....				133	02	21.6	313	01	18.4	Miller, eccentric.....	3.550620	3,553.2	11,657
	36	59	54.875	198	26	19.5	18	26	55.7	Miller, eccentric.....	3.672086	4,699.9	15,420
Livingood's house, chimney, 1902.....	97	56	44.680	269	56	35.8	89	57	47.6	Section 13, T. 29 N., R. 7 W., northwest corner.	3.470045	2,951.5	9,683
	37	00	10.594	2	07	09.6	182	07	09.2	First auxiliary.....	2.685652	484.9	1,591
Second auxiliary, 1902.....	97	56	43.955	200	16	54.6	20	17	30.4	Miller, eccentric.....	3.627028	4,236.7	13,900
				279	19	26.2	99	20	37.6	Section 13, T. 29 N., R. 7 W., northwest corner.	3.473175	2,972.9	9,754
Boundary stone 163, 1902.....	37	00	02.335	252	09	13.4	72	09	32.6	Livingood's house, chimney.....	2.919550	830.9	2,726
	97	57	15.943	286	33	51.5	106	34	10.3	First auxiliary.....	2.906606	806.5	2,646
Camchester schoolhouse, belfry, 1902 ¹	36	59	54.775	181	45	39.5	1	45	39.7	Second auxiliary.....	2.367620	233.1	765
	97	57	16.233	238	34	21.8	58	34	41.2	Livingood's house, chimney.....	2.970946	935.3	3,069
Sand Hill.....				269	46	19.2	89	46	38.2	First auxiliary.....	2.892209	780.2	2,560
	37	00	04.05	245	54	09	65	58	00	Miller.....	4.015121	10,354.3	33,971
	98	02	06.15	27	59	20	207	56	18	Sand Hill.....	4.208674	15,983.6	52,440

¹ No check on this position.

ELEVATIONS

The datum for all elevations is mean sea level.

The elevations given in class 1 are fixed directly by first-order leveling, as determined by the 1929 adjustment of the first-order level net, and are subject to a probable error of ± 0.06 meter. For more exact elevations of the stations fixed by first-order leveling and for an exact description of the point on each station mark to which such elevations are referred, the published results of first-order leveling should be consulted.

The elevations given in class 2 are fixed by reciprocal measures of vertical angles, and are subject to probable errors varying from ± 0.1 to ± 0.7 meter, the accuracy of each elevation depending mainly upon the remoteness of that station from a station whose elevation is given in class 1.

The elevations given in class 3 are for third-order stations, fixed by nonreciprocal measures of vertical angles and are subject to a probable error which may amount to as much as ± 2 meters.

The elevations of classes 2 and 3 are based upon results obtained by adjustments of the level net made previous to 1929. The change in elevations resulting from the 1929 adjustment was so small that it was not considered necessary to readjust the class 2 and 3 elevations to conform to the new values for class 1.

Table of elevations

Station	Point to which elevation refers	Elevation	
		Meters	Feet
<i>Class 1</i>			
Salina east base.....	Bolt.....	365.76	1,200.0
Salina west base.....	do.....	371.85	1,220.0
Bunker Hill (or B.M. S 1)	Stone.....	569.97	1,870.0
Russell southeast base (or B.M. T 1)	do.....	573.03	1,880.0
Russell northwest base.....	do.....	560.60	1,839.5
Blue Hill (Nebr.).....	do.....	621.94	2,040.5
Anthony southeast base.....	do.....	419.54	1,376.4
Anthony northwest base.....	do.....	425.25	1,395.2
<i>Class 2</i>			
Bowler (Mo.).....	do.....	331.2	1,087
Berry (Mo.).....	do.....	341.4	1,120
Marty.....	do.....	332.2	1,090
Haskin.....	do.....	242.2	1,123
Thomas.....	do.....	331.5	1,088
Bebe Mound.....	do.....	343.9	1,128
Eckman.....	do.....	307.1	1,008
Kanwaka.....	do.....	345.2	1,133
Simmons.....	do.....	364.2	1,195
Mabon.....	do.....	378.3	1,241
Elevation.....	do.....	360.6	1,183
Powell.....	do.....	387.2	1,270
Adams.....	do.....	400.3	1,313
Clark.....	do.....	479.6	1,573
Meyer.....	do.....	447.7	1,469
Zean Dale.....	do.....	464.8	1,525
Erricssen.....	do.....	412.3	1,353
Humboldt.....	do.....	430.7	1,413
Reinhard.....	do.....	478.4	1,553
White City.....	do.....	452.4	1,484
Robbins.....	Ground.....	406.2	1,333
Taylor.....	Stone.....	400.0	1,312
Wilmer.....	do.....	407.4	1,337
Frey.....	Ground.....	414.4	1,360
Fairmount.....	Stone.....	614.4	2,016

Table of elevations—Continued

Station	Point to which elevation refers	Elevation	
		Meters	Feet
<i>Class 2—Continued</i>			
Hays.....	Stone.....	662.6	2,174
LaCrosse.....	do.....	658.6	2,161
Smoky Hill.....	do.....	712.8	2,339
Trego.....	do.....	725.8	2,381
Skaggs.....	do.....	743.9	2,441
Big Creek.....	do.....	765.7	2,512
Schmidt.....	do.....	781.6	2,564
North Pole Mound.....	do.....	446.9	1,466
Iron Mound.....	do.....	456.6	1,498
Vine Creek.....	do.....	460.0	1,509
Thompson.....	do.....	486.6	1,596
Heath.....	do.....	553.9	1,817
Lincoln.....	do.....	513.3	1,684
Golden Belt.....	do.....	527.8	1,732
Wilson.....	do.....	567.6	1,862
Meades Ranch.....	do.....	599.4	1,967
Allen.....	do.....	579.7	1,902
Blue Hill.....	do.....	652.7	2,141
Waldo.....	do.....	619.0	2,031
Dial.....	do.....	624.0	2,047
Kill Creek.....	do.....	623.1	2,044
Lawrence 2.....	do.....	569.4	1,868
Old Well 2.....	do.....	549.0	1,803
Brown.....	do.....	589.8	1,935
Lebanon.....	do.....	587.6	1,928
Cooper.....	do.....	612.7	2,010
Lipps.....	do.....	651.8	2,138
Herrick (Nebr.).....	do.....	639.4	2,098
Loder.....	Station mark.....	492.2	1,615
Sherman.....	do.....	504.8	1,656
Bossing.....	do.....	576.6	1,892
Central.....	do.....	538.7	1,767
Little River.....	do.....	534.9	1,755
Chase.....	do.....	548.2	1,799
Savage.....	do.....	529.0	1,736
Gilmore.....	do.....	533.0	1,749
Partridge.....	do.....	500.2	1,641
Arlington.....	do.....	500.2	1,641
Sunflower.....	do.....	481.4	1,579
Pretty Prairie.....	Stone.....	487.7	1,600
Kingman.....	do.....	509.1	1,670
Cheney.....	Station mark.....	458.5	1,504
Belmont.....	do.....	481.4	1,579
Sumner.....	do.....	455.9	1,496
Prairie.....	do.....	502.9	1,650
Quarry.....	do.....	439.7	1,443
Rutherford.....	do.....	429.5	1,409
Fowler.....	do.....	390.2	1,280
Miller.....	do.....	414.2	1,359
<i>Class 3</i>			
Lenexa Methodist Church.....	Spire.....	342.3	1,123
Dennis barn.....	Cupola.....	341.4	1,120
Base 1 ¹	Ground.....	313.6	1,029
State line 2, Kansas and Missouri ¹	Stone.....	290.7	954
State line 3, Kansas and Missouri ¹	do.....	324.1	1,063
Spring Hill Presbyterian Church.....	Spire.....	352.4	1,156
Ochiltree church.....	Cupola.....	342.2	1,123
Olathe High School.....	Top of cupola.....	339.7	1,114
Olathe Methodist Episcopal Church.....	Spire.....	333.6	1,094
Olathe Deaf and Dumb Asylum.....	Chimney.....	342.6	1,124
Gardner Methodist Church.....	Cupola.....	345.1	1,132
Lawrence, Kansas State University.....	Top of north dome.....	344.5	1,130
Lawrence water tower.....	Wind vane.....	343.4	1,127
Kellam's house.....	Chimney.....	362.4	1,189
Roberts' windmill.....	Axle.....	353.4	1,159

¹ No check on this elevation.

Table of elevations—Continued

Station	Point to which elevation refers	Elevation	
		Meters	Feet
<i>Class 3—Continued</i>			
Big Springs, windmill.....	Top.....	349.4	1,146
LeCompton (U.S.G.S.).....	Ground.....	344.5	1,130
Carbondale schoolhouse.....	Cupola.....	368.3	1,208
Blue Mound.....	Stone.....	321.8	1,056
Stenger.....	Ground.....	374.9	1,230
Carson.....	Stone.....	324.8	1,066
Prominent windmill.....	371.1	1,218
Scranton schoolhouse.....	South cupola.....	359.1	1,178
Stone house.....	Roof.....	374.0	1,227
White house on hill.....	Center chimney.....	400.7	1,315
Knox Knob.....	Ground.....	348.0	1,142
Topeka First Presbyterian Church.....	Spire.....	336.8	1,105
Topeka Methodist Church.....	do.....	324.4	1,064
Topeka Statehouse.....	West wing, cupola.....	319.2	1,047
Topeka Insane Asylum.....	Cupola.....	322.4	1,058
Buffalo Mound, azimuth mark.....	Ground.....	388.7	1,275
Newbury Catholic Church.....	Spire.....	346.9	1,138
St. Mary's Catholic Church.....	do.....	326.8	1,072
Martins Hill.....	Ground.....	332.2	1,090
Fort Riley reservoir.....	Top.....	408.3	1,340
Grand View schoolhouse.....	Belfry.....	402.3	1,320
White City schoolhouse.....	Cupola.....	467.1	1,532
Ablene Catholic College.....	do.....	410.5	1,347
Gorham elevator.....	Top.....	597.4	1,960
Walker schoolhouse.....	Roof.....	600.4	1,970
Katherinestadt Catholic Church.....	Spire.....	652.8	2,142
Hertzog Catholic Church.....	Tower.....	611.4	2,006
Castle Rock.....	Ground.....	787.3	2,583
Bluff.....	do.....	794.0	2,605
Indian Creek.....	Stone.....	845.9	2,775
Canyon.....	do.....	850.4	2,790
Soldier Cap Mound.....	Ground.....	480.4	1,576
Sugar Loaf Mound.....	do.....	512.5	1,681
Salina, St. John's Military College.....	Top of cupola.....	403.7	1,324
Salina, Phillips' house.....	Top of dome.....	411.6	1,350
Ellsworth water tower.....	Top.....	510.7	1,676
Turkey Point.....	Ground.....	532.6	1,747
Small peak.....	do.....	564.1	1,851
Lincoln College.....	Top of cupola.....	452.6	1,485
Blue Hill (U.S.G.S.).....	Ground.....	535.3	1,756
Lone tree (cottonwood).....	do.....	497.2	1,631
Bunker Hill water tower.....	Tank.....	581.9	1,909
Russell High School.....	Top of cupola.....	585.4	1,921
Russell North School.....	do.....	577.8	1,844
Russell tripod.....	Ground.....	565.6	1,856
Bunker Hill Methodist Church.....	Spire.....	583.8	1,915
Bunker Hill schoolhouse.....	Top of cupola.....	581.2	1,907
Tipton (U.S.G.S.).....	Ground.....	553.1	1,815
Covert.....	do.....	561.9	1,844
Medicine Peak.....	do.....	541.6	1,777
Smith Center standpipe.....	Top.....	589.7	1,935
Hardlee (U.S.G.S.).....	Ground.....	615.6	2,020
Kansas-Nebraska State line 1.....	Stone.....	641.5	2,105
Kansas-Nebraska State line B.....	Ground.....	632.1	2,074
Kansas-Nebraska State line 2.....	Stone.....	627.6	2,059
Kansas-Nebraska State line C.....	Mound.....	590.6	1,938
Oxide.....	Ground.....	524.2	1,720
Geneseo schoolhouse.....	Top of tower.....	554.6	1,820
White Cliffs.....	Calrn.....	498.9	1,637
German church.....	Roof.....	556.0	1,824
Butte.....	Highest point.....	494.5	1,622
Loder's house.....	Chimney.....	484.1	1,588
Kanopolis salt works.....	Center hoist.....	507.6	1,665
Frederic elevator.....	Top of roof.....	554.8	1,820
Bushton elevator.....	do.....	557.6	1,829
North Sherman.....	Top of calrn.....	502.5	1,649
Windom water tower.....	Top.....	519.3	1,704
Sterling College.....	Top of tower.....	531.1	1,742
Anthony schoolhouse.....	do.....	439.1	1,441

DESCRIPTIONS OF TRIANGULATION STATIONS

The following descriptions of stations may be conveniently consulted by reference to the illustrations at the end of this publication or to the index. All azimuths given in the descriptions are reckoned continuously from true south around by west to 360° , south being 0° , west 90° , north 180° , and east 270° . Where magnetic azimuths are given they are indicated as such.

In general, except where the contrary is specifically stated, the surface and underground marks are not in contact, so that a disturbance of the surface mark will not necessarily affect the underground mark. The underground mark should be resorted to only where there is evidence that the surface mark has been disturbed.

The name and dates given in each description immediately after the county refer to the chief of party by whom the station was established, the date of the establishment of the station, and the date when the station was last recovered or searched for.

Any person who finds that one of the stations herein described has been disturbed or that the description no longer fits the facts is requested to send such information to the Director, Coast and Geodetic Survey, Washington, D.C.

MARKING OF STATIONS

The standard station and reference marks referred to in the following descriptions and notes consist of a disk and shank of bronze cast in one piece. The disk of the station mark (see fig. 2) is 90 millimeters in diameter, with a hole at the center surrounded by a 20-millimeter equilateral triangle, and has the following inscribed legend: "U.S. Coast and Geodetic Survey Triangulation Station. For information write to the Superintendent, Washington, D.C. \$250 fine or imprisonment for disturbing this mark." On the marks made since March 1921, the word "Director" replaces the word "Superintendent" in the inscription. The shank is 25 millimeters in diameter and 80 millimeters long, with a slit at the lower end into which a wedge is inserted, so that when it is driven into a drill hole in the rock it will bulge at the bottom and hold the mark firmly in place. The marks used between about 1915 and 1920 have grooves cut around the shank instead of the slit.

The standard disk reference mark, shown in figure 2, is the same size and shape as the newer type of station mark, described above, but instead of a triangle it has an arrow at the center of the disk, which, when the mark is properly set, points to the station. The legend is the same as for the station mark except that the words "reference mark" take the place of the words "triangulation station."

GENERAL NOTES IN REGARD TO STATION MARKS

Note 1.—Unless otherwise stated, the underground mark is a bottle filled with ashes and buried from 2.5 to 3 feet below the surface. The surface mark is a standard bronze station mark set in a marble post 6 inches square and 2 to 3 feet long, placed with its top flush with the ground and having two grooves at right angles and the letters U.S.C.S. cut in its top. The witness marks are two sandstone or limestone posts 5 or 6 inches square on top and 2 to 3 feet long, marked by a diagonal groove terminating in an arrowhead pointing to the station, and both placed in the meridian of the station, one to the northward and one to the southward of it, and 5 to 10 feet distant.

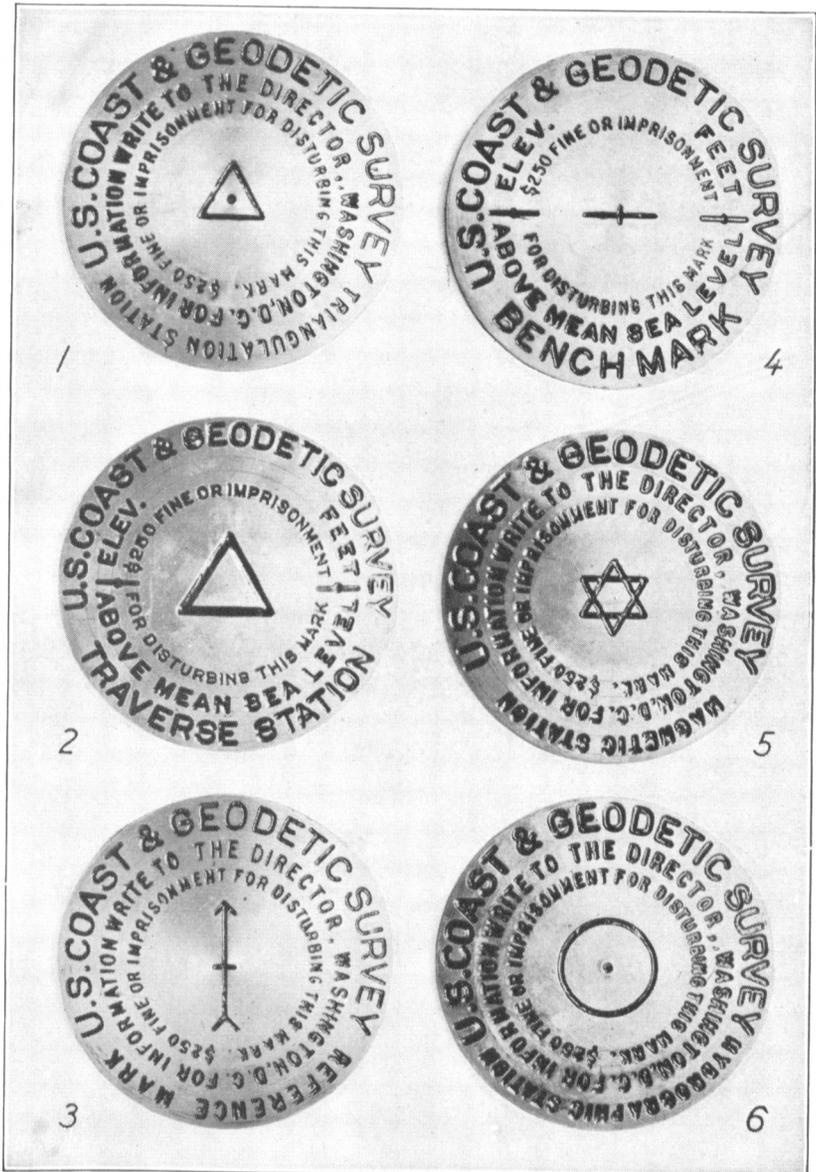


FIGURE 2.—STANDARD MARKS OF THE UNITED STATES COAST AND GEODETIC SURVEY.

