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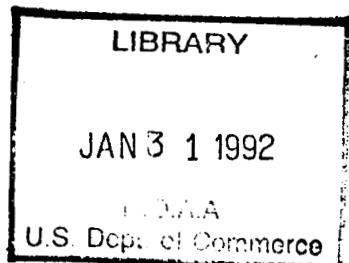
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## TRIANGULATION IN KANSAS

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Special Publication No. 70

(Supersedes Appendix No. 3, Report for 1902)



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# **National Oceanic and Atmospheric Administration**

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# TRIANGULATION IN KANSAS.

## GENERAL STATEMENT.

The primary purpose of this publication is to bring together in convenient form for the use of engineers, information in regard to all the triangulation by the Coast and Geodetic Survey in the State of Kansas. There is also included herein a full report on one additional section of the ninety-eighth meridian triangulation, two sections between bases having already been published in Appendix 6 of the Report for 1901, entitled, "Triangulation Northward Along the Ninety-Eighth Meridian in Kansas and Nebraska."

The transcontinental triangulation, extending from the Atlantic to the Pacific along the thirty-ninth parallel, and the ninety-eighth meridian triangulation, both cross Kansas and pass through its central portion. These two triangulations form 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 1885 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, in so far as the features of special interest to the scientists are concerned.<sup>1</sup> Only the positions for the primary stations were there published, and but few descriptions of stations. The positions of all these stations, primary, secondary, and tertiary, are published herein on the North American datum, together with all available descriptions.

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, and an account of it has been published, together with that portion of the transcontinental triangulation, which also forms a part of the ninety-eighth meridian triangulation, in Appendix 6 of 1901, already referred to above. The positions, descriptions, and elevations of stations in this triangulation are here reproduced for the sake of completeness.

The portion of the ninety-eighth meridian triangulation which lies in Kansas and to the southward of the transcontinental triangulation was executed during the years 1899–1902. This 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. The party which occupied these three stations continued the ninety-eighth meridian triangulation more than 400 miles, or 6° of latitude, farther south to the Lampasas Base in Texas, during the season of 1902.

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<sup>1</sup> See Transcontinental Triangulation (U. S. Coast and Geodetic Survey Special Publication No. 4).

**STATEMENT OF ADJUSTMENTS.**

For the stations involved in the triangulation along the thirty-ninth parallel, local adjustments were made.

For the remaining stations, all in the ninety-eighth meridian triangulation, the computer made local adjustments at a few stations where the proportion of broken series was greatest, these being the cases in which the local adjustment will in general produce the greatest changes in the angles. These extraordinary cases being carefully studied indicated that the effect of the local adjustment at the remaining stations would in general be simply to change the angles in the hundredths of seconds, the tenths being seldom affected. It was therefore considered that the time would not be well spent in making these local adjustments, the effects of which would be so small as to be entirely masked by the corrections inevitably applied in the figure adjustments. For the greater number of stations the directions used in the figure adjustments are therefore those resulting directly from the observations after the mere taking of means. It should be noted that with the system of observations used since 1900, in which the missing signals in a broken series are observed later in connection with the chosen initial, or with some other one and only one of the signals already observed in that series, a local adjustment will change the result very little, much less than when two or more of the signals already observed are included with the missing signal.

The figure adjustments for the triangulation in Kansas were made in five sections: First, the Salina base net; second, from the Salina base net to the Versailles base net in Missouri; third, from the Salina base net to the El Paso base net in Colorado; fourth, from the line Meades Ranch-Waldo, on the thirty-ninth parallel triangulation, to the Shelton base net; fifth, from the lines Iron Mountain-Heath and Heath-Wilson, on the thirty-ninth parallel triangulation, to the Anthony Base. Adjustments of the first three sections are published fully in U. S. Coast and Geodetic Survey Special Publication No. 4, The Transcontinental Triangulation. The adjustment of the fourth section is published in full in Appendix No. 6 of the Report for 1901, Triangulation Northward Along the Ninety-Eighth Meridian.

In the adjustment (see fig. 6) of the triangulation southward from the lines Iron Mountain-Heath and Heath-Wilson of the thirty-ninth parallel triangulation, which had previously been fixed in length and direction, to the Anthony Base, which is fixed in length by the base measures, there are 121 directions connected by 50 rigid conditions, of which 35 refer to closures of triangles, 14 to ratios of sides, and the last condition is that the length of the Anthony Base, as carried from the line Wilson-Heath, must agree with its measured length.

The length of the Anthony Base, as reduced to sea level, is 6034.7048 meters (logarithm 3.7806560). This corresponds exactly to the pub-

lished length of the base in Appendix 3 of 1901. The reduction to sea level as there printed was computed upon the supposition that the elevation of the bench mark at Anthony southeast base was 419.9346 meters. The best elevation now available for this bench mark is 419.544 meters. This change in the assigned elevation is so small as not to affect the reduction to the sea level by more than one or two tenths of a millimeter.

#### THE NORTH AMERICAN DATUM.

Early in the year 1913 the superintendent of the United States Coast and Geodetic Survey was notified by the director of the Comisión Geodésica Mexicana and by the chief astronomer of the Dominion of Canada Astronomical Observatory that the so-called United States standard datum had been adopted as the datum for the triangulation of those organizations. They also reported that the Clarke spheriod of 1866, now used in the United States, would be used by them.

Owing to the international character of the datum adopted by the three countries, the superintendent of the United States Coast and Geodetic Survey changed its designation from the "United States standard datum" to the "North American datum."

#### EXPLANATION OF THE NORTH AMERICAN DATUM.

The lengths, as already fully explained in connection with the adjustments, all depend upon the Shelton, Salina, Versailles, Anthony, and El Paso bases.

The positions—that is, the latitudes, longitudes, and azimuths—need special explanation.

All of the positions and azimuths have been computed upon the Clarke spheriod of 1866, as expressed in meters, which has been in use in the Coast and Geodetic Survey for many years.

After a spheriod has been adopted and all the angles and lengths in a triangulation have been fully fixed, it is still necessary, before the computation of latitudes, longitudes, and azimuths can be made, to adopt a standard latitude and longitude for a specified station and a standard azimuth of a line from that station. For convenience, the adopted standard position (latitude and longitude) of a given station, together with the adopted standard azimuth of a line from that station, is called the geodetic datum.

The primary triangulation in the United States was commenced at various points and existed at first as a number of detached portions in each of which the geodetic datum was necessarily dependent only upon the astronomic stations connected with that particular portion. As examples of such detached portions of triangulation there may be mentioned the early triangulation in New England and along the Atlantic coast, a detached portion of the transcontinental triangulation centering on St. Louis and another portion

of the same triangulation in the Rocky Mountain region, and three separate portions of triangulation in California, in the latitude of San Francisco, in the vicinity of Santa Barbara Channel, and in the vicinity of San Diego. With the lapse of time these separate pieces expanded until they touched or overlapped.

The transcontinental triangulation, of which the office computation was completed in 1899, joined all of the detached portions mentioned and made them one continuous triangulation. As soon as this took place the logical necessity existed for discarding the old geodetic data used in these various pieces and substituting one for the whole country, or at least for as much of the country as is covered by continuous triangulation. To do this was a very heavy piece of work, and involved much preliminary study to determine the best datum to be adopted. On March 13, 1901, the superintendent adopted what was known from that time until 1913 as the United States standard datum, but is now known as the North American datum (see above), and it was decided to reduce the positions to that datum as rapidly as possible. The datum adopted was that formerly in use in New England, and therefore its adoption did not affect the positions which had been used for geographic purposes in New England and along the Atlantic coast to North Carolina, nor those in the States of New York, Pennsylvania, New Jersey, and Delaware. The adopted datum does not agree, however, with that used in The Transcontinental Triangulation and in The Eastern Oblique Arc of the United States, publications which deal primarily with the purely scientific problem of the determination of the figure of the earth and which were prepared for publication before the adoption of the new datum.

As the adoption of such a standard datum was a matter of considerable importance, it is in order here to explain the desirability of this step more fully.

The main objects to be attained by the geodetic operations of the Coast and Geodetic Survey are, first, the control of the charts published by the Survey; second, the furnishing of geographic positions (latitudes and longitudes), accurately determined elevations, and distances and azimuths, to other Government organizations, to engineers and surveyors, and to the general public; third, the determination of the figure of the earth. For the first and second objects it is not necessary that the reference spheroid should be accurately that which most closely fits the geoid within the area covered, nor that the adopted geodetic datum should be absolutely the best that can be derived from the astronomic observations at hand. It is simply desirable that the reference spheroid and the geodetic datum adopted shall be, if possible, such a close approximation to the truth that any correction which may hereafter be derived from the observations which are now or may become available shall not greatly

exceed the probable errors of such corrections. It is, however, very desirable that one spheroid and one geodetic datum be used for the whole country. In fact, this is absolutely necessary if a geodetic survey is to perform fully the function of accurately coordinating all surveys within the area which it covers. This is the most important function of a geodetic survey. To perform this function, it is also highly desirable that when a certain spheroid and geodetic datum have been adopted for a country they be rigidly adhered to, without change, for all time, unless shown to be largely in error.

In striving to attain the third object, the determination of the figure of the earth, the conditions are decidedly different. This problem concerns itself primarily with astronomic observations of latitude, longitude, and azimuth and with the geodetic positions of the points at which the astronomic observations were made, but is not concerned with the geodetic positions of other points fixed by the triangulations. The geodetic positions (latitudes and longitudes) of comparatively few points are, therefore, concerned in this problem. However, in marked contrast to the statements made in preceding paragraphs, it is desirable in dealing with this problem that with each new important accession of data a new spheroid fitting the geoid with the greatest possible accuracy and new values of the geodetic latitudes, longitudes, and azimuths of the highest degree of accuracy should be derived.

The United States standard (now the North American) datum was adopted with reference to positions furnished for geographic purposes, but has no reference to the problem of the determination of the figure of the earth. It is adopted with reference to the engineer's problem of furnishing standard positions and does not affect the scientist's problem of the determination of the figure of the earth.

The principles which guided in the selection of the datum to be adopted were: First, that the adopted datum should not differ widely from the ideal datum for which the sum of the station errors in latitude, longitude, and azimuth should each be zero; second, it was desirable that the adopted datum should produce minimum changes in the publications of the Survey, including its charts; and, third, it was desirable, other things being equal, to adopt that datum which allowed the maximum number of positions already in the office registers to remain unchanged, and, therefore, necessitated a minimum amount of new computation. These considerations led to the adoption, as the standard, of that datum which had been in use for many years in the northeastern group of States and along the Atlantic coast as far south as North Carolina.

An examination of the station errors available in 1903 on the United States standard datum at 246 latitude stations, 76 longitude stations, and 152 azimuth stations, scattered widely over the United States from Maine to Louisiana and to California, indicated

that this datum approaches closely the ideal with which the algebraic sum of the station errors of each class would be zero.<sup>2</sup>

The North American datum, upon which the positions and azimuths given in this publication depend, may be defined in terms of the position of the station Meades Ranch as follows:

$$\begin{array}{lll} \phi = 30 & 13 & 26.686 \\ \lambda = 98 & 32 & 30.506 \\ \alpha \text{ to Waldo} & = 75 & 28 \quad 14.52 \end{array}$$

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

The principal lists of geographic positions published on the adopted datum throughout the whole United States are contained in the following publications of the Coast and Geodetic Survey and of other organizations:

- Appendix 8 of the Report for 1885, positions in Massachusetts and Rhode Island.
- Appendix 8 of the Report for 1888, positions in Connecticut.
- Appendix 8 of the Report for 1893, positions in Pennsylvania, Delaware, and Maryland.
- Appendix 10 of the Report for 1894, positions in Massachusetts.
- Appendix 6 of the Report for 1901, positions in Kansas and Nebraska.
- Appendix 4 of the Report for 1903, positions in Kansas, Oklahoma, and Texas.
- Appendix 9 of the Report for 1904, positions in California.
- Appendix 5 of the Report for 1905, positions in Texas.
- Appendix 3 of the Report for 1907, positions in California.
- Appendix 5 of the Report for 1910, positions in California.
- Appendix 4 of the Report for 1911, positions in Nebraska, Minnesota, North Dakota, and South Dakota.
- Appendix 5 of the Report for 1911, positions in Texas.
- Appendix 6 of the Report for 1911, positions in Florida.
- Special Publication No. 11, positions in Texas, New Mexico, Arizona, and California.
- Special Publication No. 13, positions in California, Oregon, and Washington.
- Special Publication No. 16, positions in Florida.
- Special Publication No. 17, positions in Texas.
- Special Publication No. 19, positions in Colorado, Utah, Nevada, Wyoming, Montana, South Dakota, and North Dakota.
- Special Publication No. 24, positions in Alabama and Mississippi.
- Special Publication No. 30, positions in West Virginia, Ohio, Kentucky, Indiana, Illinois, and Missouri.
- Special Publication No. 31, positions in Oregon, Washington, and California.
- Special Publication No. 43, positions in Georgia.
- Special Publication No. 46, positions in Maine.
- Special Publication No. 54, positions in Texas.
- Special Publication No. 62, positions in Rhode Island.
- Special Publication No. 70, positions in Kansas.

<sup>2</sup> This is further borne out in the reduction of 765 astronomic stations in connection with the "Supplementary investigation in 1909 of the figure of the earth and isostasy" by J. F. Hayford published by the U. S. Coast and Geodetic Survey.

Appendix EEE, pages 2905-3031, Annual Report of the Chief of Engineers, 1902, positions of points on and near the Great Lakes.

Publications of the Massachusetts Harbor and Land Commission.

Report on the Triangulation of Greater New York.

Report on a Plan of Sewerage for the City of Cincinnati.

Various bulletins of the United States Geological Survey.

#### EXPLANATION OF TABLES OF POSITIONS.

In the tables of positions the latitude and longitude of each point are given on the North American datum (see p. 5), also the length and azimuth of each line observed over, whether in one or both ways. Along with the latitude and longitude of each point the lengths and azimuths are given of lines from that point to other points of the triangulation. No lengths or azimuths are repeated, and for a given line the length and azimuth will be found opposite the position of one or the other of the two stations involved.

The usual column of "seconds in meters" has been omitted from the table of positions as some other method of plotting is ordinarily employed for stations in the interior of the country.

The lengths of the lines between stations are given in both meters and feet, together with the logarithm of the former. It should be remembered that it is the logarithm of the length in meters which is derived first from the computation. The length in meters is then derived from the logarithm, and finally the length in feet is obtained by multiplying the length in meters by the conversion factor, 3.28083333.