1. Triangulation station mark.
2. Traverse station mark.
3. Reference mark.

4. Bench mark.
5. Magnetic station mark.
6. Hydrographic station mark.



FIGURE 3.—OLD-TYPE STATION MARK.

Note 2.—Station is surrounded by a circular trench 4 to 8 feet in diameter, 9 to 18 inches deep, and 6 to 12 inches wide, partly filled with coal.

Note 3.—The marking is the same as that in note 1, except that the buried bottle is stated to be a stone bottle or jug.

Note 4.—The underground mark is a stone jug buried from 2 to 3 feet below the surface and marked with a cross and small drill hole in its bottom.

Note 5.—The underground mark is an earthenware crock buried bottom upward from 2 to 4 feet below the surface and marked with small drill hole and sometimes also with a cross.

Note 6.—The surface mark is a standard bronze station mark set in a marble post 8 inches square and 2.3 to 2.6 feet long, placed with its top flush with the ground, and having two grooves at right angles and the letters U.S.C.S. cut in its top.

Note 7.—An old type bronze station mark, set in concrete in a 6-inch drain tile. The flange of the tile is flush with the ground. The bronze mark is somewhat like that shown in figure 3, except that the cup is deeper and the center is marked by a cross instead of a triangle. It is secured in the concrete by a stem 76 millimeters long. Two witness marks, each consisting of a 4-inch drain tile filled with concrete, with a nail at the center of the top, are flush with the ground from $4\frac{1}{2}$ to 7 feet from the station, one north and the other south.

Note 8.—The underground mark is a stone jug buried upright, with mouth 3 to 4 feet below the surface of the ground, the center of the mouth marking the station. Above this is an earthenware jar, bottom up, 2 to 3 feet below the surface, a small drill hole in the bottom marking the station. The surface mark is a tack in the top of a white-oak post 2 to $2\frac{1}{2}$ feet long.

MEADES RANCH TO MISSOURI STATE LINE

Principal points

Meades Ranch (Osborne County, F. D. Granger, 1891; 1922).—About 12 miles north of Lucas, $2\frac{1}{2}$ miles north of J. E. Robinson's ranch, on the highest point of a prominent ridge, in the SW $\frac{1}{4}$ sec. 34, T. 9 S., R. 11 W., near the east side of a large pasture, on land owned (1922) by Dr. Doan, who lives in Lucas. The underground mark is a standard bronze station tablet, set in a block of concrete 34 inches below the surface. Station mark is a similar tablet, set in the center of the top of a block of concrete, 36 inches square at the base, 24 inches square at the top, and 3 feet high, projecting 6 inches above the surface. A 2-inch layer of sand separates the concrete blocks. The name of the station and date of establishment, is stamped on each mark. Two standard bronze reference tablets, set in stone posts, are 2.652 meters (8.70 feet) north and 2.627 meters (8.62 feet) south from the station and about 1 inch below the surface. Additional references are as follows: North and south fence on east line of Dr. Doan's lands, a wire fence with large stone posts 2 rods apart, 72.2 meters (237 feet); east and west fence on south line of section 34, 469.7 meters (1,541 feet) south; stone marking southwest corner of section 34, 571.35 meters (1,874.5 feet) in azimuth $34^{\circ}33'$.

The latitude and longitude of station Meades ranch, together with the system of Laplace azimuths throughout the country, define the North American datum of 1927, which controls the triangulation systems of United States, Mexico, Canada, and Alaska. (See p. 2.)

Waldo (Osborne County, F. D. Granger, 1891; 1922).—About $4\frac{1}{2}$ miles northwest of Waldo, on a high and nearly level ridge, in the SE $\frac{1}{4}$ sec. 24, T. 10 S., R. 14 W., on land owned (1922) by John Lake, who lives in the northwest quarter of the same section. Both underground and station marks are standard bronze station tablets set in concrete blocks, the former 34 inches and the latter 10 inches below the surface. Reference mark no. 1, a standard bronze reference tablet set in a concrete block, is in the north and south fence line between the cultivated field on the west and the pasture on the east, and is 130.8 meters (429 feet) N. 50° E. (magnetic) from the station. Reference mark no. 2, similar to no. 1, is on the same fence line, 121.6 meters (399 feet), N. 75° E. (magnetic) from the station. A circular trench surrounds the station and broken window glass is mixed with the dirt over the mark.

Bunker Hill (Russell County, F. D., Granger 1891; 1922).—In the southwest part of Bunker Hill, in the SW $\frac{1}{4}$ sec. 31, T. 13 S., R. 12 W., in an enclosed, cultivated lot, west of a large barn which is west of the town water tower and is owned (1922) by W. H. Dunker. Underground mark is a bronze reference tablet set in concrete 34 inches below the surface. Station mark is a standard bronze sta-

tion tablet set in concrete 10 inches below the surface. Reference mark no. 1, a standard bronze reference tablet, set in a concrete block, is on the north fence line of the U. P. Highway on the south line of section 31, and is 34.7 meters (114 feet) distant S. 11° E. (magnetic); Reference mark no. 2, similar to no. 1, is in the fence line, on the west line of section 31, and is distant 46.12 meters (151.3 feet), S. 79° W. (magnetic). The stone marking the southwest corner of section 31 is 72.60 meters (238.2 feet) from the station. Additional references are as follows: Center of road on west section line, 56 meters (185 feet); center of U. P. Highway on south section line, 44 meters (144 feet); northwest corner of water tower, 57.12 meters (187.4 feet), S. 77° E. (magnetic); northwest corner of barn, 18.6 meters (61 feet), N. 83° E. (magnetic); southwest corner of barn, 25.0 meters (82 feet) S. 58° E. (magnetic).

Wilson (Russell County, F. D. Granger, 1891; 1922).—About $\frac{1}{2}$ mile west and $2\frac{1}{2}$ miles north of Wilson, in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 1, T. 14 S., R. 11 W., on land owned (1922) by Charles A. Whitmer. A road running north along the line between Ellsworth and Russell Counties passes over the ridge east of the station. Underground, station and witness marks are described in note 1. The witness posts are 2.448 meters (8.03 feet) north and 4.596 meters (15.08 feet) south of the station respectively. Additional references are as follows: South, to half-section line between the NE $\frac{1}{4}$ and the SE $\frac{1}{4}$ of sec. 1, 69.5 meters (228 feet); east to east line of sec. 1, which is the county line mentioned above, 266.7 meters (875 feet); north to road leading northwest, 17.4 meters (57 feet).

Golden Belt (Lincoln County, F. D. Granger, 1891; 1922).—About 7 miles southeast of Sylvan Grove, near the south end of the northernmost of two prominent hills, in the northwest corner of the SE $\frac{1}{4}$ sec. 27, T. 22 S., R. 9 W., very near the center of the section, on rough, rocky land, owned (1891) by Mr. Marshall and used as a cattle range. The station is 110 yards from the north end and 20 yards from the south end of the hill on which it stands. There is an old stone quarry on the west face of the hill about 55 yards southwest of the station and another about 200 yards to the southeast of the station on the northwest face of the southernmost hill. Underground, station, and witness marks are described in note 1. The two witness posts are 2.911 meters (9.55 feet) north and 2.758 meters (9.05 feet) south of the station, respectively.

Lincoln (Lincoln County, F. D. Granger, 1891; 1922).—About 7 miles northeast of Lincoln, and about 300 yards west and 40 yards north of the southeast corner of sec. 16, T. 11 S., R. 7 W., on land held (1891) by a mortgage and investment company of Lincoln. The nearest house (1891) is about $\frac{1}{2}$ mile to the northeast and is owned and occupied by Mr. Parks. The station is in pasture land, no cultivated land being in the immediate vicinity. Both underground and station marks are standard bronze station tablets, set in concrete blocks, the former 34 inches below the surface and the latter projecting 4 inches above the surface. Two standard bronze reference tablets, set in stone posts, are in the meridian, 3.075 meters (10.09 feet) north and 3.478 meters (11.41 feet) south of the station, respectively.

Heath (Ellsworth County, F. D. Granger, 1890; 1922).—About 18 miles northeast of Ellsworth, and 14 miles northwest of Brookville, in the SW $\frac{1}{4}$ sec. 12, T. 14 S., R. 7 W., on land owned (1922) by Aran Sparks, who lives in a stone house about $\frac{1}{2}$ mile to the southwest. The underground, station, and witness marks are described in note 1, the station mark being 11 inches below the surface. One of the witness posts is 22.89 meters (75.1 feet) south, the other 21.82 meters (71.6 feet) north of the station. A standard bronze reference tablet, set in a block of concrete, is in the north and south fence line between the cultivated field to the west and a large pasture to the east, 37.73 meters (123.8 feet) distant, N. 78° E. (magnetic) from the station.

Thompson (Ottawa County, F. D. Granger, 1890; 1922).—About 12 miles southwest of Minneapolis, in the NW $\frac{1}{4}$ sec. 25, T. 11 S., R. 5 W., on a prominent, rocky, round-topped hill belonging (1922) to the estate of Judge R. F. Thompson. Underground, station, and witness marks are described in note 1. One of the witness posts is 4.017 meters (13.18 feet) north and the other 4.298 meters (14.10 feet) south of the station.

Iron Mound (Saline County, F. D. Granger, 1886; 1922).—About 7 miles southeast of Salina, on a prominent and well-known butte, in the NW $\frac{1}{4}$ sec. 26, T. 14 S., R. 2 W. Both underground and station marks are standard bronze station tablets, set in concrete blocks, the former 32 inches below the surface, the latter projecting 4 inches above the surface.

Vine Creek (Ottawa County, F. D. Granger, 1886; 1922).—About $2\frac{1}{2}$ miles southeast of Vine Creek, and 4 miles west of Manchester, in the NW $\frac{1}{4}$ sec. 13, T. 11 S., R. 1 W. The underground mark is a standard bronze station tablet set in a block of concrete 32 inches below the surface. The station mark is a standard bronze station tablet set in a concrete block projecting 2 inches above the surface. Two stone witness posts, each marked with a diagonal groove terminating in an arrowhead pointing to the station, are in the meridian, 3.05 meters (10.1 feet) from the station, one north and the other south. A standard bronze reference tablet is in the fence line on the east side of the road on the west line of section 13, distant from the station 7.96 meters (26.1 feet), S. 75° W. (magnetic). The stone at the northwest corner of section 13 is 142.25 meters (466.7 feet) distant in azimuth 172°19'. The stone at the sixth principal meridian, at the southeast corner of the NE $\frac{1}{4}$ of section 13 is 1,731.3 meters (5,680 feet) distant in azimuth 292°48'. Other distances and directions are as follows: Center of well, 50.6 meters (166 feet), N. 75° E. (magnetic); west to center of road on west line of section 13, 15.8 meters (52 feet); north to north line of section 13, 140.8 meters (462 feet).

North Pole Mound (Saline County, F. D. Granger, 1890; 1922).—About $8\frac{1}{2}$ miles north of Salina, on a prominent and well-known hill, in the NW $\frac{1}{4}$ sec. 1, T. 14 S., R. 3 W., in a very rocky pasture owned (1922) by M. A. Sanders, who lives at the foot of the hill on the south side. The station is on the southwest end of the hill, on the highest point, and about 10 meters north and east from the edge of the rim rock. Both underground and station marks are standard bronze station tablets, set in blocks of concrete, the former being 30 inches below the surface and the latter projecting 3 inches above surface.

Salina West Base (Saline County, F. D. Granger, 1895; 1922).—In the northeast part of Salina, east of the tanks of the Standard Oil Co., 13.03 meters (42.75 feet) northwest of the line of telegraph poles which follow on the north side of and parallel to the track of the Union Pacific Railroad, and 10 feet east of a north and south fence which marks the eastern limit of ground owned by the Standard Oil Co., 24.1 meters (79 feet) northwest of the north rail of the main track of the Union Pacific Railroad. The station is 24.29 meters (79.7 feet) west of a telegraph pole and 10.73 meters (35.2 feet) a little east of north of the fence corner of the Standard Oil Co.'s property. The underground mark is the intersection of cross lines on a copper bolt set in a limestone post, 6 inches square and 2 feet long, 2.5 feet below the surface of the ground. About 5 inches of earth covers the top of the post. Above this, except for a space of 8 inches square over the post, is a layer of concrete 4 inches thick and 36 inches square, on which rests a limestone block 30 inches square and 10 inches high, supporting another limestone block 30 inches square and 15 inches high, with beveled top and having a copper bolt with cross lines and a small drill hole sunk into its top as the surface mark. The two blocks are cemented together and are surrounded by concrete several inches thick. The exposed top of the block bears the inscription "U.S.C. & G. Survey, 1896."

Salina east base (Saline County, F. D. Granger, 1895; 1922).—About 1 mile west of the village of New Cambria, on land owned by Mrs. Mary Marlin, Salina, 24.02 meters (78.8 feet) a little south of west from a wire fence on the Marlin farm, 6.837 meters (22.43 feet) a little west of north of a wire fence alongside the railroad, 10.683 meters (35.05 feet) from the second telegraph pole, marked with a triangle, west of the gate entrance to the Marlin farm, and 21.43 meters (70.3 feet) in the same direction from the north rail of the Union Pacific Railroad track. The station is marked, both underground and at the surface, in practically the same manner as Salina west base station, the only point of difference being that the underground post is 2.7 feet below the surface, with 8 inches of earth and 5 inches of concrete over it.

Taylor (Dickinson County, F. D. Granger, 1889; 1922).—About 6 miles south and 1 mile east of Chapman, in the NE $\frac{1}{4}$ sec. 32, T. 13 S., R. 4 E., on land owned (1922) by Clarence Taylor. The underground, station, and witness marks are described in notes 1 and 2, except that the marble post does not contain the standard bronze tablet. The underground mark is 4 feet below the surface, and the station and witness marks 1 foot below the surface. The following distances were measured: North hedge, 282.09 meters (925.5 feet); line of east hedge, 14.3 meters (47 feet); west face of stone coal-house, 41.79 meters (137.1 feet); northeast corner of section 32, 639.14 meters (2096.9 feet).

Frey (Dickinson County, F. D. Granger, 1890; 1922).—About $8\frac{1}{2}$ miles north of Abilene, in the NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, T. 12 S., R. 2 E., on land owned (1890) by

Adam Frey, about 0.6 mile east-southeast from Frey's house, and south of a hedge fence dividing Frey's and Chronister's farms. The underground mark is a stone bottle filled with charcoal, buried 20 inches below the surface. Directly over this and 11 inches below the surface is a standard bronze station tablet set in a concrete block. Reference marks are one marble and two limestone posts set along the hedge 2.716 meters (8.91 feet) to the north. Standard bronze reference tablets are in the two limestone posts. Azimuths and distances to these and other points of reference are as follows: West limestone post, 138° , 3.636 meters (11.93 feet); marble post, 180° , 2.716 meters (8.91 feet); stone, northeast corner section 11, $215^\circ 06'$; east limestone post, 222° , 3.661 meters (12.01 feet); stone, northeast corner of $W\frac{1}{2}$ of $SE\frac{1}{4}$ sec. 11, $268^\circ 03'$, 175.3 meters (575 feet). Additional references are as follows: West, to north and south hedge, 226.31 meters (742.5 feet); north, to center of east and west hedge, 3.17 meters (10.4 feet); east to center of north and south hedge, 175.3 meters (575 feet).

Wilmer (Dickinson County, F. D. Granger, 1889).—About 10 miles north and 1 mile west of Chapman, 8 miles south-southwest of Wakefield, and 10 miles west-southwest of Milford, in $SE\frac{1}{4}SE\frac{1}{4}$ sec. 1, T. 11 S., R. 3 E., on land owned (1889) by Rudolph Wilmer, who lives $\frac{1}{4}$ mile to the southwest. Station was originally marked as described in notes, 1, 2, and 3. In 1922 no surface marks were found. The underground mark is probably in position.

Robbins (Geary County, F. D. Granger, 1889; 1922).—About $4\frac{1}{4}$ miles south-east of Junction City, in $SE\frac{1}{4}NE\frac{1}{4}$ sec. 30, T. 12 S., R. 6 E., at the south end of a field owned (1922) by Ole Strauss, who lives $\frac{1}{4}$ mile northwest of the station. The station is north of a small grove of cottonwood trees, 38.1 meters (125 feet) west of the main road, and 4.6 meters (15 feet) north of the fence. West of the road is a peach orchard and ranch building, the whole surrounded by a wire fence. The underground mark is a standard bronze tablet, set in concrete 34 inches below the surface. The station mark is a standard bronze tablet set in a pyramidal block of concrete. Reference mark no. 1, a bronze tablet, is 20 feet west from the center of the roadway, on the north and south fence line, 27.386 meters (89.85 feet) east (magnetic) from the station. Reference marks, 2, 3, and 4 are standard bronze tablets set in stone posts, in an east and west line, 5.46 meters (17.9 feet) south of the station. Azimuths and distances to these reference marks and certain other points are as follows: Reference mark no. 2, $325^\circ 00'$, 6.684 meters (21.93 feet); reference mark no. 3, $0^\circ 00'$, 5.456 meters (17.90 feet); reference mark no. 4, $35^\circ 00'$, 6.684 meters (21.93 feet); stone, northeast corner of section 30, $183^\circ 19'$, 555.74 meters (1,823.3 feet); quarter-section stone, $192^\circ 11'$, 157.95 meters (518.2 feet); northeast cottonwood, $287^\circ 38'$, 23.35 meters (76.6 feet); northeast corner ranch building, $35^\circ 11'$, 61.14 meters (200.6 feet).

Ericsson (Riley County, F. D. Granger, 1889; 1922).—About 9 miles west of Manhattan and 13 miles east of Milford, on the main road between these towns crossing Overalls Ridge, and in the $SE\frac{1}{4}SW\frac{1}{4}$ sec. 12, T. 10 S., R. 6 E. Station is 146.0 meters (479 feet) north of the center of the road on land belonging (1922) to A. J. Willner. The underground, station, and reference marks are described in notes 1, 2, and 3. The two stone witness posts contain standard bronze reference tablets. One is north 2.368 meters (7.77 feet) and the other south 2.408 meters (7.90 feet) from the station. The southwest corner of section 12 is 605.9 meters (1,988 feet) distant in azimuth $77^\circ 07'$. Additional references are as follows: Northeast corner of Willner's house, 22.83 meters (74.9 feet), S. 20° W. (magnetic); southwest corner of stone barn, 24.4 meters (80 feet), N. 19° W. (magnetic).

White City (Morris County, F. D. Granger, 1888).—On a level prairie, about $\frac{1}{2}$ mile east-northeast of White City, about 1,750 feet east-northeast of the crossing of the Chicago, Rock Island & Pacific and the Missouri, Kansas and Texas Railways, in the $NE\frac{1}{4}SE\frac{1}{4}$ sec. 26, T. 14 S., R. 6 E., on land belonging (1888) to Nelson Burnham. From the station the cupola of the schoolhouse at White City is in azimuth $22^\circ 58'$. The station was originally marked as described in notes 1 and 2. In 1922 no surface marks could be found. The underground mark may still be in position.

Reinhard (Morris County, F. D. Granger, 1888; 1922).—About $2\frac{1}{2}$ miles north-east of Dwight, in the $W\frac{1}{2}NE\frac{1}{4}$ sec. 6, T. 14 S., R. 18 E., on the crest of a large prairie, on the south edge of an open lot at the south end of three rows of cedar trees. Station is on land owned (1922) by Evert R. Simmons, who lives $\frac{1}{2}$ mile west of the station. The underground, station, and witness marks are described in note 1. Standard brass reference tablets have been set in the witness posts. The marble post marking the station is inscribed "F.D.G. 1888" on the south

face. Additional references are as follows: North to center of road on section line, 157.0 meters (515 feet); east to hedge on east line of Mr. Simmon's farm, 238.0 meters (781 feet).

Humboldt (Geary County, F. D. Granger, 1889; 1922).—About 14 miles east of Junction City and 35 miles south of Westgate post office, on the dividing ridge between Humboldt and McDowell Creeks, and about 200 feet north and 880 feet west of the southeast corner of the NE $\frac{1}{4}$ sec. 10, T. 12 S., R. 7 E., Winfield Township. The ridge runs in a northwesterly and southeasterly direction, varying in width from 1 500 feet to 1 mile, and falls off more abruptly on its eastern than on its western border. The station is on the highest point of the ridge, near its northeastern border, in pasture land that has never been under cultivation. The underground mark is a standard bronze station tablet in a block of concrete 30 inches below the surface. The station mark is a standard bronze tablet in concrete. Reference mark no. 1, a standard bronze tablet in a solid outcrop of rock, is 167 meters (549 feet) N. 79° E. (magnetic) from the station. Reference mark no. 2, similar to no. 1, is in the solid rock outcrop, 181.42 meters (595.2 feet) S. 20° E. (magnetic) from the station. Stone witness posts, with diagonal grooves terminating in arrowheads pointing to the station, are in the meridian, about 8 feet north and south of the station. The following distances and azimuths are from the station: Southwest corner section 10, 1,598 meters (5,242 feet), 57°07'; quarter-section stone, 1,343 meters (4,406 feet), 87°09'; clump of trees at W. Roper's house, 1 $\frac{1}{2}$ miles, 109°55'; stone pile on cone-shaped hill near Ogden, 158°03'; hill at end of range to northeast, about 8 miles, 196°; hill east of station, about 2 $\frac{1}{2}$ miles, 263°35'. Three truck loads of rock were placed around the station mark.

Zean Dale (Riley County, F. D. Granger, 1888; 1922).—About 10 miles northwest of Alma, on land owned by Mr. Durine, of Topeka, and leased (1922) by A. S. Allandorph, of Alma, with headquarter ranch about 2 miles south of the station. The station is 8.91 meters (29.25 feet) southwest of the intersection of sections 15, 16, 21, and 22, 7.04 meters (23.1 feet) south of the section fence to the north, and 5.73 meters (18.8 feet) west of the section fence to the east. It is on the crest of a large, broken prairie, which at this point falls off abruptly to the valley of the Kaw River to the north. In a little ravine about $\frac{1}{2}$ mile to the east is a well of good water. The underground, station, and witness marks are described in note 1, the marble post bearing the inscription "F.D.G. 1888" on the south face.

Meyer (Wabaunsee County, F. D. Granger, 1888; 1922).—About 6 miles south and 1 mile west of Alma, in the NE $\frac{1}{4}$ sec. 16, T. 10 S., R. 13 E., on the crest of a large prairie in the Bradley pasture. About 600 feet to the south is a public road, which at this point turns abruptly to the east from a north and south direction about a mile east of the station turns again to the north and south direction. A private road is about 250 feet to the west of the station and joins this road at the angle. About $\frac{1}{2}$ mile down a deep ravine to the north-northwest of the station is a good spring and horse pond. About 1,000 or more feet to the east of the station is a section-line fence. The underground, station, and witness marks are described in note 1, the marble post bearing the inscription "F.D.G. 1888" on the south face.

Clark (Wabaunsee County, F. D. Granger, 1888; 1922).—About 1 mile northwest of Eskridge, on the summit of a high ridge, in the NE $\frac{1}{4}$ sec. 6, T. 14 S., R. 12 E., Eskridge Township, on land owned (1922) by the Marreto Brothers. To the west of the station 128.0 meters (420 feet), is a public road which terminates at a road running north and south, the station being located about 8 or 10 feet north of the prolongation of the south side of this road. About 2,000 feet east is a good spring. The underground, station, and witness marks are described in note 1, the marble post bearing the inscription "F.D.G. 1888" on the south face.

Adams (Wabaunsee county, F. D. Granger, 1888).—Lost.

Powell (Shawnee County, F. D. Granger, 1887; 1922).—About 7 miles southeast of Keene, in the NE $\frac{1}{4}$ sec. 14, T. 13 S., R. 13 E., on land owned (1922) by J. C. Sage, who lives in the northwest corner of the quarter section. The underground mark is a bronze station tablet set in a block of concrete 30 inches below the surface. The station and witness marks are described in note 1. A standard bronze reference tablet in a block of concrete is in the fence line on the west side of the road, 20.406 meters (66.95 feet) N. 80° E. (magnetic), from the station. Distances and azimuths to other points are as follows: Quarter section stone, 451.44 meters (1,481.1 feet), 356°20'; northeast corner of schoolhouse

porch, 59.25 meters (194.4 feet), $358^{\circ}56'$; chimney of schoolhouse, 62.51 meters (205.1 feet), $9^{\circ}28'$; northwest corner of schoolhouse, 58.98 meters (193.5 feet), $10^{\circ}22'$; stone, northeast corner of section 14, 361.43 meters (1185.8 feet), $184^{\circ}32'$; wire fence east, 18.44 meters (60.5 feet). Other references are, center of road east, 26.8 meters (88 feet); center of schoolhouse well, 71.48 meters (234.5 feet), S. 17° E. (magnetic); northeast corner of schoolhouse, 58.58 meters (192.2 feet), S. 10° E. (magnetic).

Elevation (Shawnee County, F. D. Granger, 1887; 1922).—About 10 miles southwest of Topeka, near the southwest corner, of $N\frac{1}{2}$ of the $NW\frac{1}{4}$, south of Reserve line in sec. 28, T. 12 S., R. 15 E. "Elevation" is a well-known point with the new Elevation schoolhouse on its south slope and the remains of the Wesleyan Methodist Church about 60 yards to the north. The underground, station, and witness marks are described in notes 1, 2, and 3, the stone post marking the station being encased in a block of concrete and bearing the inscription "F.D.G. 1887" on its south face near the top. The following distances and azimuths are from the station: Stone, northwest corner section 28, 213.70 meters (701.1 feet), $166^{\circ}32'$; northeast corner, stone coalhouse, 12.5 meters (41 feet), $339^{\circ}06'$; tombstone of Phoebe McCool, 33.99 meters (111.5 feet). Additional references are northeast corner of school building, 84.1 meters (276 feet), S. 3° W. (magnetic); center of north and south road, 49.4 meters (162 feet), west.

Mabon (Osage County, F. D. Granger, 1887; 1922).—About 7 miles southwest of Carbondale and 5 miles northeast of Burlingame, near the south center of the $SW\frac{1}{4}SE\frac{1}{4}$ sec. 30, T. 14 S., R. 15 E. on the summit of a small rocky elevation (1922) by J. P. Mast and used as a feed lot. The underground, station, and witness marks are described in notes 1, 2, and 3. The northwest corner of Mr. Mast's house is 78.3 meters (257 feet) N. 76° W. (magnetic) from the station. Distances and azimuths to other points are as follows: Stone, southeast corner, section 30, 586.59 meters (1,924.5 feet), $276^{\circ}43'$; quarter-section stone, 237.20 meters (778.2 feet), $70^{\circ}17'$. The marble post bears the inscription "F.D.G. 1887" on the south face near the top.

Kanwaka (Douglas County, F. D. Granger, 1887; 1930).—About 18 miles east of Topeka, 10 miles northwest of Lawrence, and 5 miles south of Le Compton, in the northeast corner of the $NW\frac{1}{4}SE\frac{1}{4}$ sec. 22, T. 12 S., R. 18 E., in Kanwaka Township, in a pasture south of U.S. Road no. 40, on land owned (1930) by Thomas Anderson. The underground, station, and witness marks are described in notes 1, 2, and 3. The post marking the station is inscribed "F.D.G. 1887" on the south side near the top. A standard bronze reference tablet is in the concrete roadbed of U.S. Road no. 40, 0.7 foot from the south edge of the concrete, 29.02 meters (95.2 feet) due north from the station. Additional distances and directions are as follows: Quarter section corner of sections 22 and 23 is 441.05 meters (1,447.0 feet) north and east; quarter section corner of sections 22 and 27 is 856.58 meters (2,810.3 feet) south and west; George Anderson's house is 381.46 meters (1,251.5 feet) north and west.

Simmons (Douglas County, F. D. Granger, 1887; 1930).—About 14 miles west of Baldwin City, near the center of the $SW\frac{1}{4}SE\frac{1}{4}$ sec. 32, T. 14 S., R. 18 E., near the summit of a prominent rocky hill used as a feed lot on land formerly owned by P. A. Simmons and still known as the Simmons farm. The underground mark is a drill-hole in the head of an iron bolt tightly wedged in a hole drilled in a ledge of limestone about $2\frac{1}{2}$ feet below the surface of the ground. The station and witness marks are described in notes 1 and 2. The following distances and azimuths are from the station: Northwest corner of stone wall, 43.34 meters (142.2 feet), $272^{\circ}52'$; southwest corner of section 32, 663.40 meters (2,176.5 feet), $291^{\circ}36'$; northwest corner of the Simmons house, 87.57 meters (287.3 feet), $354^{\circ}50'$. A farm-yard gate is 22.3 meters (73 feet) about west.

Eckman (Leavenworth County, F. D. Granger, 1885; 1922).—About 8 miles west of north from De Soto, and about 153 meters (502 feet) south and 12 meters (93 feet) west of the northeast corner of sec. 6, T. 12 S., R. 22 E., in the immediate vicinity of the Daisy Hotel owned and occupied (1922) by Charles Oeischlaeger. The underground, station, and witness marks are described in note 1. The following distances and azimuths are from the station: Northeast corner of Daisy Hotel, 24.11 meters (79.1 feet), $355^{\circ}24'$; northwest corner of Daisy Hotel, 23.71 meters (77.8 feet), $17^{\circ}46'$; middle of road, 28.44 meters (93.3 feet) east; E. Martin's house, $292^{\circ}22'$. The station is surrounded by a bed of charcoal.

Bebe Mound (Douglas County, F. D. Granger, 1887; 1922).—About 3 miles east of Edgerton, in Palmyra Township, $\frac{1}{4}$ mile west of the Johnson-Douglas county line, and $2\frac{1}{4}$ miles north of the Franklin-Douglas county line, in a culti-

vated field owned (1922) by Mrs. Dwyer who lives in Edgerton, and farmed by W. A. Smith. The underground, station, and witness marks are described in notes 1 and 2, the station mark being 11 inches below the surface. A 6-inch pipe line passes above and 8 inches northeast of the station mark. Reference mark no. 1, a standard bronze tablet in a block of concrete, is just south of the north fence of the poultry yard, 27.28 meters (89.5 feet), N. 15° E. (magnetic) from the northeast corner of the Dwyer house, and 106.59 meters (349.7 feet), S. 9° E. (magnetic) from the station. Reference mark no. 2, similar to no. 1, is in a small pasture just out from the garden fence, 43.74 meters (143.5 feet) S. 62° W. from the station. A fence is 11.6 meters (38 feet) south of the station and the center of the Dwyer house is 142 meters (466 feet) from the station in azimuth 7°09'.

Thomas (Johnson County, F. D. Granger, 1885; 1922).—About 6 miles south of west of Olathe, in sec. 7, T. 14 S., R. 22 E., on the farm owned (1922) by a Mr. Thomas and his sister. The station is east of the dwelling house and south of the barn, in a small pasture, 109.27 meters (358.5 feet) west of a hedge fence which is $\frac{1}{2}$ mile west of a section line, and 19.5 meters (64 feet) north of the middle of the road. The underground, station, and witness marks are described in note 1. The southeast corner of the Thomas house is 49.7 meters (163 feet) distant in azimuth 92°15'. The station is surrounded by a bed of charcoal.

Marty (Johnson County, F. D. Granger, 1884).—Lost.

Haskin (Johnson County, F. D. Granger, 1885; 1922).—About 7 miles east of Spring Hill, in the SW $\frac{1}{4}$ sec. 18, T. 15 S., R. 25 E., on land known (1922) as the Widow Kearn farm. The underground, station, and witness marks are described in notes 1 and 3. Reference mark no. 1, a standard bronze tablet in a block of concrete with arrow pointing to the station, is at the intersection of the fence on the north side of the right-of-way of the Northern Pacific Railway and the east fence on the north and south road on the west section line, 147.28 meters (483.2 feet), S. 10° W. (magnetic) from the station. Reference mark no. 2, similar to no. 1, is in the east fence line of the roadway on the west section line, 57.24 meters (187.8 feet), S. 62° W. from the station. The southwest corner of the section is 203.1 meters (666 feet), S. 5° W. (magnetic) from the station. The station mark is surrounded by charcoal.

Berry (Cass County, Mo., F. D. Granger, 1884; 1922).—About 1 $\frac{1}{2}$ miles west of Belton, in the SW $\frac{1}{4}$ sec. 10, T. 33 N., R. 46 W., near the east center of a field owned (1922) by the estate of E. J. Walker and farmed by S. G. Halloway who lives on the south side of the Belton Road $\frac{1}{2}$ mile due south of the station. The underground, station, and witness marks are described by notes 1 and 3. A forked cottonwood tree, marked with a triangle 3 feet from the ground on the side toward the station, is 85.36 meters (279.5 feet) from the station on a bearing of 93°23'. The earth around the station is mixed with charcoal.

Bowler (Jackson County, Mo., F. D. Granger, 1884; 1922).—About 2 $\frac{1}{2}$ miles southwest of the town of Lees Summit, in the NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, T. 47 N., R. 31 W., on a small hill about $\frac{1}{2}$ mile west of the dwelling house on the farm owned (1922) by the J. O. Bowler heirs. The underground, station, and witness marks are described in note 1. The following distances and bearings are from the station: To fence on south side of pasture, 49 meters (160 feet) south; to north end of coping on east retaining wall of concrete bridge on north and south stone road, 175 meters (573 feet); to center of north and south stone road, 174 meters (572 feet) west; to center of east and west road, 193 meters (632 feet) north; to center of rock road at intersection of east road out from Bowler's place, 260 meters (854 feet), N. 50° W. (magnetic). In 1922 the south witness stone was not found.

Fulton (Cass County, Mo., F. D. Granger, 1883; 1922).—About 2 $\frac{1}{2}$ miles east of Harrisonville on land owned (1922) by M. C. Fulton, in the NE $\frac{1}{4}$ sec. 2, T. 44 N., R. 31 W., 51.36 meters (168.5 feet) from the northwest corner of the quarter, 21.67 meters (71.1 feet) south of the fence forming the northern boundary of Fulton's farm and separating it from the main road, and 21.79 meters (71.5 feet) east from a small house. The underground, station, and witness marks are described in note 1, the witness marks being 4 inches below the surface. The marble post bears the inscription "F.D.G. 1883" on its north face. The following distances and bearings are from the station: To center of well, 16.31 meters (53.5 feet), S. 55° W. (magnetic); to hedge on $\frac{1}{2}$ section line, 47 meters (153 feet), true west; to $\frac{1}{2}$ section corner in center of road between sections 2 and 35, 53 meters (174 feet), N. 75° W. (magnetic); to center of road on line between sections

For notes in regard to marking of stations see p. 40.

2 and 35, 28 meters (92 feet), north; to southeast corner of G. B. Weaver's house, 53.4 meters (175.2 feet), N. 6° W. (magnetic).

Supplementary points

Blue Hill (U.S.G.S.) (Mitchell County, U.S. Geological Survey).—This station is described in Bulletin 122 of the United States Geological Survey, page 192, as follows: "In Mitchell Co., Kans., on Blue Hill. Permanent mark: Rock with cross and U.S.G.S. cut in the top." The station was recovered in 1891 by F. D. Granger.

Salina west base latitude station (Saline County, F. D. Granger, 1896).—This station is 7.87 meters (25.8 feet) east of *Salina west base* and is marked by a pier of stone and brick laid in cement.

Buffalo Mound, azimuth mark (Wabaunsee County, F. D. Granger, 1888).—On a prominent rocky butte about 3 miles southwest of the old town of Maple Hill. The butte is well known in the vicinity and has a large rock pile on its summit, said to have been placed there by the Indians. The station is a few feet south of the rock pile and is marked by a bottle of ashes buried 8 inches below the surface of the ground.

Stenger (Osage County, F. D. Granger, 1887).—On the summit of a small hill known as Stenger Hill, about 3 miles west of Carbondale, in the NE. $\frac{1}{4}$ of the SW $\frac{1}{4}$ sec. 16, T. 14 S., R. 15 E. The underground mark is a dark glass bottle filled with ashes and buried 1 $\frac{1}{2}$ feet below the surface. The surface mark is a nail in the top of a pine stub 2 by 4 by 16 inches. Surrounding the stub are some flat limestone rocks placed on end and covered with earth.

Topeka First Presbyterian Church, spire (Shawnee County, F. D. Granger).—The spire of the church on the west side of Harrison Street between Eighth Avenue and Ninth Street, Topeka.

Topeka State House, west wing, cupola (Shawnee County, F. D. Granger, 1887).—The center of a small low cupola in the center of the west wing, Topeka State House.

Topeka Methodist Church, spire (Shawnee County, F. D. Granger, 1887).—The spire on the northeast corner of the Methodist Church on the southwest corner of Harrison Street and Sixth Avenue, Topeka.

Topeka Insane Asylum, cupola (Shawnee County, F. D. Granger, 1887).—The station is the higher one of the two cupolas of the Topeka Insane Asylum.