The rule followed in recent publications of this office has been to give latitudes and longitudes 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 (observed from only two stations).

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

These 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 its elevation above sea level is shown, and in the fifth column the number of the sketch on which it appears.

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

## CONVERSION TABLES.

*Lengths—Feet to meters (from 1 to 1000 units).*

[Reduction factor: 1 foot = 0.3048006096 meter.]

| Feet. | Meters.  |
|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|
| 0     | 0.0      | 50    | 15.24003 | 100   | 30.48006 | 150   | 45.72009 | 200   | 60.96012 |
| 1     | 0.30480  | 1     | 15.54483 | 1     | 30.76488 | 1     | 46.02489 | 1     | 61.28492 |
| 2     | 0.60960  | 2     | 15.84983 | 2     | 31.08968 | 2     | 46.32969 | 2     | 61.58972 |
| 3     | 0.91440  | 3     | 16.15443 | 3     | 31.39446 | 3     | 46.63449 | 3     | 61.87452 |
| 4     | 1.21920  | 4     | 16.45923 | 4     | 31.69926 | 4     | 46.93929 | 4     | 62.17932 |
| 5     | 1.52400  | 5     | 16.76403 | 5     | 32.00408 | 5     | 47.24409 | 5     | 62.48412 |
| 6     | 1.82880  | 6     | 17.06883 | 6     | 32.30886 | 6     | 47.54890 | 6     | 62.78893 |
| 7     | 2.13360  | 7     | 17.37363 | 7     | 32.61267 | 7     | 47.85370 | 7     | 63.09373 |
| 8     | 2.43840  | 8     | 17.67844 | 8     | 32.91647 | 8     | 48.15850 | 8     | 63.39853 |
| 9     | 2.74321  | 9     | 17.98324 | 9     | 33.22327 | 9     | 48.46330 | 9     | 63.70333 |
| 10    | 3.04801  | 60    | 18.28804 | 110   | 33.52807 | 160   | 48.78810 | 210   | 64.00813 |
| 1     | 3.35281  | 1     | 18.59284 | 1     | 33.83287 | 1     | 49.07290 | 1     | 64.31293 |
| 2     | 3.65761  | 2     | 18.89764 | 2     | 34.13767 | 2     | 49.37770 | 2     | 64.61773 |
| 3     | 3.96241  | 3     | 19.20244 | 3     | 34.44247 | 3     | 49.68250 | 3     | 64.92253 |
| 4     | 4.26721  | 4     | 19.50724 | 4     | 34.74727 | 4     | 49.98730 | 4     | 65.22733 |
| 5     | 4.57201  | 5     | 19.81204 | 5     | 35.05207 | 5     | 50.29210 | 5     | 65.53213 |
| 6     | 4.87681  | 6     | 20.11684 | 6     | 35.35687 | 6     | 50.59690 | 6     | 65.83693 |
| 7     | 5.18161  | 7     | 20.42104 | 7     | 35.66167 | 7     | 50.90170 | 7     | 66.14173 |
| 8     | 5.48641  | 8     | 20.72684 | 8     | 35.96647 | 8     | 51.20660 | 8     | 66.44653 |
| 9     | 5.79121  | 9     | 21.03124 | 9     | 36.27127 | 9     | 51.51130 | 9     | 66.75133 |
| 20    | 6.09601  | 70    | 21.33604 | 120   | 36.57607 | 170   | 51.81610 | 220   | 67.05613 |
| 1     | 6.40081  | 1     | 21.64084 | 1     | 36.88087 | 1     | 52.12090 | 1     | 67.36093 |
| 2     | 6.70561  | 2     | 21.94564 | 2     | 37.18567 | 2     | 52.42570 | 2     | 67.66574 |
| 3     | 7.01041  | 3     | 22.25044 | 3     | 37.49047 | 3     | 52.73061 | 3     | 67.97054 |
| 4     | 7.31521  | 4     | 22.55524 | 4     | 37.79528 | 4     | 53.03631 | 4     | 68.27534 |
| 5     | 7.62002  | 5     | 22.86005 | 5     | 38.10008 | 5     | 53.34011 | 5     | 68.58014 |
| 6     | 7.92482  | 6     | 23.16485 | 6     | 38.40488 | 6     | 53.64491 | 6     | 68.88494 |
| 7     | 8.22962  | 7     | 23.46965 | 7     | 38.70968 | 7     | 53.94971 | 7     | 69.18674 |
| 8     | 8.53442  | 8     | 23.77445 | 8     | 39.01448 | 8     | 54.25451 | 8     | 69.49454 |
| 9     | 8.83922  | 9     | 24.07925 | 9     | 39.31928 | 9     | 54.55931 | 9     | 69.79834 |
| 30    | 9.14402  | 80    | 24.88405 | 130   | 39.62408 | 180   | 54.88411 | 230   | 70.10414 |
| 1     | 9.44882  | 1     | 24.68882 | 1     | 39.92888 | 1     | 55.10891 | 1     | 70.40894 |
| 2     | 9.75362  | 2     | 24.99365 | 2     | 40.23368 | 2     | 55.47371 | 2     | 70.71374 |
| 3     | 10.05842 | 3     | 25.29845 | 3     | 40.53848 | 3     | 55.77851 | 3     | 71.01854 |
| 4     | 10.36322 | 4     | 25.60324 | 4     | 40.84328 | 4     | 56.08331 | 4     | 71.32234 |
| 5     | 10.66802 | 5     | 25.90805 | 5     | 41.14808 | 5     | 56.38811 | 5     | 71.62814 |
| 6     | 10.97282 | 6     | 26.21285 | 6     | 41.45288 | 6     | 56.69291 | 6     | 71.93294 |
| 7     | 11.27762 | 7     | 26.51765 | 7     | 41.75768 | 7     | 56.99771 | 7     | 72.23774 |
| 8     | 11.58242 | 8     | 26.82245 | 8     | 42.06248 | 8     | 57.30251 | 8     | 72.54255 |
| 9     | 11.88722 | 9     | 27.12725 | 9     | 42.36728 | 9     | 57.60732 | 9     | 72.84735 |
| 40    | 12.19202 | 90    | 27.43205 | 140   | 42.67209 | 190   | 57.91212 | 240   | 73.15215 |
| 1     | 12.49682 | 1     | 27.73686 | 1     | 42.97689 | 1     | 58.21692 | 1     | 73.45695 |
| 2     | 12.80163 | 2     | 28.04166 | 2     | 43.28169 | 2     | 58.52172 | 2     | 73.76175 |
| 3     | 13.10643 | 3     | 28.34646 | 3     | 43.58649 | 3     | 58.82652 | 3     | 74.06655 |
| 4     | 13.41123 | 4     | 28.65126 | 4     | 43.89129 | 4     | 59.13132 | 4     | 74.37135 |
| 5     | 13.71603 | 5     | 28.95600 | 5     | 44.19609 | 5     | 59.43612 | 5     | 74.67615 |
| 6     | 14.02083 | 6     | 29.26086 | 6     | 44.50089 | 6     | 59.74092 | 6     | 74.98095 |
| 7     | 14.32563 | 7     | 29.50568 | 7     | 44.80569 | 7     | 60.04572 | 7     | 75.28575 |
| 8     | 14.63043 | 8     | 29.87046 | 8     | 45.11049 | 8     | 60.35052 | 8     | 75.59065 |
| 9     | 14.93523 | 9     | 30.17528 | 9     | 45.41529 | 9     | 60.65532 | 9     | 75.89535 |

## TRIANGULATION IN KANSAS.

11

Lengths—Feet to meters (from 1 to 1000 units)—Continued.

| Feet. | Meters.  | Feet. | Meters.   | Feet. | Meters.   | Feet. | Meters.   | Feet. | Meters.   |
|-------|----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|
| 250   | 76.20015 | 300   | 91.44018  | 350   | 106.68021 | 400   | 121.92024 | 450   | 137.16027 |
| 1     | 76.50495 | 1     | 91.74498  | 1     | 106.98501 | 1     | 122.22504 | 1     | 137.46507 |
| 2     | 76.80975 | 2     | 92.04978  | 2     | 107.28981 | 2     | 122.52085 | 2     | 137.76988 |
| 3     | 77.11455 | 3     | 92.35458  | 3     | 107.59462 | 3     | 122.83465 | 3     | 138.07468 |
| 4     | 77.41935 | 4     | 92.65939  | 4     | 107.89942 | 4     | 123.13945 | 4     | 138.37948 |
| 5     | 77.72416 | 5     | 92.96419  | 5     | 108.20422 | 5     | 123.44425 | 5     | 138.68428 |
| 6     | 78.02896 | 6     | 93.26899  | 6     | 108.50902 | 6     | 123.74905 | 6     | 138.98908 |
| 7     | 78.33376 | 7     | 93.57379  | 7     | 108.81382 | 7     | 124.06385 | 7     | 139.20388 |
| 8     | 78.63856 | 8     | 93.87859  | 8     | 109.11862 | 8     | 124.35885 | 8     | 139.58988 |
| 9     | 78.94336 | 9     | 94.18339  | 9     | 109.42342 | 9     | 124.66345 | 9     | 139.90348 |
| 260   | 79.24816 | 310   | 94.48810  | 360   | 109.72822 | 410   | 124.96825 | 460   | 140.20828 |
| 1     | 79.55296 | 1     | 94.79209  | 1     | 110.03302 | 1     | 125.27305 | 1     | 140.51308 |
| 2     | 79.85776 | 2     | 95.00779  | 2     | 110.33782 | 2     | 125.57785 | 2     | 140.81788 |
| 3     | 80.16256 | 3     | 95.40259  | 3     | 110.64262 | 3     | 125.88265 | 3     | 141.12208 |
| 4     | 80.46736 | 4     | 95.70739  | 4     | 110.94742 | 4     | 126.18745 | 4     | 141.42748 |
| 5     | 80.77216 | 5     | 96.01219  | 5     | 111.25222 | 5     | 126.49225 | 5     | 141.73228 |
| 6     | 81.07696 | 6     | 96.31699  | 6     | 111.55702 | 6     | 126.79705 | 6     | 142.03708 |
| 7     | 81.38176 | 7     | 96.62179  | 7     | 111.86182 | 7     | 127.10183 | 7     | 142.34188 |
| 8     | 81.68656 | 8     | 96.92659  | 8     | 112.16602 | 8     | 127.40685 | 8     | 142.64669 |
| 9     | 81.99136 | 9     | 97.23139  | 9     | 112.47142 | 9     | 127.71146 | 9     | 142.95149 |
| 270   | 82.29618 | 320   | 97.53620  | 370   | 112.77623 | 420   | 128.01626 | 470   | 143.25629 |
| 1     | 82.60097 | 1     | 97.84100  | 1     | 113.08103 | 1     | 128.32106 | 1     | 143.56109 |
| 2     | 82.90577 | 2     | 98.14580  | 2     | 113.38583 | 2     | 128.62586 | 2     | 143.86589 |
| 3     | 83.21057 | 3     | 98.45060  | 3     | 113.69063 | 3     | 128.93066 | 3     | 144.17069 |
| 4     | 83.51537 | 4     | 98.75540  | 4     | 113.99543 | 4     | 129.23546 | 4     | 144.47549 |
| 5     | 83.82017 | 5     | 99.06020  | 5     | 114.30023 | 5     | 129.54026 | 5     | 144.78029 |
| 6     | 84.12497 | 6     | 99.36500  | 6     | 114.80503 | 6     | 129.84506 | 6     | 145.08509 |
| 7     | 84.42977 | 7     | 99.66980  | 7     | 114.90983 | 7     | 130.14986 | 7     | 145.38899 |
| 8     | 84.73457 | 8     | 99.97460  | 8     | 115.21463 | 8     | 130.45466 | 8     | 145.69469 |
| 9     | 85.03937 | 9     | 100.27940 | 9     | 115.51943 | 9     | 130.75946 | 9     | 145.99949 |
| 280   | 85.34417 | 330   | 100.58420 | 380   | 115.82423 | 430   | 131.06426 | 480   | 146.30429 |
| 1     | 85.64897 | 1     | 100.88900 | 1     | 116.12903 | 1     | 131.36906 | 1     | 146.06909 |
| 2     | 85.95377 | 2     | 101.19380 | 2     | 116.43383 | 2     | 131.67380 | 2     | 146.91389 |
| 3     | 86.25857 | 3     | 101.49860 | 3     | 116.73863 | 3     | 131.97866 | 3     | 147.21869 |
| 4     | 86.56337 | 4     | 101.80340 | 4     | 117.04343 | 4     | 132.28346 | 4     | 147.52350 |
| 5     | 86.86817 | 5     | 102.10820 | 5     | 117.34823 | 5     | 132.58827 | 5     | 147.82830 |
| 6     | 87.17297 | 6     | 102.41300 | 6     | 117.65304 | 6     | 132.89307 | 6     | 148.13310 |
| 7     | 87.47777 | 7     | 102.71781 | 7     | 117.95784 | 7     | 133.19787 | 7     | 148.43790 |
| 8     | 87.78258 | 8     | 103.02261 | 8     | 118.26264 | 8     | 133.50267 | 8     | 148.74270 |
| 9     | 88.08738 | 9     | 103.32741 | 9     | 118.56744 | 9     | 133.80747 | 9     | 149.04760 |
| 290   | 88.39218 | 340   | 103.63221 | 390   | 118.87224 | 440   | 134.11227 | 490   | 149.35230 |
| 1     | 88.69698 | 1     | 103.93701 | 1     | 119.17704 | 1     | 134.41707 | 1     | 149.65710 |
| 2     | 89.00178 | 2     | 104.24181 | 2     | 119.48184 | 2     | 134.72187 | 2     | 149.96190 |
| 3     | 89.30658 | 3     | 104.54661 | 3     | 119.78664 | 3     | 135.02667 | 3     | 150.26670 |
| 4     | 89.61138 | 4     | 104.85141 | 4     | 120.09144 | 4     | 135.33147 | 4     | 150.57160 |
| 5     | 89.91618 | 5     | 105.15621 | 5     | 120.39624 | 5     | 135.63827 | 5     | 150.87630 |
| 6     | 90.22098 | 6     | 105.46101 | 6     | 120.70104 | 6     | 135.94107 | 6     | 151.18110 |
| 7     | 90.52578 | 7     | 105.76581 | 7     | 121.00584 | 7     | 136.24587 | 7     | 151.48590 |
| 8     | 90.83058 | 8     | 106.07061 | 8     | 121.31064 | 8     | 136.55067 | 8     | 151.79070 |
| 9     | 91.13538 | 9     | 106.37641 | 9     | 121.61544 | 9     | 136.85547 | 9     | 152.09550 |