Le Compton (U.S.G.S.) (Douglas County, U.S. Geological Survey, 1889).—In the SW $\frac{1}{4}$ sec. 15, T. 12 S., R. 18 E., 1.2 meters (4 feet) north and 289.6 meters (950 feet) east of the southwest corner of the section.

Carson (Douglas County, F. D. Granger, 1887).—About seven miles southwest of Lawrence, and about 2 miles northwest of the Three Sisters, well-known hills on the Lawrence-Willow Springs Road, in the SE $\frac{1}{4}$ sec. 22, T. 13 S., R. 19 E. The station is on land belonging (1887) to Samuel Carson, and the point has been recently christened Hazel Hill. The underground mark is a glass bottle filled with ashes and buried 2 $\frac{1}{2}$ feet below the surface. The surface mark is a limestone post 2 $\frac{1}{4}$ feet long and 6 inches square, marked on the top by two rectangular grooves and the letters U.S.C.S. The following distances are from the station: To lone oak, 167.7 meters (550 feet) north of east; to corner of stone fence (northwest corner of quarter-section), 62.8 meters (206 feet) north of west; to fence, 11.6 meters (38 feet) north.

Blue Mound (Douglas County, F. D. Granger, 1887).—On a prominent hill about 8 miles southeast of Lawrence in the SW $\frac{1}{4}$ sec. 22, T. 22 S., R. 13 E., on land belonging (1887) to Obadiah Stett. The underground mark is a white glass bottle filled with ashes and buried about 3 feet below the surface. The surface mark is a limestone post 2 $\frac{1}{2}$ feet long and 6 inches square at the top, buried flush with the ground, and marked with the letters U.S.C.S. and two grooves at right angles. The south face has "F.D.G. 1887" cut near the top.

Section line 1 (Johnson County, F. D. Granger, 1885).—At the intersection of two roads, 479 meters (1,572 feet) north 37°55' west of station *Marty*.

Section line 2 (Johnson County, F. D. Granger, 1885).—One half mile due south of section line 1 and 520.4 meters (1,707 feet) south 34°14' east of station *Marty*.

Base 1 (Johnson County, F. D. Granger, 1885).—Between two east and west roads, east of station *Marty*, about 670 feet south of the road to the north, and 2,470 feet west of State line road to the east, on the property of Tryon Brothers (1885). The station is marked by a bottle 2 $\frac{1}{2}$ feet below the surface.

Base 2 (Johnson County, F. D. Granger, 1885).—According to the field records this station is 271.24 meters (889.9 feet) from *Base 1* in azimuth $18^{\circ}43'$. However, recent surveys by Mr. E. H. Owens, an engineer from Kansas City, indicate that this length is 50 feet too short. The corrected length of 939.9 feet was accordingly used in the computations.

State line 2 (Johnson County, F. D. Granger, 1885).—At the northeast corner of the northwest fractional quarter of sec. 26, T. 12 S., R. 25 E., and 2.90 meters (9.5 feet) west of south from the half-mile stone midway between two east and west roads on the State line.

State line 1 (Johnson County, F. D. Granger, 1885).—About $1\frac{1}{2}$ miles south of Santa Fe, Mo., and 15.82 meters (51.9 feet) north of west of the Missouri boundary stone, which is at the southeast corner of the southwest fractional quarter of sec. 35, T. 13 S., R. 25 E., at the intersection of State line and Belton-Olathe Roads.

State line 3, stake (Johnson County, F. D. Granger, 1885).—On the west side of the State line road, about $\frac{1}{2}$ mile north from the road running east from Aubry, and 552.1 meters (1,811 feet) a little west of north from the State boundary stone at the northeast corner of the southwest fractional quarter of sec. 23, T. 14 S., R. 25 E. The station is marked by a nail in the top of a strong, well driven stake.

Kansas City astronomical station (Jackson County, Mo., C. H. Sinclair, 1882).—In the grounds of the Franklin School, corner of Washington and Fourteenth Streets, 6.1 meters (20 feet) east of the building, and 5.105 meters (16.75 feet) south of the north end. The station is marked by a pier made of 2 sandstone posts 8 by 11 inches, 5 feet 11 inches long, set in concrete, with tops 3 feet above the ground, and 17 inches apart. Between these two posts is a similar one with top just above the ground and with a cross marking the station. In 1900 the Survey was informed that a contract had been let for a building which would cover this station.

MEADES RANCH TO COLORADO STATE LINE

Principal points

Allen (Russell County, F. D. Granger, 1892; 1922).—About 1 mile west and 4 miles south of Russell, in the NW $\frac{1}{4}$ sec. 22, T. 14 S., R. 14 W., in a cultivated field owned (1922) by E. Hall who lives $\frac{1}{2}$ mile south. Both the underground and the station marks are standard bronze station tablets in concrete blocks. The former 32 inches, the latter 11 inches below the surface. A standard bronze reference tablet in a concrete block is in the fence line on the south side of the road, on the north line of sec. 22, 114 meters (375 feet) east of the stone at the northwest corner, and 66.20 meters (217.2 feet) true north from the station. Distances and azimuths to other points are as follows: Stone marking northwest corner of sec. 22, 136.18 meters (446.8 feet) $122^{\circ}27'$; north chimney of house, about 150 yards, $99^{\circ}36'$; north chimney of an old house, $158^{\circ}18'$; southeast chimney of same house about 90 feet. Additional references are: West to center of road on west section line, 115.5 meters (379 feet); north to center of road on north section line, about 240 feet.

Blue Hill (Ellis County, F. D. Granger, 1892; 1922).—About 8 miles north and $1\frac{1}{2}$ miles west of Walker, in a large pasture, on a prominent ridge forming part of the Blue Hills, in the S $\frac{1}{2}$ sec. 21, T. 12 S., R. 16 W. The underground and witness marks are described in notes 2 and 3. The station mark is a standard bronze tablet in a concrete block projecting 3 inches above the surface. The two witness posts are 8 feet north and south of the station. The following distances and azimuths are from the station: Ravine, 34.1 meters (112 feet), $63^{\circ}46'$; the head of a ravine 46.9 meters (154 feet), $133^{\circ}34'$; the head of a ravine, 104.2 meters (342 feet), $288^{\circ}34'$; the head of a ravine, 64.9 meters (213 feet), $254^{\circ}25'$; and an old sod house, $340^{\circ}59'$.

Fairmount (Barton County, F. D. Granger, 1892; 1922).—About 3 miles northwest of Galatia, in the NE $\frac{1}{4}$ sec. 8, T. 16 S., R. 15 W., and 1.98 meters (6.5 feet) north of the Fairmount schoolhouse lot, the southwest corner of which is the center of the section. The underground and station marks are standard bronze tablets in concrete blocks, the former 36 inches, the latter 11 inches below the surface. A standard bronze reference tablet in a concrete block is 7 feet north of the northwest corner of the schoolhouse lot on the north and south half-section line, and 32.46 meters (106.5 feet), S. 78° W. (magnetic) from the station. Additional references are as follows: Northeast corner of schoolhouse lot, 29.6 meters (97 feet), N. 81° E. (magnetic); center of wall, 70.4 meters (231 feet), S. 20° E. (magnetic); center of concrete base of flagpole, 67.82 meters (222.5 feet), S. 3° E.

(magnetic); northeast corner of Fairmount schoolhouse, 69.22 meters (227.1 feet), S. 5° W. (magnetic); northeast corner of schoolhouse lot, 32.6 meters (107 feet), S. 75° W. (magnetic).

Hays (Ellis County, F. D. Granger, 1892; 1922).—About 4 miles northeast of Hays, near the north center of sec. 24, T. 13 S., R. 18 W., just south of the road separating sections 24 and 13, on land belonging (1922) to Edward Polifka, who lives on the same quarter section $\frac{1}{2}$ mile southwest of the station. The underground and station marks are standard bronze station tablets in concrete blocks, the former 36 inches below the surface and the latter projecting 4 inches above the surface. Two standard bronze reference tablets in stone posts are in the meridian 8 feet north and south of the station. Distances to other points are as follows: Center of road on line between sections 24 and 13, 10.4 meters (34 feet) north; center of hedge row, 3.7 meters (12 feet) south; west end of hedge, 57.9 meters (190 feet) east; stone post 6 inches square projecting 6 inches and marked "U. S. 1904," 65.90 meters (216.2 feet), N. 77° E. (magnetic).

La Crosse (Rush County, F. D. Granger, 1892; 1922).—About $5\frac{1}{2}$ miles northeast of La Crosse in the NW $\frac{1}{4}$ sec. 12, T. 17 S., R. 18 W., on the highest point of a prominent hill, in a pasture owned (1922) by George Schwab. A stone house stands on the summit of a prominent hill about 1 mile to the northwest. The underground, station, and witness marks are described in notes 1, 2, and 3. The following distances and directions are from the station: Northwest corner of Mr. Schwab's barn, 120.7 meters (396 feet), S. 30° E. (magnetic); center of drilled well, 172.15 meters (564.8 feet), S. 23° E. (magnetic); north and south fence on west side of pasture, 163.1 meters (535 feet) west; center of road on west line of section 8, 291.4 meters (956 feet) west.

Smoky Hill (Ellis County, F. D. Granger, 1893; 1924).—About 14 miles north of McCracken, in the south central part of sec. 21, T. 15 S., R. 20 W., on the highest part of a prominent hill overlooking the Smoky Hill River. The station is in the southern part of a large cattle ranch (10,000 acres) operated (1922) by Frank Meserve, and is 1,000 feet north of the southern fence of the range, 350 feet south of where the hill slopes suddenly down into the Smoky Hill valley, and 180 feet southwest of a point of about the same elevation as the station which is nearer this sudden slope. There are two hills to the west of the station, a prominent one of about the same elevation as that on which the station is located, 600 feet distant, and a smaller one 375 feet away. There is also a small hill 430 feet east and one 550 feet south. There is a deep ravine to the east—a lesser one to the west, and a steep bluff to the north. James K. Hardwick's house is $\frac{3}{8}$ mile south of the station. The underground mark is a standard bronze station tablet cemented in the mouth of a jug encased in concrete 34 inches below the surface. The station mark is a standard bronze tablet in a concrete block projecting 3 inches above the surface. Two stone witness posts are in the meridian, distant 4.3 meters (14 feet) north and 3.911 meters (12.83 feet) south, respectively. A stone, used in 1924 to mark the position of the astronomical transit, is 14.160 meters (46.46 feet) from the station in azimuth 346° 07'. The windmill at the stock range bears 159° 20'.

Trego (Trego County, F. D. Granger, 1893; 1922).—About 7 miles southwest of Ellis, in the NE $\frac{1}{4}$ sec. 27, T. 13 S., R. 21 W., 103.3 meters (339 feet) south of the north line and 479.1 meters (1,572 feet) west of the east line of the section, on the highest point of a ridge in the pasture owned (1922) by J. G. Loflin, and about $\frac{1}{4}$ mile north of his house. The underground mark is described in note 8. The station mark is a standard bronze tablet in a concrete block flush with the surface. Two stone witness posts are in the meridian 2 or 3 meters north and south of the station and a circular trench surrounds the station. The following distances and azimuths are from the station: Round Top Mount, 155°; northern "Nipple," about 625 yards, 227°; southern "Nipple," about 550 yards, 239° 36'; northeast corner of section 27, about 500 yards, 256° 21'; stone pile on top of prominent mound, about $1\frac{1}{4}$ miles, 64° 40'. The center of a drilled well near Loflin's house is 410.0 meters (1,345 feet), S. 9° W. (magnetic) from the station.

Skaggs (Ness County, F. D. Granger, 1893; 1922).—About $1\frac{1}{2}$ miles northwest of Brownell, in the southeastern part of sec. 16, T. 16 S., R. 22 W., on land owned (1922) by R. L. Skaggs, and about 200 yards from his house. The underground mark is a standard bronze station tablet, cemented in the mouth of a jug which is encased in concrete, 36 inches below the surface. The station mark is a standard bronze tablet in concrete 10 inches below the surface. A standard bronze reference tablet in a block of concrete is 2 feet west of the fence line on the west side of the roadway, on the east line of sec. 16, 3 feet south of the south fence

of Mr. Skaggs' garden, and 183.37 meters (601.6 feet), N. 60° E. (magnetic) from the station. The following distances and azimuths are from the station: Northwest corner of Skaggs' barn, 227°20'; chimney of Skaggs' house, about 200 yards, 244°36'; southeast corner of section 16, 335°02'; belfry of schoolhouse at Brownell, 343°51'; corner of post of fence, 25.33 meters (83.1 feet) southeast; corner post of fence, 32.49 meters (106.6 feet) southwest; corner post of fence, 32.0 meters (105 feet) northwest; center of drilled well, 101.5 meters (333 feet), N. 36° E. (magnetic); center of road and east line of section 16, 192.6 meters (632 feet) east. A farm road running east and west 55 feet north of the station leads into the well-traveled road to Brownell, which passes in front of Mr. Skaggs' house.

Big Creek (Trego County, F. D. Granger, 1893; 1922).—About 7 miles south of Wakeeney, in the extreme southwest corner of the NE¼NE¼NW¼NW¼ sec. 17, T. 13 S., R. 23 W., on land owned (1922) by Jacob Schneider, who lives about ½ mile south. The underground mark is described in note 8, except that above the stone jar is a concrete block containing a standard bronze station tablet 32 inches below the surface. The station mark is a standard bronze tablet set in a concrete block 12 inches below the surface. A standard bronze reference tablet in a block of concrete is in the fence line on the south side of the roadway on the north line of sec. 17, 83.76 meters (274.8 feet), N. 15° W. (magnetic) from the station. Distances and azimuths to other points are as follows: Northwest corner stone section 17, 319.4 meters (1,048 feet), 105°32'; McCormick's windmill, 203°13'; center of road on north line of section 17, 91.1 meters (299 feet) north.

Schmidt (Ness County, F. D. Granger, 1893; 1922).—About 9 miles northwest of Ransom and 9 miles northeast of Utica, in the northeast corner of the NE¼NE¼NE¼NW¼ sec. 2, T. 16 S., R. 25 W., on land owned (1922) by George B. McNinch who lives ½ mile west on the north side of the road. The underground mark is described in note 8. The station mark is a standard bronze tablet in a concrete block 11 inches below the surface. Reference mark No. 1, a standard bronze reference tablet in a concrete block, is in the south fence line on the south side of the roadway, 11.22 meters (36.8 feet), N. 14° W. (magnetic) from the station. Reference mark no. 2, similar to no. 1, is at the intersection of the fence on the south side of the roadway and the north and south fence on the half section line, 31.15 meters (102.2 feet) N. 55° E. (magnetic) from the station. The quarter section corner is 38.16 meters (125.2 feet) from the station in azimuth 240°53'. Additional references are as follows: Center of road on north line of sec. 2, 18.9 meters (62 feet) north; half-section line, 30.8 meters (101 feet) east. Reference marks nos. 1 and 2 were probably destroyed by road construction in 1932.

Indian Creek (Gove County, F. W. Perkins, 1891; 1922).—About 7 miles south of Gove City, in open prairie, in the northeast corner of the SE¼SE¼NW¼SE¼NW¼ sec. 6, T. 14 S., R. 28 W., on high land between Indian Creek and Smoky Hill River, about 1 mile south of Indian Creek, and 2 miles northwest of the house of J. W. Huntington. The underground mark is described in note 8. Above the stone jar is a concrete block containing a standard bronze station tablet, 30 inches below the surface. The station mark is a standard bronze tablet, set in a concrete block, 12 inches below the surface. Broken tile and crockery are mixed with the dirt over the station mark. A standard bronze reference tablet in a block of concrete is alongside and just to the west of the stone marking the center of section 6, 271.21 meters (889.8 feet), S. 74° E. (magnetic) from the station.

Canyon (Lane County, F. W. Perkins, 1891; 1922).—About 2½ miles north and ½ miles east of Shields, in open prairie, in the SE¼NE¼SW¼SE¼ sec. 17, T. 16 S., R. 28 W. The underground mark is described in note 8. Above the jar is a block of concrete containing a standard bronze station tablet 29 inches below the surface. The station mark is a standard bronze tablet set in a concrete block 12 inches below the surface. A standard bronze reference tablet in a concrete block is on the east side of the roadway on the half-section line of sec. 17, 311.35 meters (1,021.5 feet) N. 88° W. (magnetic) from the station. Additional references are as follows: Center of road on west line of sec. 17, 309.4 meters (1,015 feet); south line of sec. 17, 195.7 meters (642 feet).

Beaver (Logan County, F. W. Perkins, 1891; 1922).—About 18 miles north of Scott City, ¼ mile north of Hell Canyon, about 5 miles by road south of the Smoky Hill River, and about 1,775 feet east of the Scott City-Oakley Highway, in the SW¼NE¼ sec. 27, T. 15 S., R. 32 W., near the northern edge of the plateau which extends south from the Smoky Hill River. The underground mark is described in note 8. The station mark is a standard bronze tablet in concrete 11 inches below the surface. Broken tile and crockery are mixed with the dirt above the

station mark. A standard bronze reference tablet in a concrete block is 1 foot east of the stone marking the center of sec. 27, 277.80 meters (911.4 feet), S. 1° W. (magnetic) from the station. The north and south half-section line is 75.3 meters (247 feet) west of the station. The following distance and azimuths are from the station: Northeast corner of section 27, 945 paces, 231°28'.6; southwest corner of section 27, 39°58'; southeast corner of section 27, 325°41'; prominent mound at edge of bluff in section 22, 147°30'.

Monument (Logan County, F. W. Perkins, 1891; 1922).—About 15 miles south of Oakley, in the southeast corner of the NE¼SE¼SE¼NW¼NW¼ sec. 28, T. 13 S., R. 32 W., on the first high ground north from the Smoky Hill River, about 5½ miles from the river, and 1½ miles southwest of the house of Warren A. Wharton. The underground mark is described in note 8. Above the jar is a block of concrete containing a standard bronze station tablet 25 inches below the surface. The station mark is a standard bronze tablet in concrete 9 inches below the surface. A standard bronze reference tablet in a concrete block is 21 feet east and 22 feet north of the stone marking the northwest corner of section 28, and 421.5 meters (1,383 feet), N. 65° W. (magnetic) from the station. The north line of section 28 is 300.2 meters (985 feet) north.