*Lengths—Feet to meters (from 1 to 1000 units)—Continued.*

| Feet. | Meters.   |
|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|
| 500   | 152.40030 | 550   | 167.64034 | 600   | 182.88037 | 650   | 198.12010 | 700   | 213.36043 |
| 1     | 152.70511 | 1     | 167.94514 | 1     | 183.18517 | 1     | 198.42520 | 1     | 213.66523 |
| 2     | 153.00991 | 2     | 168.21094 | 2     | 183.48997 | 2     | 198.73000 | 2     | 213.67003 |
| 3     | 153.31471 | 3     | 168.55474 | 3     | 183.70477 | 3     | 199.03480 | 3     | 214.27483 |
| 4     | 153.61951 | 4     | 168.85954 | 4     | 184.00957 | 4     | 199.33960 | 4     | 214.57963 |
| 5     | 153.92431 | 5     | 169.10434 | 5     | 184.40437 | 5     | 199.64440 | 5     | 214.88443 |
| 6     | 154.22911 | 6     | 169.46914 | 6     | 184.70017 | 6     | 199.94920 | 6     | 215.1923  |
| 7     | 154.53391 | 7     | 169.77304 | 7     | 185.01397 | 7     | 200.25100 | 7     | 215.49103 |
| 8     | 154.83871 | 8     | 170.07874 | 8     | 185.31877 | 8     | 200.55880 | 8     | 215.79883 |
| 9     | 155.14351 | 9     | 170.38354 | 9     | 185.62357 | 9     | 200.86300 | 9     | 216.10363 |
| 510   | 155.44831 | 580   | 170.68834 | 610   | 185.02837 | 660   | 201.16840 | 710   | 216.40843 |
| 1     | 155.75311 | 1     | 170.99314 | 1     | 186.23317 | 1     | 201.47320 | 1     | 216.71323 |
| 2     | 156.05791 | 2     | 171.20794 | 2     | 186.53797 | 2     | 201.77800 | 2     | 217.01603 |
| 3     | 156.36271 | 3     | 171.60274 | 3     | 186.84277 | 3     | 202.08280 | 3     | 217.32283 |
| 4     | 156.66751 | 4     | 171.90754 | 4     | 187.14757 | 4     | 202.38700 | 4     | 217.62764 |
| 5     | 156.97231 | 5     | 172.21234 | 5     | 187.45237 | 5     | 202.69241 | 5     | 217.93244 |
| 6     | 157.27711 | 6     | 172.51715 | 6     | 187.75718 | 6     | 202.99721 | 6     | 218.23724 |
| 7     | 157.58192 | 7     | 172.82195 | 7     | 188.06108 | 7     | 203.30201 | 7     | 218.54204 |
| 8     | 157.88672 | 8     | 173.12075 | 8     | 188.36698 | 8     | 203.60681 | 8     | 218.84084 |
| 9     | 158.19152 | 9     | 173.43155 | 9     | 188.67158 | 9     | 203.91161 | 9     | 219.15104 |
| 520   | 158.49632 | 570   | 173.73635 | 620   | 188.97638 | 670   | 204.21641 | 720   | 219.45644 |
| 1     | 158.80112 | 1     | 174.04115 | 1     | 189.28118 | 1     | 204.52121 | 1     | 219.70124 |
| 2     | 159.10592 | 2     | 174.34595 | 2     | 189.58508 | 2     | 204.82601 | 2     | 220.06604 |
| 3     | 159.41072 | 3     | 174.65075 | 3     | 189.89078 | 3     | 205.13081 | 3     | 220.37084 |
| 4     | 159.71552 | 4     | 174.95555 | 4     | 190.19558 | 4     | 205.43501 | 4     | 220.67564 |
| 5     | 160.02032 | 5     | 175.26035 | 5     | 190.50038 | 5     | 205.74041 | 5     | 220.98044 |
| 6     | 160.32512 | 6     | 175.56515 | 6     | 190.80518 | 6     | 206.04521 | 6     | 221.25524 |
| 7     | 160.62092 | 7     | 175.86995 | 7     | 191.10908 | 7     | 206.35001 | 7     | 221.59004 |
| 8     | 160.93472 | 8     | 176.17475 | 8     | 191.41478 | 8     | 206.65481 | 8     | 221.89484 |
| 9     | 161.23952 | 9     | 176.47955 | 9     | 191.71958 | 9     | 206.95901 | 9     | 222.19904 |
| 530   | 161.54432 | 580   | 176.78435 | 630   | 192.02438 | 680   | 207.20441 | 730   | 222.50445 |
| 1     | 161.84912 | 1     | 177.08015 | 1     | 192.32918 | 1     | 207.69222 | 1     | 222.80925 |
| 2     | 162.15392 | 2     | 177.39305 | 2     | 192.63399 | 2     | 207.87402 | 2     | 223.11405 |
| 3     | 162.45872 | 3     | 177.69876 | 3     | 192.93879 | 3     | 208.17882 | 3     | 223.41885 |
| 4     | 162.76352 | 4     | 178.00356 | 4     | 193.24359 | 4     | 208.48302 | 4     | 223.72305 |
| 5     | 163.06833 | 5     | 178.30836 | 5     | 193.54839 | 5     | 208.78842 | 5     | 224.02845 |
| 6     | 163.37313 | 6     | 178.61316 | 6     | 193.85319 | 6     | 209.09322 | 6     | 224.33725 |
| 7     | 163.67793 | 7     | 178.91796 | 7     | 194.15799 | 7     | 209.39002 | 7     | 224.63805 |
| 8     | 163.98273 | 8     | 179.22276 | 8     | 194.46279 | 8     | 209.70282 | 8     | 224.94235 |
| 9     | 164.28753 | 9     | 179.52756 | 9     | 194.76759 | 9     | 210.00762 | 9     | 225.24765 |
| 540   | 164.59233 | 590   | 179.83236 | 640   | 195.07239 | 690   | 210.31242 | 740   | 225.55245 |
| 1     | 164.89713 | 1     | 180.13716 | 1     | 195.37719 | 1     | 210.61722 | 1     | 225.85725 |
| 2     | 165.20193 | 2     | 180.44196 | 2     | 195.68190 | 2     | 210.92202 | 2     | 226.16205 |
| 3     | 165.60673 | 3     | 180.74676 | 3     | 195.98679 | 3     | 211.22682 | 3     | 226.46685 |
| 4     | 165.81153 | 4     | 181.05156 | 4     | 196.29159 | 4     | 211.53182 | 4     | 226.77165 |
| 5     | 166.11633 | 5     | 181.35630 | 5     | 196.59639 | 5     | 211.83042 | 5     | 227.07045 |
| 6     | 166.42113 | 6     | 181.66116 | 6     | 196.90119 | 6     | 212.14122 | 6     | 227.38125 |
| 7     | 166.72593 | 7     | 181.96596 | 7     | 197.20599 | 7     | 212.44602 | 7     | 227.68805 |
| 8     | 167.03073 | 8     | 182.27076 | 8     | 197.51080 | 8     | 212.75083 | 8     | 227.99380 |
| 9     | 167.33553 | 9     | 182.57557 | 9     | 197.81560 | 9     | 213.05603 | 9     | 228.29568 |

*Lengths—Feet to meters (from 1 to 1000 units)—Continued.*

| Foot. | Meters.   |
|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|
| 750   | 228.00046 | 800   | 243.84049 | 850   | 250.08052 | 900   | 274.32055 | 950   | 280.50058 |
| 1     | 228.00520 | 1     | 244.14529 | 1     | 259.38532 | 1     | 274.02535 | 1     | 280.86528 |
| 2     | 229.21000 | 2     | 244.45009 | 2     | 259.60012 | 2     | 274.03015 | 2     | 290.17018 |
| 3     | 229.51488 | 3     | 244.75489 | 3     | 259.00492 | 3     | 275.23405 | 3     | 290.47408 |
| 4     | 229.81968 | 4     | 245.05969 | 4     | 260.29972 | 4     | 275.53975 | 4     | 290.77978 |
| 5     | 230.12446 | 5     | 245.36440 | 5     | 260.00452 | 5     | 275.84455 | 5     | 291.08458 |
| 6     | 230.42928 | 6     | 245.00029 | 6     | 260.90932 | 6     | 270.14035 | 6     | 291.38038 |
| 7     | 230.73406 | 7     | 245.97409 | 7     | 261.21412 | 7     | 276.45415 | 7     | 291.69418 |
| 8     | 231.03886 | 8     | 246.27889 | 8     | 261.51892 | 8     | 276.75805 | 8     | 291.99698 |
| 9     | 231.34366 | 9     | 246.58309 | 9     | 261.82372 | 9     | 277.00375 | 9     | 292.30378 |
| 760   | 231.64846 | 810   | 246.88849 | 860   | 262.12852 | 910   | 277.30855 | 960   | 292.00550 |
| 1     | 231.95326 | 1     | 247.19329 | 1     | 262.43332 | 1     | 277.07330 | 1     | 292.91339 |
| 2     | 232.25800 | 2     | 247.49800 | 2     | 262.73813 | 2     | 277.97816 | 2     | 293.21119 |
| 3     | 232.56287 | 3     | 247.80290 | 3     | 263.04203 | 3     | 278.28206 | 3     | 293.52209 |
| 4     | 232.86767 | 4     | 248.10770 | 4     | 263.34773 | 4     | 278.58770 | 4     | 293.82779 |
| 5     | 233.17247 | 5     | 248.41250 | 5     | 263.05253 | 5     | 278.80256 | 5     | 294.13259 |
| 6     | 233.47727 | 6     | 248.71730 | 6     | 263.95733 | 6     | 279.19736 | 6     | 294.43739 |
| 7     | 233.78207 | 7     | 249.02210 | 7     | 264.21613 | 7     | 279.50216 | 7     | 294.74219 |
| 8     | 234.08687 | 8     | 249.32690 | 8     | 264.50693 | 8     | 279.80690 | 8     | 295.04690 |
| 9     | 234.39167 | 9     | 249.63170 | 9     | 264.87173 | 9     | 280.11170 | 9     | 295.35179 |
| 770   | 234.69647 | 820   | 249.93650 | 870   | 265.17653 | 920   | 280.41056 | 970   | 295.65059 |
| 1     | 235.00127 | 1     | 250.24130 | 1     | 265.48133 | 1     | 280.72136 | 1     | 295.96130 |
| 2     | 235.30607 | 2     | 250.54610 | 2     | 265.78613 | 2     | 281.02610 | 2     | 296.26019 |
| 3     | 235.01087 | 3     | 250.85090 | 3     | 266.09993 | 3     | 281.33096 | 3     | 296.57099 |
| 4     | 235.01567 | 4     | 251.15570 | 4     | 266.39573 | 4     | 281.63576 | 4     | 296.87579 |
| 5     | 236.22047 | 5     | 251.46050 | 5     | 266.70053 | 5     | 281.94056 | 5     | 297.18059 |
| 6     | 236.52527 | 6     | 251.76530 | 6     | 267.00533 | 6     | 282.24530 | 6     | 297.48539 |
| 7     | 236.83007 | 7     | 252.07010 | 7     | 267.31013 | 7     | 282.55017 | 7     | 297.79020 |
| 8     | 237.13487 | 8     | 252.37490 | 8     | 267.61404 | 8     | 282.85497 | 8     | 298.06500 |
| 9     | 237.43867 | 9     | 252.67071 | 9     | 267.91074 | 9     | 283.15977 | 9     | 298.39980 |
| 780   | 237.74448 | 830   | 252.08451 | 880   | 268.22454 | 930   | 283.49457 | 980   | 298.70400 |
| 1     | 238.04928 | 1     | 253.28931 | 1     | 268.52031 | 1     | 283.76937 | 1     | 299.00040 |
| 2     | 238.35408 | 2     | 253.59411 | 2     | 268.83414 | 2     | 284.07417 | 2     | 299.31420 |
| 3     | 238.65888 | 3     | 253.89891 | 3     | 269.13804 | 3     | 284.37897 | 3     | 299.61900 |
| 4     | 238.96368 | 4     | 254.20371 | 4     | 269.44374 | 4     | 284.68377 | 4     | 299.92380 |
| 5     | 239.20848 | 5     | 254.50851 | 5     | 269.74854 | 5     | 284.98857 | 5     | 300.22860 |
| 6     | 239.57328 | 6     | 254.81331 | 6     | 270.05334 | 6     | 285.29337 | 6     | 300.53340 |
| 7     | 239.87808 | 7     | 255.11811 | 7     | 270.35814 | 7     | 285.59417 | 7     | 300.83520 |
| 8     | 240.18288 | 8     | 255.42291 | 8     | 270.66294 | 8     | 285.80207 | 8     | 301.13300 |
| 9     | 240.48768 | 9     | 255.72771 | 9     | 270.96774 | 9     | 286.20777 | 9     | 301.44780 |
| 790   | 240.70248 | 840   | 250.03251 | 890   | 271.27254 | 940   | 286.51257 | 990   | 301.75260 |
| 1     | 241.00728 | 1     | 250.33731 | 1     | 271.57734 | 1     | 286.81737 | 1     | 302.05740 |
| 2     | 241.40208 | 2     | 250.64211 | 2     | 271.88214 | 2     | 287.12217 | 2     | 302.36220 |
| 3     | 241.70688 | 3     | 250.94691 | 3     | 272.18094 | 3     | 287.42697 | 3     | 302.66701 |
| 4     | 242.01168 | 4     | 257.25171 | 4     | 272.49174 | 4     | 287.73178 | 4     | 302.97181 |
| 5     | 242.31048 | 5     | 257.55652 | 5     | 272.70655 | 5     | 288.03658 | 5     | 303.27661 |
| 6     | 242.62120 | 6     | 257.86132 | 6     | 273.10135 | 6     | 288.34138 | 6     | 303.58141 |
| 7     | 242.92600 | 7     | 258.16612 | 7     | 273.40615 | 7     | 288.64618 | 7     | 303.88021 |
| 8     | 243.23089 | 8     | 258.47092 | 8     | 273.71095 | 8     | 288.95098 | 8     | 304.19101 |
| 9     | 243.53569 | 9     | 258.77572 | 9     | 274.01575 | 9     | 289.25578 | 9     | 304.49581 |

*Lengths—Meters to feet (from 1 to 1000 units).*

[Reduction factor: 1 meter = 3.280833333 feet.]

| Meters. | Feet.     |
|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| 0       |           | 50      | 164.04167 | 100     | 328.08333 | 150     | 492.12500 | 200     | 658.16667 |
| 1       | 3.28083   | 1       | 167.32250 | 1       | 331.36417 | 1       | 495.40583 | 1       | 659.44750 |
| 2       | 6.56167   | 2       | 170.60333 | 2       | 334.64500 | 2       | 498.68667 | 2       | 662.72833 |
| 3       | 9.84250   | 3       | 173.88417 | 3       | 337.96253 | 3       | 501.96750 | 3       | 666.00017 |
| 4       | 13.12333  | 4       | 177.10500 | 4       | 341.20667 | 4       | 505.24833 | 4       | 669.20000 |
| 5       | 16.40417  | 5       | 180.44583 | 5       | 344.48750 | 5       | 508.52917 | 5       | 672.57083 |
| 6       | 19.08500  | 6       | 183.72667 | 6       | 347.70833 | 6       | 511.81000 | 6       | 675.85167 |
| 7       | 22.96583  | 7       | 187.00750 | 7       | 351.04917 | 7       | 515.09093 | 7       | 679.13250 |
| 8       | 26.24667  | 8       | 190.28833 | 8       | 354.33000 | 8       | 518.37187 | 8       | 682.41333 |
| 9       | 29.52750  | 9       | 193.60017 | 9       | 357.61083 | 9       | 521.62500 | 9       | 685.89417 |
| 10      | 32.80833  | 60      | 196.85000 | 110     | 360.89167 | 160     | 524.03333 | 210     | 688.97500 |
| 1       | 36.08917  | 1       | 200.13083 | 1       | 364.17250 | 1       | 528.21417 | 1       | 692.25583 |
| 2       | 39.37000  | 2       | 203.41167 | 2       | 367.45333 | 2       | 531.49500 | 2       | 695.53607 |
| 3       | 42.65083  | 3       | 206.69250 | 3       | 370.73417 | 3       | 534.77583 | 3       | 698.81750 |
| 4       | 45.93167  | 4       | 209.97333 | 4       | 374.01500 | 4       | 538.05687 | 4       | 702.09833 |
| 5       | 49.21250  | 5       | 213.25417 | 5       | 377.29583 | 5       | 541.33750 | 5       | 705.37917 |
| 6       | 52.49333  | 6       | 216.53500 | 6       | 380.57667 | 6       | 544.01833 | 6       | 708.66000 |
| 7       | 55.77417  | 7       | 219.81683 | 7       | 383.85750 | 7       | 547.89017 | 7       | 711.94083 |
| 8       | 59.05500  | 8       | 223.09667 | 8       | 387.13833 | 8       | 551.18000 | 8       | 715.22167 |
| 9       | 62.33583  | 9       | 226.37750 | 9       | 390.41917 | 9       | 554.46083 | 9       | 718.50250 |
| 20      | 65.61667  | 70      | 229.65833 | 120     | 393.70000 | 170     | 557.74167 | 220     | 721.78333 |
| 1       | 68.89750  | 1       | 232.93917 | 1       | 396.98083 | 1       | 561.02260 | 1       | 725.06417 |
| 2       | 72.17833  | 2       | 236.22000 | 2       | 400.26167 | 2       | 564.30333 | 2       | 728.34500 |
| 3       | 75.45917  | 3       | 239.50083 | 3       | 403.54250 | 3       | 567.58417 | 3       | 731.62583 |
| 4       | 78.74000  | 4       | 242.78167 | 4       | 406.82333 | 4       | 570.86500 | 4       | 734.90667 |
| 5       | 82.02083  | 5       | 246.00260 | 5       | 410.10417 | 5       | 574.14583 | 5       | 738.18750 |
| 6       | 85.30167  | 6       | 249.34333 | 6       | 413.38500 | 6       | 577.42667 | 6       | 741.40833 |
| 7       | 88.58250  | 7       | 252.62417 | 7       | 416.06583 | 7       | 580.70750 | 7       | 744.74917 |
| 8       | 91.86333  | 8       | 255.90500 | 8       | 419.94667 | 8       | 583.98833 | 8       | 748.03000 |
| 9       | 95.14417  | 9       | 259.18583 | 9       | 423.22750 | 9       | 587.26917 | 9       | 751.31083 |
| 30      | 98.42500  | 80      | 262.46667 | 130     | 426.50833 | 180     | 590.55000 | 230     | 754.59167 |
| 1       | 101.70583 | 1       | 265.74750 | 1       | 429.79817 | 1       | 593.83083 | 1       | 757.87250 |
| 2       | 104.98667 | 2       | 269.02833 | 2       | 433.07000 | 2       | 597.11167 | 2       | 761.16333 |
| 3       | 108.26750 | 3       | 272.30917 | 3       | 436.35083 | 3       | 600.39250 | 3       | 764.43417 |
| 4       | 111.54833 | 4       | 275.59000 | 4       | 439.03167 | 4       | 603.67333 | 4       | 767.71500 |
| 5       | 114.82917 | 5       | 278.87083 | 5       | 442.91250 | 5       | 606.95417 | 5       | 770.99583 |
| 6       | 118.11000 | 6       | 282.15167 | 6       | 446.10333 | 6       | 610.23500 | 6       | 774.27667 |
| 7       | 121.39083 | 7       | 285.43250 | 7       | 449.47417 | 7       | 613.51583 | 7       | 777.55750 |
| 8       | 124.67167 | 8       | 288.71333 | 8       | 452.75500 | 8       | 616.79667 | 8       | 780.83833 |
| 9       | 127.95250 | 9       | 291.99417 | 9       | 456.03683 | 9       | 620.07760 | 9       | 784.11917 |
| 40      | 131.23333 | 90      | 295.27500 | 140     | 459.31667 | 190     | 623.35683 | 240     | 787.40000 |
| 1       | 134.51417 | 1       | 298.55583 | 1       | 462.59750 | 1       | 626.03017 | 1       | 790.80833 |
| 2       | 137.79500 | 2       | 301.83667 | 2       | 465.87833 | 2       | 629.92900 | 2       | 793.90107 |
| 3       | 141.07583 | 3       | 305.11750 | 3       | 469.15917 | 3       | 633.20983 | 3       | 797.24260 |
| 4       | 144.35667 | 4       | 308.39833 | 4       | 472.44000 | 4       | 636.48107 | 4       | 800.62333 |
| 5       | 147.63750 | 5       | 311.07917 | 5       | 475.72083 | 5       | 639.70250 | 5       | 803.80417 |
| 6       | 150.91833 | 6       | 314.90000 | 6       | 479.00167 | 6       | 643.04333 | 6       | 807.08500 |
| 7       | 154.19917 | 7       | 318.24083 | 7       | 482.28250 | 7       | 646.32417 | 7       | 810.36583 |
| 8       | 157.48000 | 8       | 321.52167 | 8       | 485.50333 | 8       | 649.63500 | 8       | 813.64667 |
| 9       | 160.76083 | 9       | 324.80250 | 9       | 488.84417 | 9       | 652.88583 | 9       | 816.92760 |

Lengths—Meters to feet (from 1 to 1000 units)—Continued.

| Meters. | Feet.     | Meters. | Feet.       | Meters. | Feet.       | Meters. | Feet.       | Meters. | Feet.       |
|---------|-----------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| 250     | 820.20833 | 300     | 984.25000   | 350     | 1,148.29107 | 400     | 1,312.33333 | 450     | 1,470.37500 |
| 1       | 822.48917 | 1       | 987.53083   | 1       | 1,151.57250 | 1       | 1,315.01417 | 1       | 1,470.65583 |
| 2       | 826.77000 | 2       | 990.81167   | 2       | 1,154.85333 | 2       | 1,318.80500 | 2       | 1,482.03667 |
| 3       | 830.05083 | 3       | 994.09250   | 3       | 1,158.13417 | 3       | 1,322.17583 | 3       | 1,486.21750 |
| 4       | 833.33107 | 4       | 997.37333   | 4       | 1,161.41500 | 4       | 1,325.45607 | 4       | 1,489.49833 |
| 5       | 836.61250 | 5       | 1,000.65417 | 5       | 1,164.69583 | 5       | 1,328.73750 | 5       | 1,492.77917 |
| 6       | 839.89333 | 6       | 1,003.93500 | 6       | 1,167.97667 | 6       | 1,332.01833 | 6       | 1,496.06000 |
| 7       | 843.17417 | 7       | 1,007.21583 | 7       | 1,171.25750 | 7       | 1,335.29017 | 7       | 1,499.34083 |
| 8       | 846.45500 | 8       | 1,010.49097 | 8       | 1,174.53833 | 8       | 1,338.68000 | 8       | 1,502.02107 |
| 9       | 849.73583 | 9       | 1,013.77750 | 9       | 1,177.81917 | 9       | 1,341.98083 | 9       | 1,505.90250 |
| 260     | 853.01667 | 310     | 1,017.05833 | 360     | 1,181.10000 | 410     | 1,345.14107 | 460     | 1,509.18333 |
| 1       | 856.29750 | 1       | 1,020.33917 | 1       | 1,184.38083 | 1       | 1,348.42250 | 1       | 1,512.46417 |
| 2       | 859.57833 | 2       | 1,023.62000 | 2       | 1,187.60107 | 2       | 1,351.70333 | 2       | 1,515.74500 |
| 3       | 862.85917 | 3       | 1,026.90083 | 3       | 1,190.94250 | 3       | 1,354.98417 | 3       | 1,519.02583 |
| 4       | 866.14000 | 4       | 1,030.18167 | 4       | 1,194.22333 | 4       | 1,358.28500 | 4       | 1,522.30667 |
| 5       | 869.42083 | 5       | 1,033.40250 | 5       | 1,197.50417 | 5       | 1,361.54583 | 5       | 1,525.58750 |
| 6       | 872.70167 | 6       | 1,036.74333 | 6       | 1,200.78500 | 6       | 1,364.82667 | 6       | 1,528.86833 |
| 7       | 875.08250 | 7       | 1,040.02417 | 7       | 1,204.00583 | 7       | 1,368.10750 | 7       | 1,532.14917 |
| 8       | 878.36333 | 8       | 1,043.30500 | 8       | 1,207.34667 | 8       | 1,371.38833 | 8       | 1,535.43000 |
| 9       | 882.64417 | 9       | 1,046.58583 | 9       | 1,210.62750 | 9       | 1,374.66917 | 9       | 1,538.71083 |
| 270     | 885.82500 | 320     | 1,049.86667 | 370     | 1,213.90833 | 420     | 1,377.95000 | 470     | 1,541.99167 |
| 1       | 889.10583 | 1       | 1,053.14760 | 1       | 1,217.18917 | 1       | 1,381.23083 | 1       | 1,545.27250 |
| 2       | 892.38667 | 2       | 1,056.42833 | 2       | 1,220.47000 | 2       | 1,384.51107 | 2       | 1,548.55333 |
| 3       | 895.66750 | 3       | 1,059.70017 | 3       | 1,223.75083 | 3       | 1,387.79250 | 3       | 1,551.83417 |
| 4       | 898.94833 | 4       | 1,062.99000 | 4       | 1,227.03167 | 4       | 1,391.07333 | 4       | 1,555.11500 |
| 5       | 902.22917 | 5       | 1,066.27083 | 5       | 1,230.31250 | 5       | 1,394.35417 | 5       | 1,558.39583 |
| 6       | 905.51000 | 6       | 1,069.55167 | 6       | 1,233.69333 | 6       | 1,397.63500 | 6       | 1,561.07667 |
| 7       | 908.79083 | 7       | 1,072.83250 | 7       | 1,236.87417 | 7       | 1,400.91583 | 7       | 1,564.95750 |
| 8       | 912.07167 | 8       | 1,076.11333 | 8       | 1,240.15500 | 8       | 1,404.19007 | 8       | 1,568.23833 |
| 9       | 915.35250 | 9       | 1,079.39417 | 9       | 1,243.43583 | 9       | 1,407.47750 | 9       | 1,571.51917 |
| 280     | 918.03333 | 330     | 1,082.87500 | 380     | 1,246.71667 | 430     | 1,410.75833 | 480     | 1,574.80000 |
| 1       | 921.91417 | 1       | 1,085.95583 | 1       | 1,249.99750 | 1       | 1,414.08917 | 1       | 1,578.08083 |
| 2       | 925.19500 | 2       | 1,089.23667 | 2       | 1,253.27833 | 2       | 1,417.32000 | 2       | 1,581.30167 |
| 3       | 928.47583 | 3       | 1,092.51750 | 3       | 1,256.55917 | 3       | 1,420.60083 | 3       | 1,584.64250 |
| 4       | 931.75667 | 4       | 1,095.79833 | 4       | 1,259.84000 | 4       | 1,423.88167 | 4       | 1,587.92333 |
| 5       | 935.03750 | 5       | 1,099.07917 | 5       | 1,263.12083 | 5       | 1,427.16250 | 5       | 1,591.20417 |
| 6       | 938.31833 | 6       | 1,102.36000 | 6       | 1,266.40167 | 6       | 1,430.44333 | 6       | 1,594.48500 |
| 7       | 941.59917 | 7       | 1,105.04083 | 7       | 1,269.68250 | 7       | 1,433.72417 | 7       | 1,597.76583 |
| 8       | 944.88000 | 8       | 1,108.92167 | 8       | 1,272.90333 | 8       | 1,437.00500 | 8       | 1,601.04667 |
| 9       | 948.16083 | 9       | 1,112.20250 | 9       | 1,274.24417 | 9       | 1,440.28583 | 9       | 1,604.32750 |
| 290     | 951.44167 | 340     | 1,115.48333 | 390     | 1,279.52600 | 440     | 1,443.50667 | 490     | 1,607.60833 |
| 1       | 954.72250 | 1       | 1,118.76417 | 1       | 1,282.80583 | 1       | 1,446.84750 | 1       | 1,610.88917 |
| 2       | 958.00333 | 2       | 1,122.04500 | 2       | 1,286.08667 | 2       | 1,450.12833 | 2       | 1,614.17000 |
| 3       | 961.28417 | 3       | 1,125.32583 | 3       | 1,289.30750 | 3       | 1,453.40917 | 3       | 1,617.45083 |
| 4       | 964.56500 | 4       | 1,128.60667 | 4       | 1,292.64833 | 4       | 1,456.69000 | 4       | 1,620.73107 |
| 5       | 967.84583 | 5       | 1,131.88750 | 5       | 1,295.92917 | 5       | 1,459.97083 | 5       | 1,624.01250 |
| 6       | 971.12667 | 6       | 1,135.16833 | 6       | 1,299.21000 | 6       | 1,463.25167 | 6       | 1,627.20333 |
| 7       | 974.40750 | 7       | 1,138.44917 | 7       | 1,302.49083 | 7       | 1,466.53250 | 7       | 1,630.57417 |
| 8       | 977.68833 | 8       | 1,141.73000 | 8       | 1,305.77167 | 8       | 1,469.81333 | 8       | 1,633.85500 |
| 9       | 980.96917 | 9       | 1,145.01083 | 9       | 1,309.00250 | 9       | 1,473.09417 | 9       | 1,637.13583 |