Sheridan (Logan County, F. W. Perkins, 1891; 1922).—On the northern edge of the tableland, 4 miles south of the Smoky Hill River, 11 miles southwest of Russell Springs, 11 miles south of McAllaster and 13 miles east-southeast of Wallace, in the SE¼NW¼NE¼NE¼ sec. 7, T. 14 S., R. 36 W. The underground mark is a hole in the bottom of a stone jar, 36 inches below the surface. Above the jar is a concrete block containing a standard station tablet 30 inches below the surface. The station mark is a standard bronze tablet in a concrete block 9 inches below the surface. Broken crockery and tile are mixed with the dirt above the station mark. Reference mark no. 1, a standard bronze tablet in a concrete block, is 32 feet north of the center of the roadway on the north side of sec. 7, on the east and west fence line, 163.71 meters (537.1 feet), S. 13° W. (magnetic) from the station. Reference mark no. 2, a standard bronze tablet in the stone post marking the northeast corner of sec. 7, is 278.95 meters (915.2 feet), N. 42° E. (magnetic) from the station. The east line of sec. 7 is 234.4 meters (769 feet) east. The following azimuths are from the station: South gable of Freeman's stone house, 265° 26'; ridge of Wurst's stone granary, 266° 18'; north gable of Jessie Wagner's stone house, 320° 36'.

Gopher (Logan County, F. W. Perkins, 1891; 1922).—About 5 miles north of Russell Springs and 5½ miles southeast of Winona, in the NW¼NW¼SE¼SE¼SW¼ sec. 24, T. 12 S., R. 35 W., on the highest ground in the pasture owned (1891) by Vincent W. Battreall, and ½ mile southwest of his house. The underground mark is described in note 8. Above the jar is a concrete block containing a standard bronze station tablet 25 inches below the surface. The station mark is a standard bronze tablet in concrete 10 inches below the surface. Broken crockery is mixed with the dirt over the station mark. A standard bronze reference tablet in a block of concrete is at the south side center of section 24, on the ½ section line, on the north side of the roadway, 230.28 meters (755.5 feet), S. 70° E. (magnetic) from the station. Additional references are as follows: North and south half-section line of sec. 24, 188.1 meters (617 feet), east; south line of sec. 24, 132.6 meters (435 feet), south.

Teeters Hill (Logan County, F. W. Perkins, 1891; 1922).—About 16 miles northeast of Wallace, 7½ miles northwest of McAllaster, in the southwest corner of the NW¼NE¼SW¼NW¼ sec. 30, T. 11 S., R. 37 W., on the highest of the bluffs on the south side of the north fork of the Smoky Hill River, about 2 miles south of J. F. Teeter's ranch, and ¾ mile west of the road from McAllaster to Teeter's ranch. The underground mark is a 1-gallon jar, placed bottom up, 4 feet below the surface. Above the jar is a 5-inch drain tile 25 inches long filled with concrete and encased in a mass of concrete 15 inches in diameter. The mark is 23 inches below the surface. The station mark is a standard bronze tablet set in concrete 10 inches below the surface. Pieces of broken tile are mixed with the dirt over the mark. A standard bronze reference tablet in a concrete block is in the fence line on the west line of sec. 30, is 187.03 meters (613.6 feet), S. 84° W. (magnetic) from the station. The east and west half-section line of sec. 30, is 285.6 meters (937 feet), south.

Wallace Bluffs (Wallace County, F. W. Perkins, 1891; 1922).—About 4 miles south of Wallace, in the NW¼SE¼ sec. 7, T. 14 S., R. 38 W., on the south bluffs on the south forks of the Smoky Hill River, about 500 meters from the road from Wallace, on the highest land in the section. The underground mark is

a $\frac{1}{4}$ -inch hole in the bottom of a 1-gallon stone jar placed bottom up 4 feet below the surface. Above this is a 4-inch tile, 2 feet long, filled with concrete and encased in a mass of concrete 18 inches in diameter. A standard bronze station tablet is in the top of the tile 2 feet below the surface. The station mark is a standard bronze tablet in a concrete block 10 inches below the surface. Broken crockery and pieces of tile are in the dirt over the mark. A standard bronze reference tablet in a block of concrete is on the east break of the ridge 124.30 meters (407.8 feet), N. 74° E. (magnetic) from the station.

Turtle (Wallace County, F. W. Perkins, 1891; 1922).—About 9 miles north of Sharon Springs, $5\frac{1}{2}$ miles north of Smoky Hill River, and 1 mile west of the Sharon Springs-Goodland highway, in the northwest corner of the NE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, T. 12 S., R. 40 W., on the divide between the headwaters of Pond Creek on the south and Turtle Creek on the north, on the west line of the roadway on the east line of section 9, and 334.7 meters (1,098 feet) south of the half-section corner on the east side center of section 9. The underground mark is described in note 8. Above the jar is a block of concrete containing a standard bronze station tablet 24 inches below the surface. The station mark is a standard bronze tablet in concrete 10 inches below the surface. Broken tile is mixed with the dirt over the mark. A standard bronze reference tablet in concrete is in the fence line on the east boundary of the roadway on the section line between sections 9 and 10, 13.56 meters (44.5 feet) due east (true) from the station.

Curlew (Wallace County, F. W. Perkins, 1891; 1922).—About 4 miles south and $1\frac{1}{2}$ miles west of Sharon Springs, in the northeast corner of the SW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, T. 14 S., R. 40 W., near the northern edge of the plateau which, commencing about 6 or 7 miles south of the Smoky Hill River, extends south to Arkansas. The station is on land owned (1922) by John Haarberg, southwest of his house, in the north part of his garden. The underground mark is described in note 8. Above the jar is a block of concrete containing a standard bronze station tablet 24 inches below the surface. The station mark, a standard bronze tablet in a concrete block, is 10 inches below the surface. A standard bronze reference tablet in a concrete block is on the east side of the east garden fence, 12.59 meters (41.3 feet) S. 86° E. (magnetic) from the station. The center of a drilled well iron casing is 12.8 meters (42 feet) N. 52° E. (magnetic) from the station. The southwest corner of Mr. Haarberg's house is 32.83 meters (107.7 feet) N. 38° E. (magnetic) from the station.

McLane (Wallace County, F. W. Perkins, 1891; 1922).—About 14 miles northwest of Sharon Springs and 11 miles north of Weskan, on the Goose Creek bluffs, about 1 mile south of the creek, and $2\frac{1}{2}$ miles southeast of McLane's ranch. The road from McLane's ranch to Sharon Springs passes about 200 meters south of the station and the Lister post office is about $\frac{3}{4}$ mile northwest. The station is on the section line between sections 3 and 10, T. 12 S., R. 42 W., 254.05 meters (833.5 feet) west of the section corner at the northeast corner of section 10 and southeast corner of section 3. C. H. Rich owns the land in section 10 (1922). The underground marks are as follows: Lowest mark is a hole in the bottom of a earthenware jar, placed bottom up 4 feet below the surface. Above the jar is a drain tile filled with concrete and encased in concrete, with a standard bronze station tablet in the top, 23 inches below the surface. The station mark is a standard bronze tablet in concrete and projects 2 inches above the surface.

Arapahoe (Cheyenne County, Colo., F. W. Perkins, 1891; 1922).—About 7 miles southeast of Arapahoe, 11 miles southwest of Weskan, 3 miles west of the Kansas-Colorado boundary line, in the NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10, T. 15 S., R. 42 W., on the highest and most prominent hill in the vicinity. The station and underground marks are similar to those at *Curlew* (see above). Pieces of broken crockery and tile are mixed with the dirt over the station mark. A standard bronze reference tablet in concrete is on the south fence line of the roadway along the north line of section 10, 30 feet south of the section line, and 238.81 meters (783.5 feet), N. 13° W. (magnetic) from the station. Additional references are as follows: Drain pipe with cap at the northeast corner of section 10 (U.S. Land Office Mark), 516.0 meters (1,693 feet), N. 45° E. (magnetic); east line of section 10, 449.0 meters (1,473 feet), east.

Monotony (Cheyenne County, Colo., F. W. Perkins, 1891; 1922).—Near the north boundary of the county, 12 miles north and 4 miles west of Arapahoe Railroad station, on the highest point of the divide between the north fork of the Smoky Hill River to the north and Sand Creek to the south, and about

3 miles from each in the NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 8, T. 12 S., R. 43 W. The nearest house (1891) is on the Cheyenne Wells-Burlington road about $4\frac{1}{2}$ miles northwest of the station and belongs to A. Eichels. The station and underground marks are similar to those at station *Curlew* (see p. 53). Pieces of broken crockery and tile are mixed with the dirt over the mark. A standard bronze reference tablet in concrete, projecting 4 inches above the surface, is in the fence line on the north line of the roadway along the north line of the section, 2.59 meters (8.5 feet) east of the half-section corner, 30 feet north of the center of the roadway, and 290.38 meters (952.7 feet) N. 14° W. (magnetic) from the station. Additional references are as follows: North and south half-section line, section 8, 153.0 meters (502 feet), west; half-section corner between sections 8 and 5, marked with iron pipe and cap, 319.4 meters (1,048 feet), N. 43° W. (magnetic); north line section 8, 281.0 meters (922 feet), north.

Supplementary points

Castle Rock (Gove County, F. D. Granger, 1890).—About 11 miles south and 2 miles west of Collyer, near sec. 1, T. 14 S., R. 26 W. To the northwest, a few hundred yards from the rock, stands the famous Castle Tower which rises abruptly from the flat prairie to the height of 73 feet. The main Collyer road passes about 200 yards west of the rock.

Bluff (Gove County, F. D. Granger, 1890).—About 2 miles west of Castle Rock, in the SW $\frac{1}{4}$ sec. 3, T. 14 S., R. 26 W. About $\frac{1}{2}$ mile south of the station is a sod house occupied (1890) by a Mr. McCarty.

Hill (Lane County, F. D. Granger, 1890).—About 5 miles northwest of Shields, in sec. 13, T. 16 S., R. 29 W. A flagpole was observed upon.

Pond (Wallace County, F. W. Perkins, 1891; 1908).—About $5\frac{1}{2}$ miles north and $\frac{1}{2}$ mile east from Sharon Springs, on the first high ground after crossing the Smoky Hill River, and about 3 miles north of the river, in the southeast corner of the SW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26, T. 12 S., R. 40 W. A road running north from Sharon Springs passes 1 mile west of the station, and a road running northward along the section line $\frac{1}{2}$ mile east of Sharon Springs passes within $\frac{1}{2}$ mile of the station. The house of John Wesley Bouslog, who lives in the NW $\frac{1}{4}$ sec. 34, bears about west southwest from the station. The underground mark is a 1-gallon earthenware jar buried with bottom up, 4 feet 2 inches below the surface. A $\frac{1}{4}$ -inch hole in the center of the bottom marks the station. Above the jar is a drain-tile pipe $5\frac{1}{2}$ inches in diameter and 25 inches long with the top of the tile 22 inches below the surface. Above the tile is a white-oak post painted red, $3\frac{1}{2}$ inches square and 2 feet long, with the top projecting 3 inches above the ground, and marked by a galvanized tack. Pieces of tiles and earthenware jars were mixed with the earth in filling the hole. About 6 inches below the surface is a paving of broken tiles and earthenware jars about 2 feet square. A small quantity of broken jar was left on the surface and a sod wall was built around the station. A pine stake was put in place of the old oak stake in 1908. Four reference stakes of white oak painted red, $3\frac{1}{2}$ inches square by 2 feet long, with a tack in center of each, are approximately 5 feet from the station, north, east, south, and west.

Gilbert (Wallace County, W. H. Burger, 1908).—About 7 miles S. 60° W. from Wallace, and 3 miles south of the Union Pacific Railway, in the SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 1, T. 14 S., R. 40 W. The station is about 4 feet from the east line of the quarter section and about 5 feet from the north line, on pasture land belonging to H. E. Gilbert who lives about 2 miles east of Sharon Springs and about 2 miles north of the station. It is marked by a pint bottle encased in a cylinder of concrete 12 inches in diameter and 18 inches long with the top inscribed "U.S.C. & G.S. 1908." The underground mark is similar except that the cylinder is only 12 inches long and has no inscription. Broken glass was placed around the station mark and around the tripod legs.

Wallace latitude station (Wallace County, E. Smith, 1885; 1922).—In the northeastern corner of the small park belonging to the Union Pacific Railway Co. at Wallace. It is marked by two limestone piers, each 5 feet in length, set firmly in concrete to the depth of 3 feet below the general surface of the ground. In 1908 a point midway between the piers was marked by a cross in the stone flagging.

Kansas-Colorado boundary mark 73 $\frac{1}{2}$ (Wallace County, F. W. Perkins, 1891).—At the point formerly occupied by the stone monument marking the State line, which has been removed. The position was recovered approxi-

mately and is now marked by the center of the mouth of a gallon jug buried with mouth up 2 feet 8 inches below the surface. The jug was covered with 1 foot of earth and two thicknesses of 1-inch boards 2 feet square. A tack in boards marks the station. The surface mark is a cross chiseled on hard conglomerate sandstone, 20 by 15 inches by 6 inches deep. The stone projects an inch above the surface and is marked "B.M. 73½." It is covered with a mound of limestone, forming a prominent object.

MEADES RANCH TO NEBRASKA STATE LINE

Principal points

Dial (Osborne County, F. D. Granger, 1897).—On a prominent hill known locally as Sand Mound, near the west center of the SW¼ sec. 22, T. 9 S., R. 13 W. A north and south section line road crosses Sand Mound at a short distance west of the station. The surface mark is a limestone post 6 inches square and 2 feet long, placed with its top flush with the surface, marked by a drill hole and the letters U.S.C.S. The underground mark is a cross in the top of a copper bolt 6 inches long and 0.6 inch in diameter wedged with wire nails in a drill hole in a flat ledge of rock which is in its original position. The bolt is 2.03 feet below the top of the surface mark.

Kill Creek (Osborne County, F. D. Granger, 1897).—About 880 feet north and 300 feet east of the southwest corner sec. 9, T. 9 S., R. 14 W., on a prominent swell of ground. The land belongs (1897) to a land company. The nearest house is distant about 0.2 mile and is owned and occupied (1897) by J. E. Harris. The station is on line between the center of an old well and the southwest corner of an old sod house, 6.04 meters (19.8 feet) from the former and 4.983 meters (16.35 feet) from the latter. The house is approximately northwest of the well. The stone marking the southwest corner of section 9 is in azimuth 17°42'27" and the stone marking the northwest corner of section 9 is in azimuth 174°37'47". The surface mark is a copper bolt with cross lines set in a limestone post 6 inches square and 2 feet long, marked with the letters U.S.C.S. on the top surface. The underground mark is described in note 4.

Old Well 2 (Smith County, F. D. Granger, 1897).—About 100 feet almost directly east of *Old Well* (U.S.G.S.) (see p. 56). The surface mark is a rough stone post 9.5 inches square and 2.2 feet long, with two V-shaped grooves at right angles and the letters U.S.C.S. cut in the top. The underground mark is described in note 4. The following distances and azimuths are from the station: *Old Well* (U.S.G.S.) 30.875 meters (129.57 feet), 92°52'32"; stone marking southwest corner of section 16, 466.0 meters (1,529 feet), 282°14'32"; center of Okke Bohlen's house 21.94 meters (72.0 feet), 317°16'.

Lawrence 2 (Osborne County, F. D. Granger, 1897).—This station is 3.377 meters (11.08 feet) in azimuth 93°27' from station *Lawrence*, U.S.G.S. (see p. 56). The surface mark is a limestone post 1.6 feet long and 6 inches square with two rectangular grooves and the letters U.S.C.S. cut in the top. The underground mark is described in note 5.

Brown (Smith County, F. D. Granger, 1898; 1906).—About 4 miles east of Smith Center, on high ground near the northwest corner of SE¼ sec. 20, T. 3 S., R. 12 W., on land owned (1906) by C. F. Shade who lives ¼ mile southwest in the southwest corner of the section, 80.5 meters (264 feet) south of the hedge row on the south side of the east and west half-section line road. The underground and station marks are described in notes 5 and 6, except that the marble post does not contain the standard bronze station tablet. The northwest corner of the NE¼SW¼ sec. 20 is about 100 paces to the west.

Lebanon (Smith County, F. D. Granger, 1897; 1906).—About 1¼ miles north and 1½ miles east of Lebanon, near the northwest corner of the NE¼NE¼ sec. 2, T. 2 S., R. 11 W. The station is in the line of an east and west wire fence on the south side of the section line road, about 200 feet east of the head of a small ravine which runs to the south, and about 1,300 feet west of the northeast corner of the section, on land belonging (1906) to J. W. Crystal. The highest ground in the vicinity lies about ½ mile to the north. The surface mark is a Georgia marble post 6 inches square and 2 feet long, with two V-shaped grooves at right angles and the letters U.S.C.S. cut on its top. The underground mark is described in note 4. To the north in the exact projection of the line from *Old Well 2*, at a distance of 2.832 meters (9.29 feet) is a pine stub with a nail in it and underneath the stub at a depth of 30 inches an upright stone jug. The fol-

For notes in regard to marking of stations see p. 40.

lowing azimuths are from the station: Anderson's house, $211^{\circ}35'$; United Brethren church, $268^{\circ}59'42''$; Crystal's house, $314^{\circ}02'$.

Lipps (Smith County, F. D. Granger, 1898).—In the SW $\frac{1}{4}$ sec. 1, T. 1 S., R. 14 W., on land owned (1898) by Joseph Lipps, whose house stands near the center of the west side of the southwest quarter of the section. The station is 600 feet east of the north and south road passing Mr. Lipp's house. The underground and surface marks are described in notes 5 and 6, except that the marble post does not contain the standard bronze station tablet.

Cooper (Smith County, F. D. Granger, 1898).—About 7.5 miles west and 7 miles south of Red Cloud, near the center of the NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 8, T. 1 S., R. 14 W., in a cultivated field owned (1898) by E. M. Cooper, about 700 feet south and 325 feet west of the center of section 8. The underground and surface marks are described in notes 4 and 6, except that the marble post does not contain the standard bronze station tablet.

Herrick (Franklin County, Nebr., F. D. Granger, 1898).—About $3\frac{1}{2}$ miles south and $1\frac{1}{4}$ miles west of the town of Campbell, in the SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, T. 3 N., R. 13 W., on land owned (1898) by Lyman Herrick. The following distances and azimuths are from the station: Stone marking the southeast corner of section 2, $271^{\circ}13'.4$; Lyman Herrick's windmill, 45.66 meters (149.8 feet), $274^{\circ}38'.4$; stone marking the south center of section 2, $84^{\circ}27'.4$; belfry of the schoolhouse at Campbell, $196^{\circ}21'25''$; southwest corner of Mr. Herrick's house, 36.15 meters (118.6 feet), $274^{\circ}6$; wire fence south of the station, 27.22 meters (89.3 feet). The underground and surface marks are described in notes 5 and 6, except that the post is of hard limestone and does not contain the standard bronze station tablet.

Blue Hill (Webster County, Nebr., F. D. Granger, 1898).—About $2\frac{1}{2}$ miles south and 3 miles west of Blue Hill, near the south center of sec. 24, T. 4 N., R. 11 W., on land owned (1898) by Peter Paugh. The following distances and azimuths are from the station: Standpipe at Blue Hill, $228^{\circ}33'21''$; W. W. Hogate's windmill, $339^{\circ}24'$; Hogate's house, $348^{\circ}19'$; stone marking the south center of sec. 24, 76.531 meters (251.09 feet), $350^{\circ}10'$; stone marking the northwest corner of sec. 24, $152^{\circ}09'$; wire fence, 13.32 meters (43.7 feet), 90° . The underground and surface marks are described in notes 5 and 6, except that the marble post does not contain the standard bronze station tablet.

Supplementary points

Lawrence (U.S.G.S.) (Osborne County, U.S. Geological Survey).—This station is described in Bulletin No. 122, Results of Primary Triangulation, U.S. Geological Survey, as follows: "In Osborne Co., Kans., on a swell of ground near the center of the west side of sec. 23, T. 6, R. 14, and about on the highest point. Permanent mark: Cross and U.S.G.S. cut on top of large flat stone. Jug with cross cut on it, is underneath the flat stone." The station was recovered in 1897 by F. D. Granger. The flat stone had been broken up, but the jug remained undisturbed.

Old Well (U.S.G.S.) (Smith County, U.S. Geological Survey).—This station is described in Bulletin No. 122, Results of Primary Triangulation, U.S. Geological Survey, as follows: "In Smith Co., Kans., in the SW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of sec. 16, T. 5, R. 11 and is 42 feet north and 138.75 feet west of the northwest corner of a stone foundation for a building. Permanent mark: Cross and U.S.G.S. cut in large rock and a bottle top set underneath the rock." The station was recovered in 1897 by F. D. Granger.

Tipton (U.S.G.S.) (Osborne County, U.S. Geological Survey).—This station is described in Bulletin 122 of the United States Geological Survey, page 192, as follows: "In Osborne Co., Kans., on the east side of sec. 15, T. 8, R. 11, on high hill 2 miles west of the town. Permanent mark: Large limestone rock with cross cut and U.S.G.S. on top. Bottom of bottle placed 2 inches below the rock." The station was recovered in 1897 by F. D. Granger.

Covert (Osborne County, F. D. Granger, 1897).—Near the south end of a prominent range of hills about 5 miles south and 0.7 mile west of Osborne in the NW $\frac{1}{4}$ sec. 18, T. 8 N., R. 12 W. The surface mark is a rough stone post marked with a cross and the letters U.S.C.S. The underground mark is a jug top.

Hardilee (U.S.G.S.) (Smith County, U.S. Geological Survey).—This station is described on page 193 of Bulletin 122 as follows: "In Smith Co., Kans., on the highest point of ground in sec. 20, T. 2, R. 14, near the center of the SE $\frac{1}{4}$. Permanent mark: White sandstone rock, marked with a cross and U.S.G.S." The station was recovered in 1897 by F. D. Granger.

Kansas-Nebraska State line A (Franklin County, Nebr., F. D. Granger, 1898).—A stone at the southwest corner of sec. 36, T. 1 N., R. 14 W.

Kansas-Nebraska State line B (F. D. Granger, 1898).—A flag near the Kansas and Nebraska State line.

Kansas-Nebraska State line 1 (Franklin County, Nebr., F. D. Granger, 1898).—A stone at the southeast corner of sec. 36, T. 1 N., R. 14 W.

Kansas-Nebraska State line 2 (Smith County, F. D. Granger, 1898).—A stone at the northeast corner of sec. 1, T. 1 S., R. 14 W.

Kansas-Nebraska State line C (Webster County, Nebr., F. D. Granger, 1898).—An earth mound at the southeast corner of sec. 32, T. 1 N., R. 11 W. The underground mark is a stone jug buried 2 feet beneath the surface.

THIRTY-NINTH PARALLEL ARC TO OKLAHOMA STATE LINE

Principal points

Bossing (Ellsworth County, W. Eimbeck, 1899; 1922).—About 5 miles west and 8 miles south of Ellsworth, in the SW $\frac{1}{4}$ sec. 33, T. 16 S., R. 9 W., on the little knob situated about 30 yards due north of the house owned (1899) by Louis Bossing, on land owned (1922) by Oscar Wilkens who lives $\frac{3}{4}$ mile southwest of the station. The nearest railroad station is Lorraine. The underground mark is a copper bolt in two bricks, cemented together and surrounded by grouting, buried 31 inches below the surface of the ground with the longitudinal edges due north and south. Three inches of dirt were placed over this and then a pine board 1 by 12 by 14 inches. The surface mark is a standard bronze station tablet set in a marble post 6 by 6 by 27 inches set flush with the ground, with the letters U.S.C. & G.S. cut on the top. Two witness stones 4 by 4 by 27 inches are about 25 feet north and south of the station, an arrowhead in each pointing toward the station. The following distances and bearings are from the station: Northwest corner of stone barn, 41.30 meters (135.5 feet), S. 58° E., (magnetic); northwest corner of stone house, 53.9 meters (177 feet), S. 10° E. (magnetic); center of well, 60.4 meters (198 feet), S. 8° W. (magnetic).

Loder (Saline County, W. Eimbeck, 1899; 1922).—About 7 miles north and 2 miles west of Marquette, nearly in the center of the SE $\frac{1}{4}$ sec. 21, T. 16 S., R. 5 W., on the middle summit or ridge of high and open pasture land belonging (1922) to Ed. Richard of Marquette. The underground mark is a bolt in two bricks cemented together buried 30 inches below the surface of the ground and surrounded with plaster of paris. The surface mark is a standard bronze station tablet in a marble post 6 by 6 by 27 inches set flush with the surface. The top of the post is marked with two rectangular grooves and the letters U.S.C. & G.S. Two witness stones, 4 by 4 by 26 inches, are about 25 feet north and south of the station. Additional references are: East line of section 21, 89.6 meters (294 feet) east; stone at southwest corner of section 21, 150.0 meters (492 feet), S. 47° E. (magnetic); south line of section 21, 109.7 meters (360 feet) south.

Sherman (Ellsworth County, W. Eimbeck, 1899; 1922).—About 2 $\frac{1}{2}$ miles southeast of the Sherman Middle Ranch buildings, about $\frac{1}{4}$ mile north of the corner of secs. 16, 17, 20 and 21, T. 17 S., R. 6 W., and about 95 yards west of the line fence between sections 16 and 17, near a gate and road crossing. The nearest railroad station is at Langley, about 3 $\frac{1}{2}$ miles southeast. The underground mark is a standard bronze station tablet in concrete 32 inches below the surface. The surface mark is a standard bronze station tablet in a concrete block flush with the surface of the ground. Two witness posts 5 by 5 inches at the top are 25 feet north and south of the station.

Little River (Rice County, A. T. Mosman, 1900).—About 2 miles north and 9 miles east from Lyons and 4 $\frac{1}{2}$ miles from Little River, in the SW $\frac{1}{4}$ sec. 13, T. 19 S., R. 7 W., on land belonging (1900) to Peter Lundstrum. The underground and station marks are described in note 7. The corner of sections 13, 14, 23, and 24 is 388.72 meters (1273.3 feet) from the station in azimuth 30°00'.1.

Central (Rice County, A. T. Mosman, 1900; 1922).—About 6 miles north and 2 miles east of Lyons, in a cultivated field in the SW $\frac{1}{4}$ sec. 26, T. 18 S., R. 8 W. The lower underground mark is a quart bottle 35 inches below the surface. Above the bottle is a standard bronze station tablet in a concrete block 31 inches below the surface. The surface mark is a standard bronze station tablet in a concrete block 12 inches below the surface. The following distances and directions are from the station: Hedge on west side of roadway on east line of sec. 26, 360.3 meters (1,182 feet) east; center of roadway on east line of section 26, 369.4 meters (1,212 feet); center of intersection of roads at southeast corner of section

26, 429.5 meters (1,409 feet); hedge on north line of roadway on south line of section 26, 207.6 meters (681 feet) south; center of road on south line of section 26, 216.7 meters (711 feet) south. The corner of sections 26, 27, 34, and 35 is 1,317.54 meters (4,322.6 feet) from the station in azimuth $80^{\circ}21'$.

Chase (Rice County, A. T. Mosman, 1900).—About 4 miles west of Chase and 4 miles north of Raymond, in the NW $\frac{1}{4}$ sec. 3, T. 20 S., R. 10 W., opposite the house of C. J. Wood. The underground and station marks are described in note 7. The following distances and azimuths are from the station: Northeast corner of Mr. Wood's house, 66.65 meters (218.7 feet), $53^{\circ}43'$; fence on east side of road running north and south, 20.52 meters (67.3 feet); section corner, 252.6 meters (829 feet), $172^{\circ}46'$.

Savage (Rice County, A. T. Mosman, 1901).—About 6 miles southwest of Sterling, in NE $\frac{1}{4}$ sec. 12, T. 22 S., R. 9 W. The underground and station marks are described in note 7.

Gilmore (Reno County, A. T. Mosman, 1901).—About 8 miles north and 2 miles west of Hutchinson, 6 miles east and 2 miles north of Nickerson, and about 300 yards south of Mr. Fenwick's house, on a sand hill. The west side of the hill is being scooped out by the wind and the station will probably soon disappear. The underground and station marks are described in note 7.

Partridge (Reno County, A. T. Mosman, 1901; 1906).—About $1\frac{1}{4}$ miles north and $\frac{1}{2}$ mile west of Partridge, and $\frac{1}{4}$ mile north of the southwest corner of sec. 4, T. 24 S., R. 7 W., on the farm belonging (1901) to J. W. Hamilton. The underground and station marks are described in note 7.

Sunflower (Reno County, A. T. Mosman, 1901; 1906).—About 6 miles due east of Castleton, in the northeast corner of the SW $\frac{1}{4}$ sec. 22, T. 25 S., R. 5 W., on the south brow of the ridge which runs from the north and terminates just after entering the quarter section. The station is 5 paces south and 51 paces west of four fence corners at the center of the section. The underground, surface and witness marks are described in note 7.

Arlington (Reno County, A. T. Mosman, 1901).—About $1\frac{1}{2}$ miles south of Arlington, on the north side of the SE $\frac{1}{4}$ sec. 16, T. 25 S., R. 8 W., on land belonging (1901) to W. A. Brown. The underground and station marks are described in note 7.

Pretty Prairie (Reno County, A. T. Mosman, 1901; 1906).—About $\frac{1}{2}$ mile south and $\frac{1}{2}$ mile east of Pretty Prairie, near the middle of sec. 20, T. 26 S., R. 6 W., on land owned (1901) by Jacob R. Graber who lives 4 miles east of the station. The station is in the southeast corner of a pasture, 31.85 meters (104.5 feet) from the south fence line, and 33 meters (108 feet) from the east fence line. The underground and station marks are described in note 7. U.S.C. & G.S. bench mark T 4 is 774.01 meters (2539.4 feet) from the station in azimuth $150^{\circ}33'7$.

Kingman (Kingman County, A. T. Mosman, 1901).—On the west line of sec. 25, T. 28 S., R. 8 W., on land belonging (1901) to Thomas Gillen, about 350 yards from the corner of sections 23, 24, 25, and 26 where there is a schoolhouse, and 13.17 meters (43.2 feet) from the west fence line on the road. The underground and station marks are described in note 7. U.S.C. & G.S. bench mark X 4 is 342.97 meters (1,125.2 feet) from the station in azimuth $177^{\circ}55'$.

Cheney (Kingman County, A. T. Mosman, 1901).—In the SE $\frac{1}{4}$ sec. 26, T. 27 S., R. 5 W., on open prairie 200 yards northeast of a schoolhouse. The underground and station marks are described in note 7.

Belmont (Kingman County, A. T. Mosman, 1901).—In the SE $\frac{1}{4}$ sec. 16, T. 29 S., R. 6 W., on land owned (1901) by James Baldwin, on the east side of the quarter section about $\frac{1}{4}$ mile from the southeast corner, near the road, and about 75 yards southeast of Mr. Baldwin's house. The underground and station marks are described in note 7.

Prairie (Harper County, A. T. Mosman, 1901).—About 3 miles west and $\frac{1}{2}$ mile south of Duquoin and about $\frac{3}{4}$ mile north of the southeast corner of sec. 1, T. 31 S., R. 8 W., on the east section line, on land owned (1901) by Andrew Titus of Anthony. The underground and station marks are described in note 7.

Sumner (Sumner County, A. T. Mosman, 1901).—In the SW $\frac{1}{4}$ sec. 30, T. 30 S., R. 4 W., about 250 yards east and 200 yards south of the northwest corner of the quarter section. Mat. Hamilton, who has charge of the land (1901) lives $1\frac{1}{2}$ miles south and $\frac{1}{4}$ mile east of the station. The nearest railroad station and post office is Norwich, 3 miles north and 2 miles west. The underground and station marks are described in note 7.

Quarry (Harper County, A. T. Mosman, 1901; 1906).—In the SE $\frac{1}{4}$ sec. 21, T. 32 S., R. 6 W., about $\frac{3}{4}$ mile west and 150 yards north of the southeast corner of the section, on land owned (1901) by Z. T. Robinson of Harper. A. Wohlford

lives 200 yards south of the station on the south side of the road, and O. H. Riggins lives $\frac{3}{4}$ mile west. The nearest railroad station is Harper, $3\frac{1}{2}$ miles west and 3 miles north. The station is near an old stone quarry and is marked by a cross on the head of a copper bolt 4 inches long and $\frac{1}{2}$ inch in diameter set in solid rock with its upper end 2.15 feet below the surface mark. The surface marks are described in note 7.

Fowler (Harper County, W. Bowie, 1902).—About $3\frac{1}{4}$ miles east and 3 miles north of Bluff City, in the SW $\frac{1}{4}$ sec. 36, T. 33 S., R. 5 W., on land belonging (1902) to S. P. Joyner. The station and reference marks are the same as at *Miller* (see below). The following distances and azimuths are from the station: Stone at southwest corner of section, 562.98 meters (1847.0 feet), $68^{\circ}27'.8$; reference mark, 193.294 meters (634.17 feet), $348^{\circ}17'.2$; chimney of main house of Mr. Joyner, about 130 meters, $329^{\circ}57'.7$; shaft of windmill at north roadside, about 190 meters, $353^{\circ}48'.9$. The reference mark is in a field in the corner of the fence, 0.35 meter (1.1 feet) north of the north road fence and 0.70 meter (2.3 feet) west of the north and south fence along the west side of Mr. Joyner's dooryard.

Rutherford (Harper County, A. T. Mosman, 1901; 1902).—About $4\frac{1}{4}$ miles west of Anthony, in the NW $\frac{1}{4}$ sec. 29, T. 33 S., R. 7 W., about 400 yards east and 250 yards south of the northwest corner of the section, on land belonging (1901) to a mortgage company and rented by Mr. Rutherford who lives 1 mile south of the station. The underground and station marks are described in note 7.

Anthony northwest base (Harper County, A. L. Baldwin, 1900; 1902).—About 4 miles north and $2\frac{1}{2}$ miles west of Anthony, on the north line of sec. 3, T. 33 S., R. 7 W. The underground mark is a small hole in the top of a copper bolt set in a stone 6 by 6 inches and 21 inches long, embedded in cement with its top 4 feet below the surface of the ground. The surface mark is an old type bronze tablet set in a hard limestone block 23 by 23 inches and 16 inches high, embedded in a mass of concrete 4 feet square and 4 feet deep, with its top flush with the surface of the ground. The bronze tablet is similar to the one described in note 7, except that the center is marked by a small hole instead of a cross. A drain tile 7 inches in diameter and 25 inches long is embedded in the concrete with its lower end resting on the underground mark.

Anthony southeast base (Harper County, A. L. Baldwin, 1900; 1906).—On the north line of an east and west road, $1\frac{1}{4}$ miles directly north of the large schoolhouse at Anthony, and 89 meters (292 feet) east of Springfield Avenue, on land belonging to R. R. Beam of Anthony. The station marks are the same as at Anthony northwest base, described above. A large stone, 28 by 11 by 5 inches with its top 4 inches above the ground is on the north side of the east and west road, at the east line of Springfield Avenue. A $\frac{1}{2}$ -inch drill hole in the center of the top of the stone is 89.320 meters (293.04 feet) from the station in azimuth $90^{\circ}19'.6$.

Miller (Harper County, W. Bowie, 1902).—In sec. 36, T. 34 S., R. 6 W., on a low ridge on the land of George Miller, 22 meters (72 feet) north of the northwest corner of his house. The underground mark is the projecting point of a 60-penny nail in the top of a piece of 4-inch terra-cotta pipe 2 feet long filled with concrete and buried with its top $2\frac{1}{2}$ feet below the surface of the ground. Over this is 6 inches of sand. The surface mark is exactly similar except that it is set flush with the surface of the ground and is surrounded with concrete. The reference mark, which is at the southwest corner of section 36, is exactly the same as the underground mark but is set flush with the ground. It is 202.509 meters (664.40 feet) from the station in azimuth $3^{\circ}32'.2$. The corner of sections 35, 36, 1, and 2 is 210.22 meters (689.7 feet) from the station in azimuth $6^{\circ}08'.6$.

Sand Hill (Woods County, Okla., W. Bowie, 1902).—About $9\frac{1}{2}$ miles south and $4\frac{1}{2}$ miles west of Manchester, in the SW $\frac{1}{4}$ sec. 25, T. 28 N., R. 9 W., on the north edge of what are known as the Sand Hills. The station and reference marks are the same as at station *Miller* (see above). The reference mark is in the fence corner south of the quarter section stone common to sections 25 and 36, 536.00 meters (1,758.5 feet) from the station in azimuth $352^{\circ}47'11''$. The quarter-section corner is 525.75 meters (1,724.9 feet) from the station in azimuth $352^{\circ}19'24''$.

Renfrow (Grant County, Okla., O. W. Ferguson, 1902).—In the southeast corner of the NW $\frac{1}{4}$ sec. 14, T. 28 N., R. 5 W., 91.40 meters (299.9 feet) north of the east-and-west fence and 82.73 meters (271.6 feet) west of the north-and-south fence, on the land of Tony Tucker (1902). The station and reference marks are the same as at station *Miller* (see above). The reference mark is 0.60 meter

(2.0 feet) west of the north-and-south fence, and 0.77 meter (2.5 feet) north of the east-and-west fence, and 121.770 meters (399.51 feet) from the station in azimuth $317^{\circ}31'21''$. Other distances and azimuths are as follows: Southeast corner of sec. 14, 1,257.7 meters (4,126 feet), $315^{\circ}13'30''$; Mr. Zimmerman's house, center chimney, $\frac{3}{8}$ mile, $254^{\circ}49'04''$; Elmer Behann's house, center chimney, $\frac{3}{8}$ mile, $286^{\circ}48'53''$; Richland schoolhouse, belfry, $\frac{3}{8}$ mile, $318^{\circ}17'11''$.