Lengths—Meters to feet (from 1 to 1000 units)—Continued.

| Meters. | Feet.       |
|---------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| 500     | 1,640.41667 | 550     | 1,804.45833 | 600     | 1,968.50000 | 650     | 2,132.54167 | 700     | 2,296.58333 |
| 1       | 1,643.69750 | 1       | 1,807.73917 | 1       | 1,971.78083 | 1       | 2,135.82250 | 1       | 2,299.88417 |
| 2       | 1,646.97833 | 2       | 1,811.02000 | 2       | 1,975.06167 | 2       | 2,139.10333 | 2       | 2,303.14500 |
| 3       | 1,650.25917 | 3       | 1,814.30083 | 3       | 1,978.34260 | 3       | 2,142.38417 | 3       | 2,306.42583 |
| 4       | 1,653.54000 | 4       | 1,817.58167 | 4       | 1,981.02233 | 4       | 2,146.88600 | 4       | 2,309.70867 |
|         |             |         |             |         |             |         |             |         |             |
| 5       | 1,656.82083 | 5       | 1,820.86250 | 5       | 1,984.90417 | 5       | 2,148.94583 | 5       | 2,312.98750 |
| 6       | 1,660.10167 | 6       | 1,824.14333 | 6       | 1,988.18500 | 6       | 2,152.22667 | 6       | 2,316.26833 |
| 7       | 1,663.38250 | 7       | 1,827.42417 | 7       | 1,991.46583 | 7       | 2,156.50750 | 7       | 2,319.54917 |
| 8       | 1,666.66333 | 8       | 1,830.70500 | 8       | 1,994.74887 | 8       | 2,159.78833 | 8       | 2,322.83000 |
| 9       | 1,669.94417 | 9       | 1,833.98683 | 9       | 1,998.02760 | 9       | 2,162.06917 | 9       | 2,326.11088 |
|         |             |         |             |         |             |         |             |         |             |
| 510     | 1,673.22500 | 560     | 1,837.26667 | 610     | 2,001.30833 | 660     | 2,165.36000 | 710     | 2,329.39167 |
| 1       | 1,676.50583 | 1       | 1,840.54760 | 1       | 2,004.58917 | 1       | 2,168.63083 | 1       | 2,332.67250 |
| 2       | 1,679.78667 | 2       | 1,843.82833 | 2       | 2,007.87000 | 2       | 2,171.91167 | 2       | 2,335.95333 |
| 3       | 1,683.06750 | 3       | 1,847.10917 | 3       | 2,011.15083 | 3       | 2,175.19250 | 3       | 2,339.28417 |
| 4       | 1,686.34833 | 4       | 1,850.38000 | 4       | 2,014.43167 | 4       | 2,178.47333 | 4       | 2,342.51500 |
|         |             |         |             |         |             |         |             |         |             |
| 5       | 1,689.62917 | 5       | 1,863.67083 | 5       | 2,017.71260 | 5       | 2,181.75417 | 5       | 2,345.79583 |
| 6       | 1,692.91000 | 6       | 1,866.95167 | 6       | 2,020.99333 | 6       | 2,185.03500 | 6       | 2,349.07667 |
| 7       | 1,696.19083 | 7       | 1,860.22250 | 7       | 2,024.27417 | 7       | 2,188.31583 | 7       | 2,352.35750 |
| 8       | 1,699.47167 | 8       | 1,863.51333 | 8       | 2,027.55600 | 8       | 2,191.59867 | 8       | 2,355.83833 |
| 9       | 1,702.75250 | 9       | 1,866.79417 | 9       | 2,030.83683 | 9       | 2,194.87750 | 9       | 2,358.91917 |
|         |             |         |             |         |             |         |             |         |             |
| 520     | 1,706.08333 | 570     | 1,870.07500 | 620     | 2,034.11667 | 670     | 2,198.15833 | 720     | 2,362.20000 |
| 1       | 1,709.31417 | 1       | 1,873.35583 | 1       | 2,037.39750 | 1       | 2,201.43917 | 1       | 2,365.48083 |
| 2       | 1,712.59500 | 2       | 1,876.63667 | 2       | 2,040.67833 | 2       | 2,204.72000 | 2       | 2,368.76167 |
| 3       | 1,715.87583 | 3       | 1,879.91760 | 3       | 2,043.95917 | 3       | 2,208.00083 | 3       | 2,372.04250 |
| 4       | 1,719.15667 | 4       | 1,883.19833 | 4       | 2,047.24000 | 4       | 2,211.28167 | 4       | 2,375.32333 |
|         |             |         |             |         |             |         |             |         |             |
| 5       | 1,722.43750 | 5       | 1,886.47917 | 5       | 2,050.52083 | 5       | 2,214.56250 | 5       | 2,378.80417 |
| 6       | 1,725.71833 | 6       | 1,889.76000 | 6       | 2,053.80167 | 6       | 2,217.84333 | 6       | 2,381.88500 |
| 7       | 1,728.99917 | 7       | 1,903.08083 | 7       | 2,057.08250 | 7       | 2,221.12417 | 7       | 2,385.16583 |
| 8       | 1,732.28000 | 8       | 1,906.32167 | 8       | 2,060.36333 | 8       | 2,224.40500 | 8       | 2,388.44667 |
| 9       | 1,735.56083 | 9       | 1,909.60250 | 9       | 2,063.64417 | 9       | 2,227.68583 | 9       | 2,391.72750 |
|         |             |         |             |         |             |         |             |         |             |
| 530     | 1,738.84167 | 580     | 1,902.88333 | 630     | 2,064.02500 | 680     | 2,230.96667 | 730     | 2,395.00833 |
| 1       | 1,742.12250 | 1       | 1,906.10417 | 1       | 2,070.20583 | 1       | 2,234.24750 | 1       | 2,398.28917 |
| 2       | 1,745.40333 | 2       | 1,909.44500 | 2       | 2,073.48667 | 2       | 2,237.52833 | 2       | 2,401.67000 |
| 3       | 1,748.68417 | 3       | 1,912.72583 | 3       | 2,076.76750 | 3       | 2,240.80917 | 3       | 2,404.88083 |
| 4       | 1,751.96500 | 4       | 1,916.00687 | 4       | 2,080.08933 | 4       | 2,244.09000 | 4       | 2,408.13167 |
|         |             |         |             |         |             |         |             |         |             |
| 5       | 1,755.24583 | 5       | 1,919.28750 | 5       | 2,083.32917 | 5       | 2,247.37083 | 5       | 2,411.41250 |
| 6       | 1,758.52667 | 6       | 1,922.56833 | 6       | 2,086.61000 | 6       | 2,250.63167 | 6       | 2,414.69333 |
| 7       | 1,761.80750 | 7       | 1,925.84917 | 7       | 2,089.89083 | 7       | 2,253.93250 | 7       | 2,417.07417 |
| 8       | 1,765.08833 | 8       | 1,929.12000 | 8       | 2,093.17167 | 8       | 2,257.21333 | 8       | 2,421.26500 |
| 9       | 1,768.36917 | 9       | 1,932.41083 | 9       | 2,096.45260 | 9       | 2,260.49417 | 9       | 2,424.53583 |
|         |             |         |             |         |             |         |             |         |             |
| 540     | 1,771.65000 | 590     | 1,935.69167 | 640     | 2,099.73333 | 690     | 2,263.77500 | 740     | 2,427.81667 |
| 1       | 1,774.93083 | 1       | 1,938.97250 | 1       | 2,103.01417 | 1       | 2,267.05583 | 1       | 2,431.09760 |
| 2       | 1,778.21167 | 2       | 1,942.28333 | 2       | 2,106.29500 | 2       | 2,270.33667 | 2       | 2,434.37833 |
| 3       | 1,781.49250 | 3       | 1,945.58417 | 3       | 2,109.57583 | 3       | 2,273.61750 | 3       | 2,437.68617 |
| 4       | 1,784.77333 | 4       | 1,948.81500 | 4       | 2,112.85667 | 4       | 2,276.89833 | 4       | 2,440.94000 |
|         |             |         |             |         |             |         |             |         |             |
| 5       | 1,788.05417 | 5       | 1,952.09583 | 5       | 2,116.12750 | 5       | 2,280.17917 | 5       | 2,444.22088 |
| 6       | 1,791.33500 | 6       | 1,955.37667 | 6       | 2,119.41833 | 6       | 2,283.40000 | 6       | 2,447.50167 |
| 7       | 1,794.61583 | 7       | 1,958.65750 | 7       | 2,122.69917 | 7       | 2,286.74083 | 7       | 2,450.79260 |
| 8       | 1,797.89667 | 8       | 1,961.93833 | 8       | 2,125.98000 | 8       | 2,290.02167 | 8       | 2,454.06333 |
| 9       | 1,801.17750 | 9       | 1,965.21917 | 9       | 2,129.26083 | 9       | 2,293.30267 | 9       | 2,457.34417 |

## TRIANGULATION IN KANSAS.

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Lengths—Meters to feet (from 1 to 1000 units)—Continued.

| Motors. | Feet.       | Meters. | Feet.       | Motors. | Feet.       | Meters. | Feet.       | Motors. | Feet.       |
|---------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| 750     | 2,460.62500 | 800     | 2,624.60667 | 850     | 2,788.70833 | 900     | 2,952.75000 | 950     | 3,116.79167 |
| 1       | 2,463.00583 | 1       | 2,627.94750 | 1       | 2,791.08017 | 1       | 2,958.03083 | 1       | 3,120.07250 |
| 2       | 2,467.18667 | 2       | 2,631.22833 | 2       | 2,795.27000 | 2       | 2,960.31167 | 2       | 3,123.35333 |
| 3       | 2,470.40750 | 3       | 2,634.50917 | 3       | 2,798.55083 | 3       | 2,962.59250 | 3       | 3,126.63417 |
| 4       | 2,473.74833 | 4       | 2,637.79000 | 4       | 2,801.83167 | 4       | 2,965.87333 | 4       | 3,129.91500 |
| 5       | 2,477.02917 | 5       | 2,641.07083 | 5       | 2,805.11250 | 5       | 2,969.15417 | 5       | 3,133.19583 |
| 6       | 2,480.31000 | 6       | 2,644.35167 | 6       | 2,808.39333 | 6       | 2,972.43500 | 6       | 3,136.47667 |
| 7       | 2,483.50083 | 7       | 2,647.03250 | 7       | 2,811.67417 | 7       | 2,975.71583 | 7       | 3,139.75750 |
| 8       | 2,486.87167 | 8       | 2,650.91333 | 8       | 2,814.95500 | 8       | 2,978.99667 | 8       | 3,143.03833 |
| 9       | 2,490.15260 | 9       | 2,654.19417 | 9       | 2,818.23583 | 9       | 2,982.27750 | 9       | 3,146.31917 |
| 760     | 2,493.43333 | 810     | 2,657.47500 | 860     | 2,821.51667 | 910     | 2,985.55833 | 960     | 3,149.60000 |
| 1       | 2,496.71417 | 1       | 2,660.75583 | 1       | 2,824.79750 | 1       | 2,988.83917 | 1       | 3,152.88017 |
| 2       | 2,499.90500 | 2       | 2,664.03667 | 2       | 2,828.07833 | 2       | 2,992.12000 | 2       | 3,156.16167 |
| 3       | 2,503.27583 | 3       | 2,667.31750 | 3       | 2,831.35917 | 3       | 2,995.40083 | 3       | 3,159.44250 |
| 4       | 2,506.55667 | 4       | 2,670.59833 | 4       | 2,834.64000 | 4       | 2,998.08107 | 4       | 3,162.72333 |
| 5       | 2,509.83750 | 5       | 2,673.87917 | 5       | 2,837.92083 | 5       | 3,001.96250 | 5       | 3,166.00417 |
| 6       | 2,513.11833 | 6       | 2,677.10000 | 6       | 2,841.20167 | 6       | 3,005.24333 | 6       | 3,169.28500 |
| 7       | 2,516.39017 | 7       | 2,680.44083 | 7       | 2,844.48250 | 7       | 3,008.52417 | 7       | 3,172.56683 |
| 8       | 2,519.68000 | 8       | 2,683.72167 | 8       | 2,847.70333 | 8       | 3,011.80800 | 8       | 3,175.84087 |
| 9       | 2,522.99083 | 9       | 2,687.00250 | 9       | 2,851.04417 | 9       | 3,016.05833 | 9       | 3,179.12750 |
| 770     | 2,526.24167 | 820     | 2,690.28333 | 870     | 2,854.32500 | 920     | 3,018.30087 | 970     | 3,182.40833 |
| 1       | 2,529.52250 | 1       | 2,693.50417 | 1       | 2,857.68083 | 1       | 3,021.04750 | 1       | 3,185.68917 |
| 2       | 2,532.80333 | 2       | 2,696.84500 | 2       | 2,860.88667 | 2       | 3,024.92833 | 2       | 3,188.97000 |
| 3       | 2,536.08417 | 3       | 2,700.12583 | 3       | 2,864.16750 | 3       | 3,028.20017 | 3       | 3,192.25083 |
| 4       | 2,539.36500 | 4       | 2,703.40667 | 4       | 2,867.44833 | 4       | 3,031.49000 | 4       | 3,195.53167 |
| 5       | 2,542.04583 | 5       | 2,706.08750 | 5       | 2,870.72917 | 5       | 3,034.77083 | 5       | 3,198.81250 |
| 6       | 2,545.92067 | 6       | 2,709.90833 | 6       | 2,874.01000 | 6       | 3,038.05167 | 6       | 3,202.09333 |
| 7       | 2,549.20760 | 7       | 2,713.24017 | 7       | 2,877.29083 | 7       | 3,041.33250 | 7       | 3,205.37417 |
| 8       | 2,552.48833 | 8       | 2,716.53000 | 8       | 2,880.57167 | 8       | 3,044.01333 | 8       | 3,208.65500 |
| 9       | 2,555.76917 | 9       | 2,719.81083 | 9       | 2,883.85250 | 9       | 3,047.89417 | 9       | 3,211.03883 |
| 780     | 2,559.05000 | 830     | 2,723.09107 | 880     | 2,887.13333 | 930     | 3,051.17500 | 980     | 3,215.21667 |
| 1       | 2,562.33083 | 1       | 2,726.37250 | 1       | 2,890.41417 | 1       | 3,054.45583 | 1       | 3,218.49760 |
| 2       | 2,565.01107 | 2       | 2,729.65333 | 2       | 2,893.06500 | 2       | 3,057.73007 | 2       | 3,221.77833 |
| 3       | 2,568.89260 | 3       | 2,732.03417 | 3       | 2,896.97583 | 3       | 3,061.01750 | 3       | 3,225.05917 |
| 4       | 2,572.17333 | 4       | 2,736.21500 | 4       | 2,900.26607 | 4       | 3,064.20833 | 4       | 3,228.34000 |
| 5       | 2,575.45417 | 5       | 2,739.49583 | 5       | 2,903.53750 | 5       | 3,067.57917 | 5       | 3,231.62083 |
| 6       | 2,578.77360 | 6       | 2,742.77607 | 6       | 2,906.81833 | 6       | 3,070.80000 | 6       | 3,234.00167 |
| 7       | 2,582.01583 | 7       | 2,746.05750 | 7       | 2,910.09017 | 7       | 3,074.14083 | 7       | 3,238.18250 |
| 8       | 2,585.29667 | 8       | 2,749.33833 | 8       | 2,913.38000 | 8       | 3,077.42167 | 8       | 3,241.40333 |
| 9       | 2,588.57750 | 9       | 2,752.61917 | 9       | 2,916.60083 | 9       | 3,080.70260 | 9       | 3,244.74417 |
| 790     | 2,591.85833 | 840     | 2,755.00000 | 890     | 2,919.94167 | 940     | 3,083.98333 | 990     | 3,248.02500 |
| 1       | 2,595.13917 | 1       | 2,759.18083 | 1       | 2,923.22250 | 1       | 2,087.26417 | 1       | 3,251.30583 |
| 2       | 2,598.42000 | 2       | 2,762.46167 | 2       | 2,926.60333 | 2       | 3,090.64500 | 2       | 3,254.58667 |
| 3       | 2,601.70083 | 3       | 2,765.74250 | 3       | 2,929.78417 | 3       | 3,093.82583 | 3       | 3,257.88760 |
| 4       | 2,604.98107 | 4       | 2,769.02333 | 4       | 2,933.06500 | 4       | 3,097.10667 | 4       | 3,261.14833 |
| 5       | 2,608.28260 | 5       | 2,772.30417 | 5       | 2,936.34583 | 5       | 3,100.38750 | 5       | 3,264.42917 |
| 6       | 2,611.54333 | 6       | 2,775.58500 | 6       | 2,939.62667 | 6       | 3,103.60633 | 6       | 3,267.71000 |
| 7       | 2,614.82417 | 7       | 2,778.86683 | 7       | 2,942.90750 | 7       | 3,106.94917 | 7       | 3,270.99083 |
| 8       | 2,618.10500 | 8       | 2,782.14667 | 8       | 2,946.18833 | 8       | 3,110.23000 | 8       | 3,274.27167 |
| 9       | 2,621.38583 | 9       | 2,786.42750 | 9       | 2,949.40917 | 9       | 3,113.51083 | 9       | 3,277.55250 |

## GEOGRAPHIC POSITIONS.

*Thirty-ninth parallel.*

| Station.                 | Latitude<br>and<br>longitude. | Azimuth.                     | Back<br>azimuth.             | To station.                     | Loga-<br>rithm of<br>distance<br>in meters. | Meters.                          | Distance.                      |
|--------------------------|-------------------------------|------------------------------|------------------------------|---------------------------------|---|----------------------------------|--------------------------------|
| <i>Principal points.</i> |                               |                              |                              |                                 |   |                                  |                                |
| Bowler (Mo.), 1884...    | 38 53 16.076<br>04 23 39.564  |                              |                              |                                 |   |                                  |                                |
| Fulton (Mo.), 1883...    | 38 38 43.589<br>04 18 34.846  | 164 42 34.07                 | 344 39 22.06                 | Bowler.....                     | 4.4455213                                   | 27894.07                         | 91817.8                        |
| Berry (Mo.), 1884...     | 38 49 13.996<br>04 33 23.688  | 242 25 32.30<br>311 44 47.67 | 62 31 45.02<br>131 54 10.38  | Bowler.....<br>Fulton.....      | 4.2082854<br>4.4040420                      | 16154.20<br>29150.23             | 52999.2<br>95037.0             |
| Marty, 1884.....         | 38 59 22.786<br>04 40 15.041  | 295 09 51.60<br>332 42 35.51 | 115 20 17.24<br>152 46 47.57 | Bowler.....<br>Berry.....       | 4.4233814<br>4.3246128                      | 20508.27<br>21117.51             | 86909.2<br>69283.0             |
| Haskin, 1885.....        | 38 44 23.610<br>04 41 06.663  | 182 33 56.07<br>230 38 40.68 | 2 34 28.46<br>50 43 24.59    | Marty.....<br>Berry.....        | 4.433441<br>4.1502186<br>4.5355773          | 27755.18<br>14132.40<br>34322.37 | 91060.1<br>46366.3<br>112806.0 |
| Thomas, 1885.....        | 38 50 24.485<br>04 53 39.299  | 229 20 38.19<br>301 25 36.89 | 49 29 03.40<br>121 33 28.39  | Marty.....<br>Haskin.....       | 4.4067853<br>4.3284210                      | 25514.39<br>21302.06             | 83708.5<br>69888.5             |
| Eckman, 1885.....        | 39 02 32.453<br>05 00 06.343  | 281 25 47.64<br>337 24 57.90 | 101 38 17.61<br>157 29 01.17 | Marty.....<br>Thomas.....       | 4.4681429<br>4.3857228                      | 29251.15<br>24806.52             | 95068.1<br>79745.6             |
| Bebe Mound, 1887...      | 38 46 17.208<br>05 03 38.898  | 189 38 40.87<br>242 09 56.57 | 9 41 03.37<br>02 16 12.33    | Eckman.....<br>Thomas.....      | 4.4843486<br>4.2135939                      | 30503.42<br>16352.87             | 100076.6<br>63651.0            |
| Kanwaka, 1887.....       | 38 59 34.317<br>05 23 45.895  | 260 44 17.28<br>310 05 07.68 | 80 59 10.97<br>130 17 45.34  | Eckman.....<br>Bebe Mound ..... | 4.5389188<br>4.5807468                      | 34589.86<br>38084.37             | 113483.6<br>124948.5           |
| Simmons, 1887.....       | 38 47 04.033<br>05 26 04.119  | 188 11 23.33<br>232 32 44.84 | 8 12 50.13<br>52 49 03.18    | Kanwaka.....<br>Eckman.....     | 4.3684075<br>4.6738803                      | 23350.48<br>47193.29             | 76628.7<br>154833.3            |
| Elevation, 1887.....     | 38 58 59.096<br>05 45 40.887  | 267 55 10.50<br>307 44 11.39 | 88 08 57.84<br>127 50 30.08  | Kanwaka.....<br>Simmons.....    | 4.5006112<br>4.5552655                      | 31667.31<br>36914.14             | 103895.2<br>117828.3           |
| Mabon, 1887.....         | 38 47 49.467<br>05 47 09.485  | 186 53 46.17<br>237 09 14.77 | 5 54 41.79<br>57 23 56.09    | Elevation.....<br>Kanwaka.....  | 4.3172077<br>4.6042049                      | 20759.06<br>40206.37             | 08107.0<br>131910.4            |
| Powell, 1887.....        | 38 55 20.610<br>05 65 41.548  | 245 52 48.70<br>318 55 42.33 | 65 59 06.33<br>02 42 07.96   | Elevation.....<br>Mabon.....    | 4.2724513<br>4.2742513                      | 34599.15<br>18808.38             | 103292.8<br>61707.2            |
| Adams, 1888.....         | 39 02 40.968<br>06 04 24.369  | 284 06 23.18<br>310 32 36.71 | 104 18 10.39<br>136 38 05.62 | Elevation.....<br>Powell.....   | 4.4453252<br>4.2627067                      | 27882.08<br>18310.77             | 91476.5<br>60074.6             |
| Clark, 1888.....         | 38 51 58.932<br>06 07 15.463  | 191 44 22.91<br>247 10 32.50 | 11 46 10.48<br>67 33 05.94   | Adams.....<br>Elevation.....    | 4.3058329<br>4.5285234                      | 20222.41<br>33769.40             | 06346.4<br>110791.8            |
| Moyer, 1888.....         | 38 55 39.622<br>06 18 15.984  | 236 56 18.07<br>293 05 27.32 | 57 04 59.27<br>13 12 22.08   | Adams.....<br>Clark.....        | 4.3777226<br>4.2383200                      | 23862.87<br>17311.18             | 78200.1<br>50705.1             |
| Zean Dale, 1888.....     | 39 05 12.300<br>06 24 34.322  | 279 00 31.91<br>314 16 55.26 | 09 13 14.44<br>134 27 48.71  | Adams.....<br>Clark.....        | 4.4692440<br>4.5438711                      | 29460.77<br>30484.13             | 96655.9<br>114777.1            |
| Reinhard, 1888.....      | 38 52 07.050<br>06 53 52.731  | 208 59 07.70<br>253 43 33.72 | 20 04 58.95<br>73 53 21.94   | Moyer.....<br>Clark.....        | 4.3711818<br>4.5855534                      | 25400.17<br>38608.21             | 77119.8<br>126339.0            |
| Humboldt, 1889....       | 39 01 22.730<br>06 38 05.660  | 249 59 00.28<br>340 24 32.34 | 70 07 31.48<br>190 27 11.34  | Zean Dale.....<br>Reinhard..... | 4.3170925<br>4.2597316                      | 20753.56<br>18185.77             | 08089.0<br>58664.5             |
| Ericsson, 1889.....      | 39 11 26.067<br>06 42 43.382  | 203 41 09.77<br>340 14 43.99 | 113 52 37.18<br>160 17 30.15 | Zean Dale.....<br>Humboldt..... | 4.4500970<br>4.2850156                      | 28582.29<br>19766.85             | 03773.7<br>64848.5             |
| Robbins, 1890.....       | 38 58 52.001<br>06 47 54.600  | 197 48 15.01<br>251 47 23.32 | 17 51 31.23<br>71 53 33.98   | Ericsson.....<br>Humboldt.....  | 4.3768881<br>4.3768881                      | 24426.90<br>23815.96             | 80140.6<br>49303.9             |
| White City, 1888....     | 38 48 10.474<br>06 43 45.022  | 163 06 36.60<br>242 53 48.14 | 343 03 58.90<br>02 59 59.58  | Robbins.....<br>Reinhard.....   | 4.3154790<br>4.2052142                      | 20670.60<br>16040.36             | 67836.5<br>52625.7             |