Supplementary points

Ellsworth astronomical station (Ellsworth County, G. W. Dean, 1885; 1901).—Near the south side of the city school square, near Douglass Avenue and Second Street. The station is 4.02 meters (13.2 feet) from the northern line of Second Street, 34.793 meters (114.15 feet) from the nearest corner of Douglass Avenue and Second Street, 36.73 meters (120.5 feet) from the west corner of the school building and 40.0 meters (131 feet) south and 20.3 meters (67 feet) west from *Ellsworth Schoolhouse Cupola*. The station is marked by a drill hole in a block of marble, $1\frac{1}{2}$ feet long, 7 inches wide, and 6 inches thick, set in the concrete between two limestone piers, each 5 feet long, 10 inches wide, and 7 inches thick.

Section 13, T. 29 N., R. 7 W., northwest corner (Oklahoma and Kansas, W. Bowie, 1902).—This station is the center of the stone at the corner of secs. 13 and 14, T. 29 N., R. 7 W., approximately in the boundary line between Oklahoma and Kansas.

Boundary stone 160 (Kansas and Oklahoma, W. Bowie, 1902).—In the fence line on the south side of the boundary road, on the northern line of school sec. 13, T. 29 N., R. 7 W., and 1,077.1 meters (3,534 feet) east of the northwest corner of said section. The stone was found loose and reversed but was placed in position. It is of white sandstone, 12 by 5 inches by 20 inches deep, projecting about 9 inches, and is marked on top "160", on north side "K", and on south side "I.T."

Boundary stone 163 (Kansas and Oklahoma, W. Bowie, 1902).—On the southern line of sec. 15, T. 35 S., R. 6 W., 670 meters (2,198 feet) west of the southeast corner of sec. 15, and 157.3 meters (516 feet) east of the fence corner on the eastern side of the entrance to the house of Ira Livingood. The stone, which is of white sandstone 12 by 5 inches by 20 inches deep, was found in good condition and solidly set in the ground, projecting about 6 inches. It is marked as follows: On top "163", on north side "K", and on south side "I.T."

For notes in regard to markings of stations see p. 40.

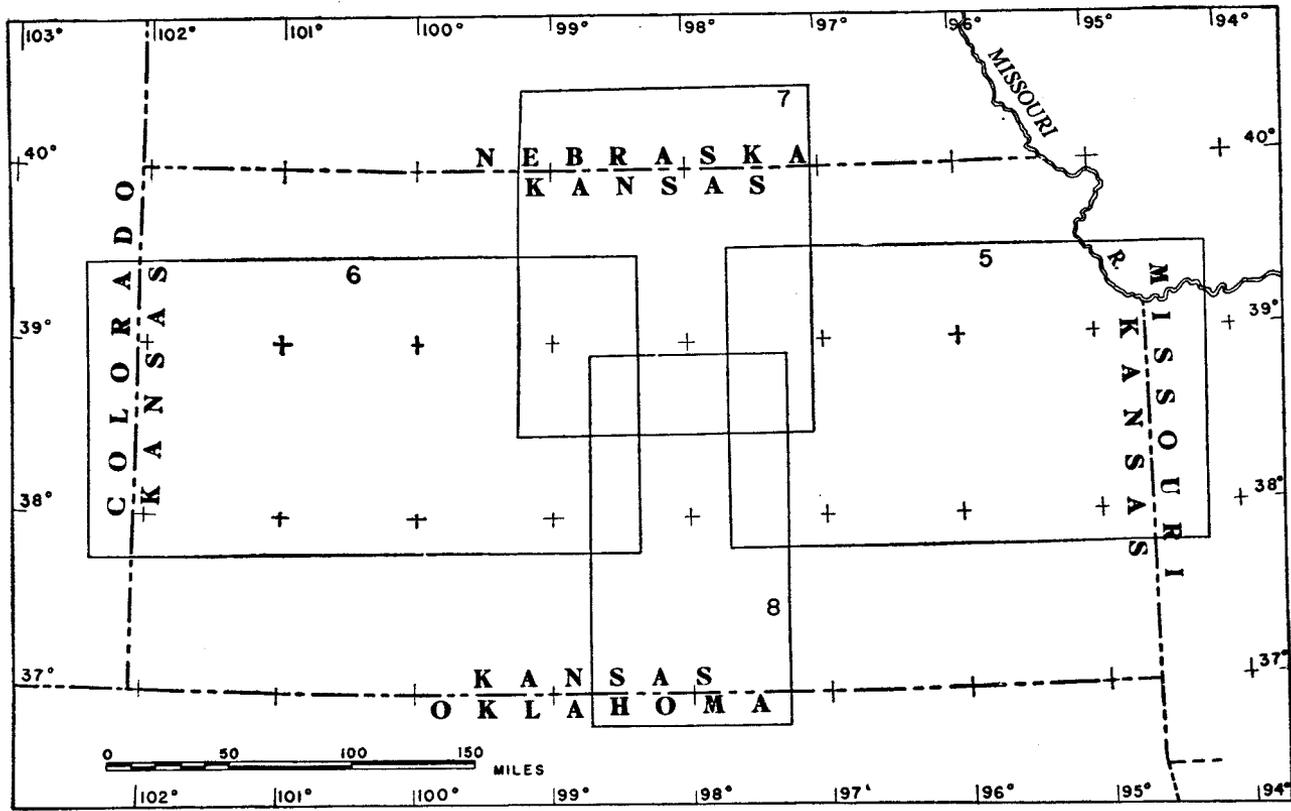


FIGURE 4.—Index map of Kansas showing areas covered by each of the following sketches, figures 5 to 8.

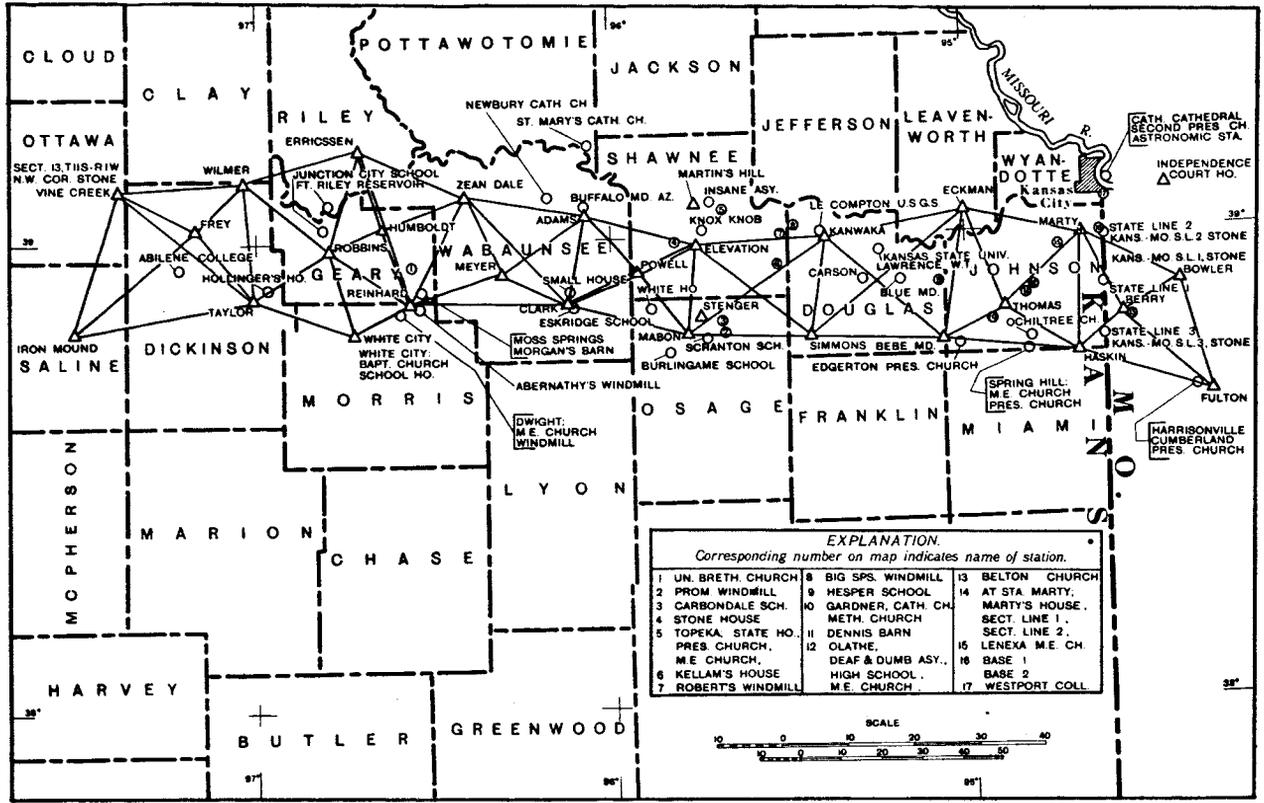


FIGURE 5.—Triangulation, Missouri boundary to Salina.

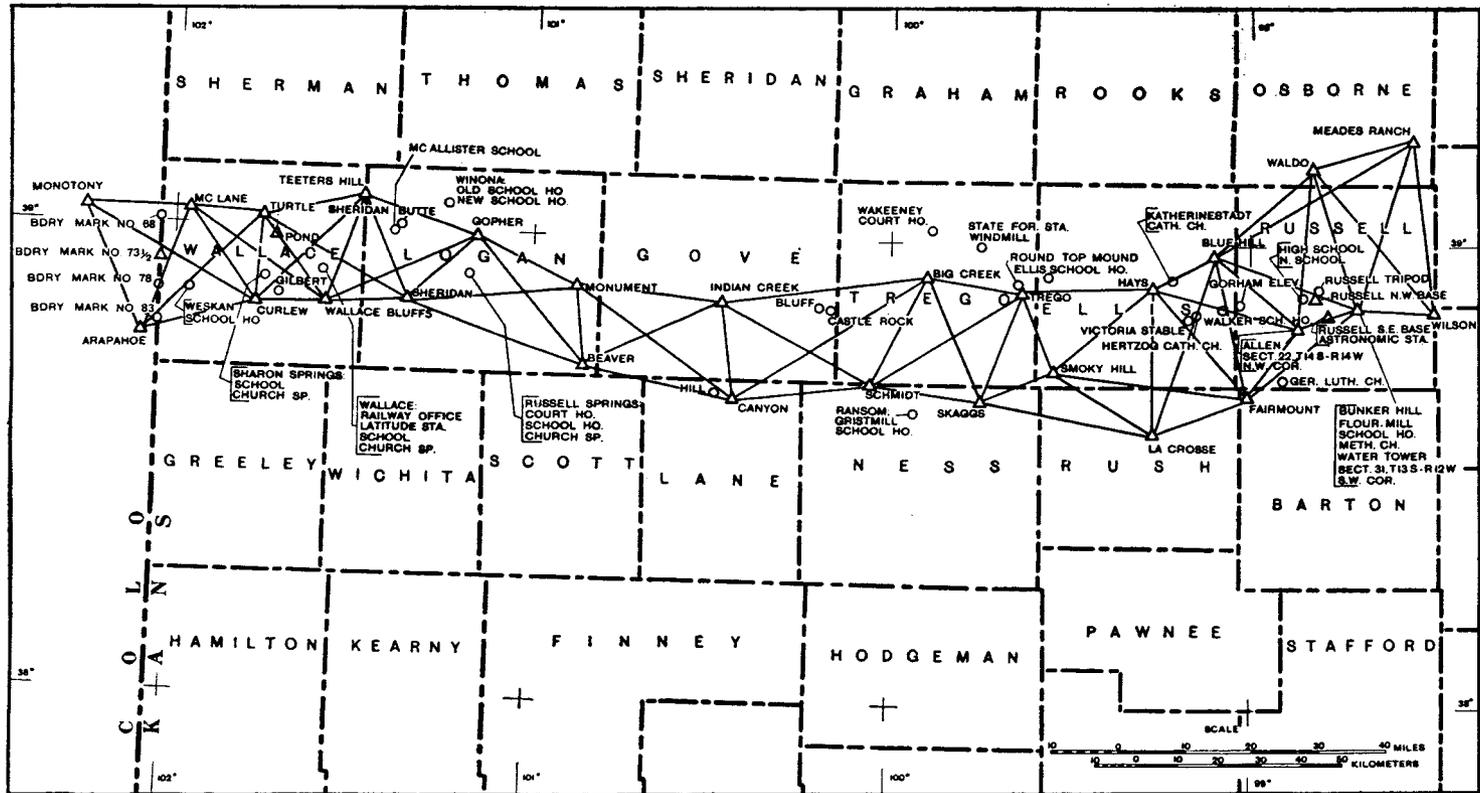


FIGURE 6.—Triangulation, Meades Ranch to Colorado boundary.

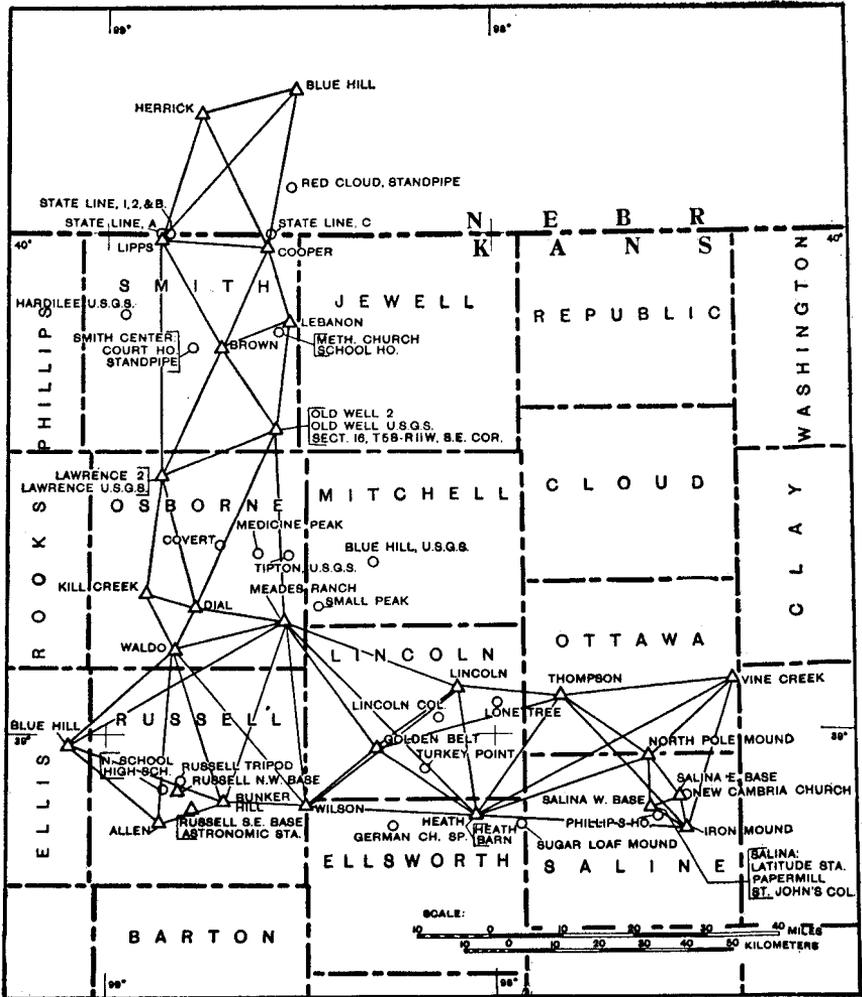


FIGURE 7.—Triangulation, Salina to Meades Ranch to Nebraska boundary.

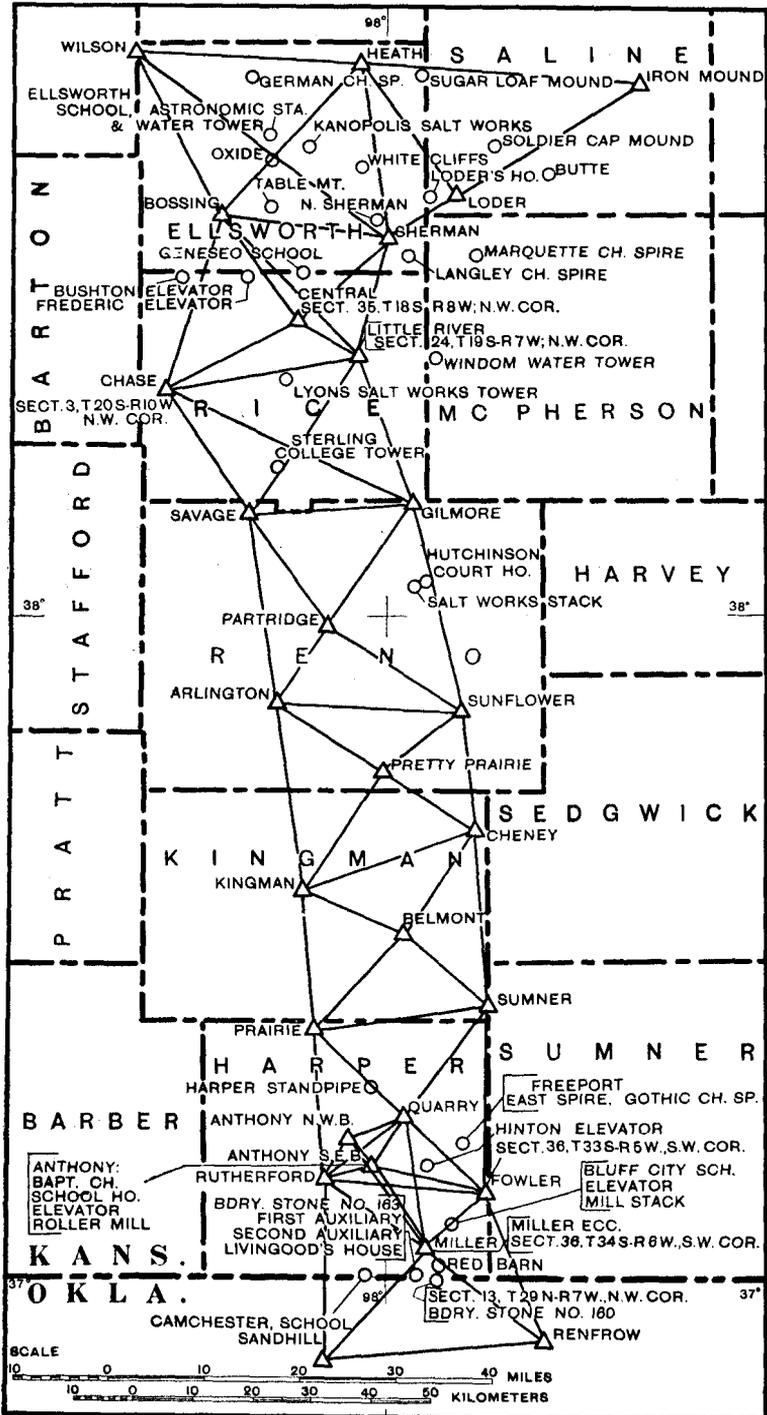


FIGURE 8.—Triangulation, Salina to Oklahoma boundary.