## GEOGRAPHIC POSITIONS—Continued.

*Thirty-ninth parallel—Continued.*

| Station.                           | Latitude<br>and<br>longitude. | Azimuth.                     | Back<br>azimuth.             | To station.  | Loga-<br>rithm<br>of<br>distance<br>in meters.   | Meters.                                      | Distance.                                    |
|------------------------------------|-------------------------------|------------------------------|------------------------------|--|--|--|--|
|                                    |                               |                              |                              |  |  |  | Feet.  |
| <i>Principal points—Continued.</i> | ° ° ° ° ° ° ° °               | ° ° ° ° ° ° ° °              | ° ° ° ° ° ° ° °              |  |  |  |  |
| Taylor, 1880.....                  | 38 52 58.442<br>97 00 26.243  | 238 52 40.38<br>290 06 14.37 | 59 00 32.71<br>110 10 42.32  | Robbins.....<br>White City....   | 4.3249775<br>4.4103902                           | 21133.79<br>25727.07                         | 69336.4<br>84408.2                           |
| Wilmer, 1880.....                  | 39 07 16.239<br>97 02 21.830  | 254 39 47.46<br>306 38 24.05 | 74 52 11.46<br>120 47 30.43  | Ericsson.....<br>Robbins.....<br>Taylor.....                               | 4.4671764<br>4.4151200<br>4.4248364              | 29320.84<br>26008.78<br>20597.23             | 96100.8<br>85330.5<br>87201.1                |
| Frey, 1890.....                    | 30 01 27.109<br>97 10 23.355  | 227 02 53.63<br>317 20 30.49 | 47 07 57.26<br>137 32 45.89  | Wilmer.....<br>Taylor.....   | 4.1980417<br>4.3279647                           | 15810.36<br>21279.68                         | 51871.2<br>60815.0                           |
| Vine Creek, 1880.....              | 39 06 00.300<br>97 23 21.014  | 265 49 07.83<br>294 37 55.17 | 86 02 22.86<br>114 46 05.79  | Wilmer.....<br>Frey.....<br>Taylor.....                                    | 4.4822301<br>4.3138366<br>4.6134821              | 30355.02<br>20003.20<br>11065.97             | 99501.7<br>67596.0<br>134730.6               |
| Iron Mound, 1886.....              | 38 48 20.935<br>97 30 41.549  | 197 57 47.76<br>230 39 26.36 | 18 02 24.16<br>50 52 11.00   | Vine Creek....<br>Frey.....<br>Taylor.....                                 | 4.53477049<br>4.57854111<br>4.64888111           | 34253.50<br>37891.44<br>44553.42             | 112380.0<br>12415.5<br>146172.3              |
| Thompson, 1890.....                | 30 04 14.794<br>97 49 44.067  | 261 41 30.14<br>316 32 17.01 | -84 58 07.67<br>136 44 15.08 | Vine Creek...<br>Iron Mound...   | 4.5818489<br>4.6028824                           | 38181.14<br>40075.82                         | 125206.0<br>131482.1                         |
| North Pole Mound,<br>1890.         | 38 57 09.860<br>97 36 31.235  | 228 51 50.08<br>332 14 16.86 | 49 00 07.11<br>152 17 55.36  | Vine Creek....<br>Iron Mound....<br>Thompson....                           | 4.4011081<br>4.2530021<br>4.3644044              | 25183.03<br>18118.49<br>23142.19             | 82621.3<br>69427.3<br>75925.7                |
| Salina east base,<br>1895.         | 38 52 25.110<br>97 31 57.754  | 345 46 19.74<br>143 08 20.59 | 165 47 07.53<br>323 05 34.80 | Iron Mound...<br>North Pole<br>Mound.                                      | 3.8739878<br>4.0405304                           | 7481.14<br>10978.18                          | 24544.4<br>30017.6                           |
| Salina west base, 1895             | 38 51 07.674<br>97 36 10.840  | 177 28 50.39<br>228 38 47.96 | 357 28 43.58<br>68 39 01.06  | North Pole<br>Mound....<br>Salina east base                                | 4.0484285<br>3.8104085                           | 11170.66<br>6562.446                         | 36678.6<br>21497.5                           |
| Heath, 1890.....                   | 38 50 40.442<br>98 02 58.247  | 217 13 08.57<br>243 16 03.32 | 37 21 27.91<br>03 40 57.94   | Thompson....<br>Vine Creek....<br>North Pole<br>Mound....<br>Iron Mound... | 4.4991880<br>4.8057323<br>4.6029768              | 31563.71<br>63934.06<br>40084.51             | 103555.3<br>20975.7<br>131510.6              |
| Lincoln, 1891.....                 | 39 05 29.183<br>98 05 55.923  | 275 31 24.02<br>351 06 48.70 | 95 41 37.30<br>170 08 40.53  | Thompson....<br>Heath.....   | 4.3705480<br>4.4480713                           | 23471.89<br>27737.70                         | 77007.4<br>91003.0                           |
| Golden Belt, 1891....              | 38 58 42.872<br>98 18 24.488  | 235 05 58.82<br>255 57 27.70 | 55 13 50.26<br>76 15 30.98   | Lincoln.....<br>Thompson....<br>Heath.....                                 | 4.3411360<br>4.6207346<br>4.4284620              | 21934.92<br>42631.89<br>20820.24             | 71964.8<br>139468.1<br>87922.7               |
| Wilson, 1891.....                  | 38 51 50.913<br>98 20 15.608  | 230 56 08.33<br>233 02 42.57 | 51 02 57.34<br>53 17 22.94   | Golden Belt...<br>Lincoln.....<br>Heath.....                               | 4.3049773<br>4.0241919<br>4.5808577              | 20182.61<br>42091.20<br>38904.10             | 66215.8<br>138094.4<br>124980.4              |
| Meades Ranch, 1891..               | 39 13 26.686<br>98 32 30.506  | 290 53 50.41<br>314 30 36.47 | 111 10 37.33<br>134 49 12.64 | Lincoln.....<br>Heath.....<br>Golden Belt...<br>Wilson.....                | 4.6129954<br>4.7770682<br>4.5314959<br>4.0045764 | 41019.97<br>56933.30<br>34001.33<br>40232.35 | 134579.7<br>190031.2<br>111552.7<br>131905.6 |
| Bunker Hill, 1891....              | 38 52 16.436<br>98 42 20.476  | 199 51 29.13<br>272 18 47.22 | 10 57 40.79<br>02 28 59.81   | Meades Ranch...<br>Wilson.....   | 4.6197308<br>4.2773929                           | 41661.11<br>18940.56                         | 130083.2<br>62140.8                          |
| Waldo, 1892.....                   | 39 00 55.045<br>98 40 50.128  | 255 17 17.57<br>318 17 14.47 | 75 28 14.52<br>138 30 11.69  | Meades Ranch...<br>Wilson.....<br>Bunker Hill...                           | 4.4113352<br>4.6500421<br>4.5306549              | 25783.11<br>44734.45<br>34407.04             | 84590.1<br>146760.3<br>112885.7              |
| Blue Hill, 1892.....               | 38 58 57.310<br>98 05 57.933  | 228 48 22.76<br>240 45 31.84 | 48 58 32.70<br>61 08 37.98   | Waldo.....<br>Meades Ranch...<br>Bunker Hill...                            | 4.4890332<br>4.7418210<br>4.5000004              | 30870.87<br>55185.00<br>30312.86             | 101301.9<br>181052.8<br>119130.4             |
| Allen, 1892.....                   | 38 49 35.089<br>98 52 18.705  | 131 19 58.31<br>185 24 58.50 | 311 11 23.81<br>5 26 32.00   | Blue Hill.....<br>Waldo.....<br>Bunker Hill...                             | 4.4192905<br>4.5773694<br>4.1833810              | 20260.11<br>37789.35<br>15263.90             | 86155.0<br>123980.6<br>50045.5               |
| Fairmount, 1892....                | 38 40 30.165<br>99 00 18.666  | 106 28 22.67<br>214 24 45.88 | 346 24 48.09<br>34 20 45.05  | Blue Hill.....<br>Allen.....<br>Bunker Hill...                             | 4.5455361<br>4.3096355<br>4.5302006              | 35118.51<br>20400.25<br>33900.07             | 115218.0<br>6929.8<br>111220.5               |

## GEOGRAPHIC POSITIONS—Continued.

## Thirty-ninth parallel—Continued.

| Station.                           | Latitude<br>and<br>longitude. | Azimuth.                                     | Back<br>azimuth.                            | To station.  | Loga-<br>rithm of<br>distance<br>in meters. | Meters.                          | Distance.                       |
|------------------------------------|-------------------------------|--|---|--|---|----------------------------------|---------------------------------|
|                                    |                               |  |   |  |   | Feet.                            |                                 |
| <i>Principal points—Continued.</i> |                               |  |   |  |   |                                  |                                 |
| Hays, 1892.....                    | 38 54 51.841<br>99 16 16.771  | 243 01 04.68<br>285 34 52.00<br>318 49 37.10 | 63 07 33.69<br>105 49 54.48<br>138 50 38.04 | Blue Hill.....<br>Allen.....<br>Fairmount.....       | 4.2230921<br>4.5564539<br>4.5472107         | 10714.45<br>36012.55<br>37254.18 | 54837.3<br>118151.2<br>115663.1 |
| La Crosse, 1892.....               | 38 35 37.940<br>99 10 10.060  | 170 44 21.10<br>198 50 46.88<br>248 34 25.45 | 350 44 16.98<br>18 57 10.34<br>08 44 20.70  | Hays.....<br>Blue Hill.....<br>Fairmount.....        | 4.512270<br>4.6590576<br>4.3937077          | 35581.72<br>45006.74<br>24757.55 | 116737.7<br>149838.0<br>81225.4 |
| Smoky Hill, 1893.....              | 38 43 35.088<br>99 32 53.677  | 228 57 51.50<br>278 42 19.46<br>301 08 32.08 | 49 08 16.44<br>97 02 43.10<br>121 18 59.04  | Hays.....<br>Fairmount.....<br>La Crosse.....        | 4.5029910<br>4.6779070<br>4.4520799         | 31841.32<br>47632.97<br>28377.88 | 104486.1<br>156276.5<br>93103.1 |
| Trego, 1893.....                   | 38 53 55.551<br>99 38 15.907  | 266 45 32.75<br>337 51 28.51                 | 86 50 21.24<br>157 54 50.48                 | Hays.....<br>Smoky Hill.....                         | 4.5028649<br>4.3149583                      | 31832.07<br>20051.83             | 104435.7<br>67755.2             |
| Skaggs, 1893.....                  | 38 39 28.137<br>99 45 14.932  | 200 40 39.93<br>246 54 24.08<br>270 23 41.06 | 20 45 02.37<br>07 02 07.46<br>09 41 50.27   | Trego.....<br>Smoky Hill.....<br>La Crosse.....      | 4.4563060<br>4.2892052<br>4.6314524         | 28565.98<br>19465.48<br>42800.85 | 93818.6<br>63803.0<br>140422.5  |
| Big Creek, 1893.....               | 38 55 39.410<br>99 54 22.406  | 277 44 46.75<br>336 08 43.13                 | 97 54 53.89<br>156 14 26.10                 | Trego.....<br>Skaggs.....                            | 4.3711854<br>4.5150194                      | 23500.36<br>32735.53             | 77120.4<br>107399.8             |
| Schmidt, 1893.....                 | 38 41 46.498<br>100 03 17.173 | 206 37 25.90<br>238 06 54.36<br>279 10 07.27 | 26 43 01.10<br>58 18 35.01<br>99 21 23.59   | Big Creek.....<br>Trego.....<br>Skaggs.....          | 4.4585118<br>4.6297384<br>4.4233455         | 28741.06<br>42630.72<br>26500.03 | 94290.6<br>139884.0<br>86002.0  |
| Indian Creek, 1891....             | 38 52 02.084<br>100 28 32.632 | 262 05 47.01<br>297 17 30.75                 | 82 27 14.07<br>117 33 28.97                 | Big Creek.....<br>Schmidt.....                       | 4.6977321<br>4.0130124                      | 49857.08<br>41210.03             | 163574.7<br>135206.2            |
| Canyon, 1891.....                  | 38 39 25.301<br>100 20 14.715 | 171 63 25.86<br>236 40 35.11                 | 351 51 50.51<br>57 06 33.14                 | Indian Creek.....<br>Big Creek.....<br>Schmidt.....  | 4.3723091<br>4.7408582<br>4.5291065         | 23570.52<br>55002.79<br>33581.99 | 77330.9<br>180651.8<br>110170.9 |
| Beaver, 1891.....                  | 38 43 24.662<br>100 51 47.401 | 244 31 00.94<br>281 07 58.72                 | 64 45 34.82<br>101 23 50.82                 | Indian Creek.....<br>Canyon.....                     | 4.5711202<br>4.5771447                      | 37249.45<br>37709.80             | 122209.3<br>123910.4            |
| Monument, 1891.....                | 38 53 60.404<br>100 53 05.004 | 275 32 42.05<br>304 29 40.46                 | 05 48 00.69<br>124 46 35.38                 | Indian Creek.....<br>Canyon.....<br>Beaver.....      | 4.5523980<br>4.0744946<br>4.2010060         | 35077.84<br>47200.10<br>19573.42 | 117053.0<br>155052.6<br>64217.1 |
| Gopher, 1891.....                  | 38 59 27.457<br>101 09 29.915 | 293 12 36.32<br>310 00 57.25                 | 113 22 55.03<br>131 18 03.85                | Monument.....<br>Beaver.....                         | 4.4117000<br>4.5934461                      | 25808.33<br>39214.45             | 84072.8<br>128050.1             |
| Sheridan, 1891.....                | 38 51 33.573<br>101 21 16.871 | 220 18 21.19<br>283 41 01.64                 | 49 25 45.37<br>83 58 43.22                  | Gopher.....<br>Monument.....<br>Beaver.....          | 4.3510218<br>4.6128294<br>4.6550707         | 22439.94<br>41004.30<br>45287.33 | 73621.7<br>134528.3<br>148580.2 |
| Teeters Hill, 1891....             | 39 04 23.182<br>101 28 35.773 | 288 12 24.94<br>335 30 53.35                 | 108 24 30.55<br>150 40 12.16                | Gopher.....<br>Sheridan.....                         | 4.4028546<br>4.4140110                      | 29030.44<br>25978.37             | 95244.0<br>85230.7              |
| Wallace Bluffs, 1891.....          | 38 50 50.301<br>101 34 57.420 | 200 14 17.43<br>246 40 50.06                 | 20 18 17.41<br>66 56 58.70                  | Teeters Hill.....<br>Gopher.....<br>Sheridan.....    | 4.4235940<br>4.6023980<br>4.2970835         | 20521.59<br>40031.20<br>10810.08 | 87012.9<br>131335.7<br>65023.1  |
| Turtle, 1891.....                  | 39 01 17.931<br>101 45 25.750 | 250 40 32.90<br>297 11 07.66                 | 76 51 09.15<br>117 28 18.31                 | Teeters Hill.....<br>Sheridan.....<br>Wallace Bluffs | 4.3070768<br>4.5940893<br>4.3877590         | 24050.36<br>30272.57<br>24420.75 | 81858.0<br>128840.8<br>80120.4  |
| Curlew, 1891.....                  | 38 50 28.101<br>101 40 56.087 | 186 12 37.03<br>225 39 63.92                 | 6 13 35.07<br>45 51 26.11                   | Turtle.....<br>Teeters Hill.....<br>Wallace Bluffs   | 4.3057051<br>4.5818174<br>4.2398204         | 20219.25<br>30809.63<br>17370.82 | 66338.0<br>121389.8<br>56990.8  |
| McLane, 1891.....                  | 39 01 54.398<br>101 57 49.345 | 273 31 50.74<br>301 26 04.88                 | 93 38 44.90<br>121 40 27.15                 | Turtle.....<br>Wallace Bluffs<br>Curlew.....         | 4.2533830<br>4.5885391<br>4.4218004         | 17921.88<br>38773.80<br>20411.95 | 58708.7<br>127210.6<br>80053.2  |
| Arapahoe (Colo.), 1891             | 38 40 01.519<br>102 05 43.882 | 201 13 23.10<br>225 59 04.46                 | 21 18 21.15<br>40 11 49.31                  | McLane.....<br>Turtle.....<br>Curlew.....            | 4.4987257<br>4.6100980<br>4.4532012         | 31530.13<br>40747.11<br>28309.20 | 103445.1<br>133044.5<br>93103.4 |
| Monotony (Colo.), 1891.            | 39 01 44.752<br>102 14 58.020 | 269 13 17.61<br>297 10 24.06                 | 89 24 05.78<br>117 28 01.06                 | McLane.....<br>Curlew.....<br>Arapahoe.....          | 4.3037378<br>4.6589319<br>4.5052989         | 24759.27<br>45690.54<br>32100.08 | 81231.0<br>145034.6<br>105022.7 |