Index to positions, descriptions, elevations, and sketches

Station	Position	Description	Elevation	Sketch	Station	Position	Description	Elevation	Sketch
	Page	Page	Page	Figure		Page	Page	Page	Figure
Abernathy's windmill	17			5	Canyon	23	51	39	6
Abilene Catholic College, cupola	17		39	5	Carbondale school-house (stone), cupola	19		39	5
Adams	15	45	37	5	Carson	19	48	39	5
Allen	22	49	38	6, 7	Castle Rock	26	54	39	6
Anthony:					Catholic Cathedral, Kansas City (Mo.)	22			5
Baptist Church, spire	34			8	Catholic Church: Gardner, spire	20			5
Elevator, stack	35			8	Hertzog, tower	26		39	6
Northwest base	32	59	37	8	Katherinestad, spire	25		39	6
Roller mill, stack	35			8	Newbury, spire	18		39	5
Schoolhouse, tower	34		39	8	St. Mary's, spire	18		39	5
Southeast base	32	59	37	8	Catholic College, Abilene, cupola	17		39	5
Arapahoe (Colo.)	24	53		6	Central	31	57	38	8
Arlington	31	58	38	8	Chase	31	58	38	8
Baptist Church:					Cheney	31	58	38	8
Anthony, spire	34			8	Clark	15	45	37	5
White City, spire	17			5	College of Redemptorist Fathers, Westport (Mo.)	21			5
Base 1	21	48	38	5	College tower, Sterling	33		39	8
Base 2	21	49		5	Colorado-Kansas boundary mark:				
Beaver	23	51		6	68	28			6
Bebe Mound	15	46	37	5	73½	28	54		6
Belmont	31	58	38	8	78	28			6
Belton South Methodist Church, spire (Mo.)	21			5	83	28			6
Berry (Mo.)	15	47	37	5	Cooper	29	56	38	7
Big Creek	23	51	38	6	Courthouse:				
Big Springs, windmill	19		39	5	Hutchinson	34			8
Blue Hill	22	49	38	6, 7	Independence, high cupola or tower (Mo.)	22			5
Blue Hill (Nebr.)	29	56	37	7	Russell Springs, cupola	27			6
Blue Hill (U.S.G.S.)	16	48	39	7	Smith Center, cupola	29			7
Blue Mound	20	48	39	5	Wakeeney, cupola	26			6
Bluff	26	54	39	6	Covert	29	56	39	7
Bluff City:					Cumberland Presbyterian Church, Harrisonville, spire (Mo.)	21			5
Elevator (red), north gable	35			8	Curlaw	24	53		6
Mill, iron stack	35			8	Deaf & Dumb Asylum, Olathe, new chimney	21		38	5
Schoolhouse, belfry	34			8	Dennis barn, cupola	20		38	5
Bossing	30	57	38	8	Dial	28	55	38	7
Boundary mark, Kansas-Colorado:					Dwight Methodist Church, cupola	17			5
68	28			6	Dwight windmill	17			5
73½	28	54		6	Eckman	15	46	37	5
78	28			6	Edgerton Presbyterian Church, spire	20			5
83	28			6	Elevation	15	46	37	5
Boundary stone 160	35	60		8	Elevator:				
Boundary stone 163	36	60		8	Anthony, stack	35			8
Bowler (Mo.)	16	47	37	5	Bluff City, (red) north gable	35			8
Brown	29	55	38	7	Bushton	34		39	8
Buffalo Mound, azimuth mark	18	48	39	5	Hinton, north gable	35			8
Bunker Hill	13	41	37	6, 7					
Bunker Hill:									
Flouring mill, iron chimney	25			6					
Methodist Church, spire	25		39	6					
Schoolhouse, cupola	25		39	6					
Water tower	25		39	6					
Burlingame school-house, cupola	18			5					
Bushton elevator	34		39	8					
Butte, highest point	33		39	8					
Camchester school-house, belfry	36			8					

Index to positions, descriptions, elevations, and sketches—Continued

Station	Position	Description	Elevation	Sketch	Station	Position	Description	Elevation	Sketch
Ellis, schoolhouse, tower.....	Page 26			Figure 6	Independence court-house, high cupola or tower (Mo.).....	Page 22			5
Ellsworth:					Indian Creek.....	23	51	39	6
Astronomical station.....	33	60		8	Insane Asylum, Topeka, cupola.....	19	48	39	5
Schoolhouse, cupola.....	32		39	8	Iron Mound.....	13	42	38	5, 7, 8
Water tower, pole.....	14	44	37	5	Junction City, Grand View schoolhouse, belfry.....	17		39	5
Erricssen.....	18			5	Kanopolis, salt works, center hoist.....	34		39	8
Eskridge schoolhouse, cupola.....	23	49	37	6	Kansas-Colorado boundary mark:				
Fairmount.....	36			8	68.....	28			6
First auxiliary.....	18	48	39	5	73½.....	28	54		6
First Presbyterian Church, Topeka, spire.....	25			6	78.....	28			6
Flouring mill, Bunker Hill, iron chimney.....	17		39	5	83.....	28			6
Fort Riley reservoir, top.....	32	59	38	8	Kansas-Missouri State line:				
Fowler.....	34		39	8	1, stone.....	22			5
Frederic, elevator.....	35			8	2, stone.....	22		38	5
Freeport gothic church, spire.....	35			8	3, stone.....	22		38	5
Freeport, east spire.....	14	43	37	5	Kansas-Nebraska State line:				
Frey.....	16	47		5	1.....	30	57	39	7
Fulton (Mo.).....	20			5	2.....	30	57	39	7
Gardner Catholic Church, spire.....	20			5	A.....	20	57		7
Gardner Methodist Church, spire.....	20		38	5	B.....	30	57	39	7
Geneseo schoolhouse, tower.....	33		39	8	C.....	30	57	39	7
German church, spire.....	33		39	7, 8	Kansas City (Mo.):				
German Lutheran Church, spire.....	25			6	Astronomical station.....	22	49		5
Gilbert.....	27	54		6	Catholic Cathedral.....	22			5
Gilmore.....	31	58	38	8	Second Presbyterian Church, spire.....	22			5
Golden Belt.....	13	42	38	7	Kansas State University, Lawrence, north dome, anemometer.....	20		38	5
Gopher.....	23	52		6	Kanwaka.....	15	46	37	5
Gorham, elevator.....	25		39	6	Katherinestadt Catholic Church, spire.....	25		39	6
Grand View schoolhouse, belfry, Junction City.....	17		39	5	Kellam's house, chimney.....	19			5
Gristmill, Ransom, smokestack.....	26			6	Kill Creek.....	28	55	38	7
Hardlee (U.S.G.S.).....	29	56	39	7	Kingman.....	31	58	38	8
Harper, standpipe.....	34			8	Knox Knob, top.....	19		39	5
Harrisonville, Cumberland Presbyterian Church, spire (Mo.).....	21			5	La Crosse.....	23	50	38	6
Haskin.....	15	47	37	5	Langley church, spire.....	33			8
Hays.....	23	50	38	6	Lawrence 2.....	29	55	38	7
Heath.....	13	42	38	7, 8	Lawrence, Kansas State University, north dome, anemometer.....	20		38	5
Heath's barn, cupola.....	33			7	Lawrence water tower, pole.....	20		38	5
Herrick (Nebr.).....	29	56	38	7	Lawrence (U.S.G.S.).....	29	56		7
Hertzog Catholic Church, tower.....	26		39	6	Lebanon.....	29	55	38	7
Hesper schoolhouse, belfry.....	20			5	Lebanon Methodist Church, spire.....	30			7
High school:					Lebanon schoolhouse, cupola.....	30			7
Olathe.....	21		38	5	LeCompton (U.S.G.S.).....	19	48	39	5
Russell, cupola, pole.....	25		39	6, 7	Lenexa Methodist Church, spire.....	21		38	5
Hill.....	26	54		6	Lincoln.....	13	42	38	7
Hinton elevator, north gable.....	35			8	Lincoln College, cupola.....	16		39	7
Hollinger's house, cupola.....	17			5	Lipps.....	29	56	38	7
Humboldt.....	14	45	37	5	Little River.....	31	57	38	8
Hutchinson, court-house.....	34			8	Livingood's house, chimney.....	36			8
Hutchinson salt works, largest stack.....	33			8					

Index to positions, descriptions, elevations, and sketches—Continued

Station	Position	Description	Elevation	Sketch	Station	Position	Description	Elevation	Sketch
Loder	Page 31	Page 57	Page 38	Figure 8	Pond	Page 27	Page 54	Page	Figure 6
Loder's house, chimney	34		39	8	Powell	15	45	37	5
Lone tree (cottonwood)	16		39	7	Prairie	31	58	38	8
Lyons salt works, tower	33			8	Presbyterian Church: Edgerton, spire	20			5
McAllaster school-house, spire	27			6	Spring Hill, spire	20			5
McLane	24	53		6	Pretty Prairie	31	58	38	8
Mabon	15	46	37	5	Prominent windmill	19			5
Marquette church, spire	33			8	Quarry	32	58	38	8
Martins Hill	19		39	5	Ransom gristmill, smokestack	26			6
Marty	15	47	37	5	Ransom schoolhouse, cupola	26			6
Marty's house, lighting rod	21			5	Red barn near section 13, south gable	36			8
Meades ranch	13	41	38	6, 7	Red Cloud, stand-pipe (Nebr.)	30			7
Medicine Peak	29		39	7	Reinhard	14	44	37	5
Methodist Church: Bunker Hill, spire	25		39	6	Renfrow (Okla.)	32	59		8
Dwight, cupola	17			5	Robbins	14	44	37	5
Gardner, spire	20		38	5	Roberts' windmill	19		38	5
Lebanon, spire	30			7	Round Top Mound	26			6
Lenexa, spire	21		38	5	Russell: High school, cupola, pole	25		39	6, 7
Olathe, spire	21		38	5	North school, tall cupola	24		39	6, 7
Spring Hill, spire	20		38	5	Northwest base	24		37	6, 7
Topeka, spire	19	48	39	5	Southeast base	24		37	6, 7
Meyer	15	45	37	5	Southeast base astronomical station	25			6, 7
Mill, Bluff City, iron stack	35			8	Russell Springs: Church, spire	27			6
Miller	32	59	38	8	Courthouse, cupola	27			6
Miller, eccentric	35			8	Schoolhouse, cupola	27			6
Missouri - K a n s a s State line:					Russell, tripod	25		39	6, 7
1, stone	22			5	Rutherford	32	59	38	8
2, stone	22		38	5	St. John's Military College, vane on tower, Salina	17		39	7
3, stone	22		38	5	St. Mary's Catholic Church, spire	18		39	5
Monotony (Colo.)	24	53		6	Salina: East base	14	43	37	7
Monument	23	52		6	Paper mill, tall brick chimney	17			7
Moss Springs, Morgan's barn, ventilator	18			5	Phillips' house, dome	17		39	7
Nebraska - K a n s a s State line:					St. John's Military College, vane on tower	17		39	7
1	30	57	39	7	West base	14	43	37	7
2	30	57	39	7	West base, latitude station	17	48		7
A	30	57		7	Salt works: Hutchinson, largest stack	33			8
B	30	57	39	7	Kanopolis, center hoist	34		39	8
C	30	57	39	7	Lyons, tower	33			8
New Cambria church (stone), white spire	16			7	Sand Hill (Okla.)	32	59		8
Newbury Catholic Church, spire	18		39	5	Savage	31	58	38	8
North Pole Mound	14	43	38	7	Schmidt	23	51	38	6
North School, Russell, tall cupola	24		39	6, 7	Schoolhouse: Anthony, tower	34		39	8
North Sherman, cairn	34		39	8	Bluff City, belfry	34			8
Ochiltree church, cupola	20		38	5	Bunker Hill, cupola	25		39	6
Olathe: Deaf and Dumb Asylum, new chimney	21		38	5	Burlingame, cupola	18			5
High school	21		38	5	Camchester, belfry	36			8
Methodist Episcopal Church, spire	21		38	5	Carbondale (stone), cupola	19		39	5
Old well 2	28	55	38	7	Ellis, tower	26			6
Old well (U.S.G.S.)	29	56		7	Ellsworth, cupola	33			8
Oxide	33		39	8					
Paper mill, Salina, tall brick chimney	17			7					
Partridge	31	58	38	8					
Phillips' house, Salina, dome	17		39	7					

Index to positions, descriptions, elevations, and sketches—Continued

Station	Position	Description	Elevation	Sketch	Station	Position	Description	Elevation	Sketch
Schoolhouse—Contd.	Page	Page	Page	Figure	Spring Hill Methodist Church, cupola	Page	Page	Page	Figure
Eskridge, cupola	18			5	Spring Hill Presbyterian Church, spire	20			5
Grand View, Junction City, belfry	17		39	5	Standpipe:	20		38	5
Hesper, belfry	20			5	Harper	34			8
Lebanon, cupola	30			7	Red Cloud (Nebr.)	30			7
McAllaster, spire	27			6	Smith Center	30		39	7
Ransom, cupola	26			6	State forestry station, large windmill	26			6
Russell Springs, cupola	27			6	State House, west wing, cupola, Topeka	19	48	39	5
Scranton, south end, cupola	19		39	5	State House, west wing, flagstaff, Topeka	19			5
Sharon Springs, cupola	28			6	State line 1	21	49		5
Walker, cupola	25		39	6	State line 1:				
Wallace, cupola	27			6	Kansas-Missouri, stone	22			5
Weskan, cupola	28			6	Kansas-Nebraska	30	57	39	7
White City, cupola	17		39	5	State line 2	21	49		5
Winona, new, tower	27			6	State line 2:				
Winona, old, cupola	27			6	Kansas-Missouri, stone	22		38	5
Scranton schoolhouse, south end, cupola	19		39	5	Kansas-Nebraska	30	57	39	7
Second auxiliary	36			8	State line 2:				
Second Presbyterian Church, spire, Kansas City (Mo.)	22			5	Kansas-Missouri, stone	22		38	5
Section:					State line 3:				
3, T. 20 S., R. 10 W., northwest corner	35			8	Kansas-Missouri, stone	22		38	5
13, T. 11 S., R. 1 W., northwest corner, stone	16			5	Stake	21	49		5
13, T. 29 N., R. 7 W., northwest corner	35	60		8	State line A, Kansas-Nebraska	30	57		7
16, T. 5 S., R. 11 W., southeast corner	29			7	State line B, Kansas-Nebraska	30	57	39	7
22, T. 14 S., R. 14 W., northwest corner, stone	25			6	State line C, Kansas-Nebraska	30	57	39	7
24, T. 19 S., R. 7 W., northwest corner	35			8	Stenger	18	48	39	5
31, T. 13 S., R. 12 W., southwest corner, stone	25			6	Sterling College, tower	33		39	8
35, T. 18 S., R. 8 W., northwest corner	35			8	Stone house, center	18		39	5
36, T. 33 S., R. 5 W., southwest corner	35			8	Sugar Loaf Mound, rock pile	16		39	7, 8
36, T. 34 S., R. 6 W., southwest corner	35			8	Summer	32	58	38	8
Section line 1	21	48		5	Sunflower	31	58	38	8
Section line 2	21	48		5	Table Mountain, cairn	33			8
Sharon Springs church, spire	27			6	Taylor	14	43	37	5
Sharon Springs schoolhouse, cupola	28			6	Teeters Hill	24	52		6
Sheridan	23	52		6	Thomas	15	47	37	5
Sheridan Butte	27			6	Thompson	13	42	38	7
Sherman	31	57	38	8	Tipton (U.S.G.S.)	29	56	39	7
Simmons	15	46	37	5	Topeka:				
Skaggs	23	50	38	6	First Presbyterian Church, spire	18	48	39	5
Small house	18			5	Insane Asylum, cupola	19	48	39	5
Small peak	16		39	7	Methodist Church, spire	19	48	39	5
Smith Center courthouse, cupola	29			7	State House, west wing, cupola	19	48	39	5
Smith Center standpipe	30		39	7	State House, west wing, flagstaff	19			5
Smoky Hill	23	50	38	6	Trego	23	50	38	6
Soldier Cap Mound	16		39	8	Turkey Point	16		39	7
South Methodist Church, Belton, spire (Mo.)	21			5	Turtle	24	53		6
					United Brethren Church, cupola	17			5
					Victoria, stable cupola west of	26			6
					Vine Creek	13	43	38	5, 7
					Wakeeney courthouse, cupola	26			6
					Waldo	13	41	38	6, 7

Index to positions, descriptions, elevations and sketches—Continued

Station	Position	Description	Elevation	Sketch	Station	Position	Description	Elevation	Sketch
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Walker, schoolhouse, cupola.....	25		39	6	White City.....	14	44	37	5
Wallace Bluffs.....	24	52		6	White City Baptist Church, spire.....	17			5
Wallace:					White City schoolhouse, cupola.....	17		39	5
Church, spire.....	27			6	White Cliffs, cairn.....	33		39	8
Latitude station.....	27	54		6	White house on hill, center chimney.....	18		39	5
Railway office, chimney.....	27			6	Wilmer.....	14	44	37	5
Schoolhouse, cupola.....	27			6	Wilson.....	13	42	38	6, 7, 8
Water tower:					Windom water tower.....	34		39	8
Bunker Hill.....	25		39	6	Winona new schoolhouse, tower.....	27			6
Ellsworth, pole.....	32		39	8	Winona old schoolhouse, cupola.....	27			6
Lawrence, pole.....	20		38	5					
Windom.....	34		39	8	Zean Dale.....	15	45	37	5
Weskan schoolhouse, cupola.....	28			6					
Westport, College of Redemptorist Fathers (Mo.).....	21			5					

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