## GEOGRAPHIC POSITIONS—Continued.

*Thirty-ninth parallel—Continued.*

| Station.  | Latitude and longitude.      | Azimuth.  | Back azimuth.  | To station.  | Logarithm of distance in meters.                         | Meters.   | Feet.                                       |
|---|------------------------------|---|--|--|--|---|---|
| <i>Supplementary points.</i>  |                              |   |  |  |  |   |   |
| Independence courthouse, high cupola or tower (Mo.), 1884.                                    | 39 05 32.741<br>94 24 57.013 | 355 15 58.35<br>22 25 22.42   | 175 16 47.46<br>202 19 57.94   | Bowler.....<br>Berry.....<br>Marty.....  | 4.3578212<br>4.5137405<br>4.3951284                      | 22794.0<br>32039.3<br>24838.7                       | 74783<br>107084<br>81402                    |
| Kansas City Catholic Cathedral, Eleventh Street, between Broadway and Washington (Mo.), 1884. | 39 06 03.118<br>94 35 20.437 | 273 31 36.5<br>324 26 47.9<br>355 10 08.7<br>29 52 35.9<br>70 49 21.0   | 93 38 09.4<br>144 34 08.9<br>175 17 16.1<br>209 49 30.3<br>259 33 44.4 | Independence courthouse.<br>Bowler.....<br>Berry.....<br>Marty.....<br>Eckman..... | 4.175090<br>4.403102<br>4.404490<br>4.153315<br>4.550978 | 14096.2<br>29051.1<br>31224.1<br>14233.0<br>36300.0 | 49200<br>95312<br>102441<br>46698<br>119114 |
| Kansas City Second Presbyterian Church spire (Mo.), 1885.                                     | 39 05 55.813<br>94 35 13.448 | 272 41 54.75<br>30 55 25.85<br>80 13 08.76                              | 92 48 23.10<br>210 52 15.87<br>259 57 27.81                            | Independence courthouse.<br>Marty.....<br>Eckman.....                              | 4.1707387<br>4.1499601<br>4.5014808                      | 14816.3<br>14124.3<br>30432.3                       | 48610<br>46339<br>119528                    |
| Westport, College of Redemptorist Fathers (Mo.), 1884.  | 39 04 01.546<br>94 35 19.549 | 319 41 24.6<br>354 40 08.6<br>39 36 41.0                                | 139 48 44.9<br>174 41 15.2<br>219 33 34.9                              | Bowler.....<br>Berry.....<br>Marty.....  | 4.416281<br>4.439138<br>4.047434                         | 20078.4<br>27487.7<br>11154.1                       | 85559<br>90183<br>36595                     |
| Kansas City astronomical station (Mo.), 1882.   | 39 05 50.40<br>94 35 22.10   |   |  |  |  |   |   |
| Harrisonville Cumberland Presbyterian Church spire (Mo.), 1885.                               | 38 39 14.918<br>94 21 00.013 | 108 11 29.0<br>135 30 36.2<br>171 35 54.9<br>285 15 49.0                | 287 58 55.0<br>315 22 45.0<br>351 34 15.4<br>103 17 21.0               | Haskin.....<br>Berry.....<br>Bowler.....<br>Fulton.....                            | 4.486573<br>4.413706<br>4.418633<br>3.504256             | 30660.1<br>25924.2<br>26220.0<br>3606.5             | 100591<br>85053<br>80023<br>12029           |
| State line 3, stake, 1885.  | 38 46 20.761<br>94 36 30.102 | 61 36 44.4<br>167 20 53.5<br>218 32 17.7                                | 241 33 51.4<br>347 18 32.3<br>33 34 08.4                               | Haskin.....<br>Marty.....<br>Berry.....  | 3.880372<br>4.392993<br>3.834472                         | 7592.3<br>24716.8<br>6830.8                         | 24909<br>81092<br>22411                     |
| Belton South Methodist Church spire (Mo.), 1885.  | 38 48 32.750<br>94 31 49.882 | 60 17' 46.1<br>116 55 47.0<br>148 46 25.9<br>233 29 49.6<br>313 10 22.0 | 240 11 57.4<br>290 54 41.9<br>328 41 08.7<br>53 34 57.2<br>133 27 40.6 | Haskin.....<br>Berry.....<br>Marty.....<br>Bowler.....<br>Fulton.....              | 4.189806<br>3.448318<br>4.370170<br>4.107359<br>4.422341 | 15481.2<br>2808.8<br>23451.5<br>14701.4<br>20444.8  | 50791<br>9215<br>70940<br>48233<br>80761    |
| Missouri and Kansas Stateline 3, stone, 1885. <sup>1</sup>                                    | 38 46 02.85<br>94 36 30.10   | 170 59 23   | 350 50 23  | Stateline 3....  | 2.74207  | 552.16  | 1811.5                                      |
| Stateline 1, 1885 <sup>1</sup> ....   | 38 53 01.80<br>94 36 28.09   | 328 59 26<br>22 47 35   | 149 01 16<br>202 44 41   | Berry.....<br>Haskin.....  | 3.013532<br>4.238782                                     | 8104.7<br>17329.3                                   | 20885<br>56855                              |
| Missouri and Kansas Stateline 1, stone (Mo.), 1885. <sup>1</sup>                              | 38 53 01.56<br>94 36 28.11   | 117 32 54   | 297 32 54  | Stateline 1....  | 1.19031  | 15.82   | 51.9  |
| Base 1, 1885 <sup>1</sup> .....   | 38 50 27.48<br>94 36 50.18   | 345 31 14<br>88 17 00   | 105 33 21<br>268 14 55   | Berry.....<br>Marty.....   | 4.200836<br>3.080172                                     | 19536.9<br>4788.2                                   | 04097<br>15709                              |
| Base 2, 1885 <sup>1</sup> .....   | 38 50 19.15<br>94 36 59.80   | 198 43 00   | 18 43 08   | Base 1.....  | 2.43336  | 271.24  | 889.9                                       |
| Stateline 2, 1885 <sup>1</sup> ....   | 38 50 10.30<br>94 36 29.52   | 110 31 44<br>120 32 31  | 290 31 25<br>309 32 14   | Base 2.....<br>Base 1.....   | 2.80111<br>2.92022                                       | 778.2<br>832.2                                      | 2553<br>2730                                |
| Missouri and Kansas Stateline 2, stone, 1884. <sup>1</sup>                                    | 38 50 10.39<br>94 36 29.49   | 11 08 31  | 191 08 31  | Stateline 2....  | 0.4617   | 2.90  | 0.5   |
| Section line 1, 1885 <sup>1</sup> ..  | 38 50 35.04<br>94 40 02.81   | 37 55 13  | 217 55 05  | Marty.....   | 2.08034  | 479.0   | 1572  |
| Section line 2, 1885 <sup>1</sup> ..  | 38 50 08.84<br>94 40 02.88   | 145 45 51   | 325 45 43  | Marty.....   | 2.71030  | 520.4   | 1707  |
| Marty's house, lightning rod, 1884. <sup>1</sup>  | 38 50 36.27<br>94 40 18.43   | 275 46 38<br>348 54 34  | 95 46 48<br>168 54 36  | Section line 1..<br>Marty.....   | 2.57727<br>2.62720                                       | 377.8<br>423.8                                      | 1239<br>1390                                |

<sup>1</sup>No check on this position.

## GEOGRAPHIC POSITIONS—Continued.

*Thirty-ninth parallel—Continued.*

| Station.   | Latitude and longitude.      | Azimuth.   | Back azimuth.  | To station.  | Logarithm of distance in meters.                         | Distance.   |
|--|------------------------------|--|--|--|--|---|
| <i>Supplementary points—Continued.</i>                           | ° ° "                        | ° ° "  | ° ° "  |  |  |   |
| Lenexa Methodist Episcopal Church spire, 1885.                   | 38 57 45.236<br>94 44 21.174 | 44 44 50.7<br>111 21 36.3<br>243 03 39.0<br>315 14 10.6                | 224 39 00.1<br>291 11 41.5<br>63 06 13.9<br>135 20 57.2                | Thomas.....<br>Eckman.....<br>Marty.....<br>Berry.....                     | 4.281502<br>4.387514<br>3.822478<br>4.345097             | 19120.6<br>24407.0<br>6644.7<br>22181.8             |
| Olathe high school, 1885.  | 38 52 41.989<br>94 48 58.821 | 323 24 34.3<br>57 58 13.4<br>138 37 20.6                               | 143 29 30.2<br>237 53 17.4<br>318 30 26.9                              | Haskin.....<br>Thomas.....<br>Eckman.....                                  | 4.281716<br>3.902110<br>4.385367                         | 19130.0<br>7982.0<br>24286.0                        |
| Olathe Methodist Episcopal Church spire, 1885. <sup>1</sup>      | 38 52 50.54<br>94 49 08.39   | 55 26 07<br>226 40 38  | 235 23 17<br>46 46 14  | Thomas.....<br>Marty.....  | 3.899495<br>4.240003                                     | 7934.1<br>17644.2                                   |
| Olathe Deaf and Dumb Asylum, new chimney, 1887. <sup>1</sup>     | 38 52 58.95<br>94 48 45.78   | 60 11 00<br>137 14 38  | 240 01 40<br>317 07 30   | Bebe Mound..<br>Eckman.....  | 4.395329<br>4.382176                                     | 24850.1<br>24108.8                                  |
| Dennis barn cupola, 1885.  | 38 51 58.426<br>94 49 59.024 | 61 20 45.8<br>143 17 06.3<br>225 43 48.6                               | 241 18 28.2<br>323 10 44.9<br>45 49 55.9                               | Thomas.....<br>Eckman.....<br>Marty.....                                   | 3.780849<br>4.387508<br>4.293320                         | 6037.4<br>24406.6<br>19048.1                        |
| Ochiltree church cupola, 1887. <sup>1</sup>                      | 38 46 06.78<br>94 49 02.54   | 285 26 04<br>90 57 15  | 135 31 02<br>270 48 06   | Haskin.....<br>Bebe Mound..  | 4.076387<br>4.326493                                     | 11923.0<br>21158.9                                  |
| Spring Hill Methodist Church spire, 1887.                        | 38 44 34.316<br>94 49 41.630 | 98 59 59.2<br>152 02 34.8<br>271 28 32.6                               | 278 51 15.1<br>332 00 05.9<br>91 33 54.9                               | Bebe Mound..<br>Thomas.....<br>Haskin.....                                 | 4.310994<br>4.087810<br>4.094866                         | 20464.2<br>12226.7<br>12441.3                       |
| Spring Hill Presbyterian Church spire, 1887.                     | 38 44 38.424<br>94 49 40.340 | 151 46 13.6<br>271 46 48.8<br>98 48 24.9                               | 331 43 43.9<br>91 52 08.3<br>278 39 39.8                               | Thomas.....<br>Haskin.....<br>Bebe Mound..                                 | 4.085792<br>4.093842<br>4.311434                         | 12184.1<br>12412.0<br>20484.9                       |
| Gardner Methodist Church spire, 1887.                            | 38 48 33.600<br>94 55 29.799 | 70 26 37.5<br>165 34 57.9<br>217 55 46.4                               | 250 21 31.1<br>345 32 04.1<br>37 56 55.7                               | Bebe Mound..<br>Eckman.....<br>Thomas.....                                 | 4.097951<br>4.420697<br>3.637042                         | 12530.0<br>20711.4<br>4335.5                        |
| Gardner Catholic Church spire, 1887. <sup>1</sup>                | 38 48 33.74<br>94 55 38.97   | 70 09 18<br>219 43 26  | 250 04 16<br>39 44 40  | Bebe Mound..<br>Thomas.....  | 4.009223<br>3.647435                                     | 12368.7<br>4440.5                                   |
| Hesper schoolhouse belfry, 1885. <sup>1</sup>                    | 38 53 56.45<br>95 04 05.78   | 199 53 30<br>293 20 48   | 19 56 01<br>113 27 22  | Eckman.....<br>Thomas.....   | 4.228501<br>4.210341                                     | 16923.9<br>10426.6                                  |
| Edgerton Presbyterian Church spire, 1887. <sup>1</sup>           | 38 45 54.76<br>95 00 43.59   | 99 20 31<br>230 52 25  | 279 18 41<br>56 56 51  | Bebe Mound..<br>Thomas.....  | 3.632245<br>4.120275                                     | 4288.9<br>13190.9                                   |
| Blue Mound, 1887....   | 38 54 15.821<br>95 10 55.056 | 117 57 02.6<br>225 30 07.4<br>285 51 15.4<br>324 28 38.6               | 297 48 57.9<br>45 36 55.6<br>106 02 05.2<br>144 33 10.1                | Kanwaka.....<br>Eckman.....<br>Thomas.....<br>Bebe Mound..                 | 4.322232<br>4.339684<br>4.414436<br>4.258196             | 21000.6<br>21872.5<br>25987.9<br>18121.6            |
| Lawrence, Kansas State University, north dome, anerometer, 1887. | 38 57 25.632<br>95 14 37.467 | 40 54 07.8<br>106 46 41.6<br>245 87 53.7<br>293 04 38.3<br>322 19 51.2 | 220 46 58.8<br>286 46 50.6<br>65 47 01.9<br>113 17 48.3<br>142 26 44.4 | Simmons.....<br>Kanwaka.....<br>Eckman.....<br>Thomas.....<br>Bebe Mound.. | 4.403337<br>4.139414<br>4.361704<br>4.518295<br>4.415240 | 23312.6<br>13785.2<br>22998.7<br>32983.4<br>28016.0 |
| Lawrence water tower, pole, 1887.                                | 38 57 38.912<br>95 14 31.646 | 40 32 30.2<br>104 59 01.9<br>246 25 41.7<br>323 07 12.8                | 220 25 15.5<br>284 53 13.2<br>66 34 46.3<br>143 14 02.4                | Simmons.....<br>Kanwaka.....<br>Eckman.....<br>Bebe Mound..                | 4.410177<br>4.140129<br>4.366107<br>4.419245             | 25714.5<br>13808.0<br>22704.2<br>28257.0            |
| Carson, 1887.....  | 38 54 22.062<br>95 17 15.260 | 43 28 37.4<br>135 42 10.5<br>238 30 15.5<br>307 08 07.2                | 223 21 05.7<br>316 38 04.9<br>58 41 02.8<br>127 16 39.3                | Simmons.....<br>Kanwaka.....<br>Eckman.....<br>Bebe Mound..                | 4.268672<br>4.129083<br>4.462694<br>4.393060             | 18564.0<br>13461.2<br>29019.8<br>24720.7            |
| Le Compton, U. S. G. S., 1889. <sup>1</sup>                      | 39 00 01.38<br>95 24 22.99   | 313 04 00<br>5 49 14   | 133 04 24<br>186 48 11   | Kanwaka.....<br>Simmons.....   | 3.087018<br>4.381581                                     | 1221.9<br>24075.8                                   |
| Big Springs windmill, 1887. <sup>1</sup>                         | 39 00 41.02<br>95 28 44.78   | 285 56 03<br>82 45 51  | 105 59 11<br>262 35 12   | Kanwaka.....<br>Elevation.....   | 3.873928<br>4.391872                                     | 7480.5<br>24653.1                                   |

<sup>1</sup> No check on this position.

## GEOGRAPHIC POSITIONS—Continued.

Thirty-ninth parallel—Continued.

| Station.   | Latitude<br>and<br>longitude. | Azimuth.   | Back<br>azimuth.  | To station.   | Loga-<br>rithm of<br>distance<br>in meters.                          | Meters.   | Distance.  |
|--|-------------------------------|--|---|---|--|---|--|
|  |                               |  |   |   |  | Feet.   |  |
| <i>Supplementary points—Continued.</i>                               |                               |  |   |   |  |   |  |
| Roberts windmill,<br>1887.   | 38 59 58.242<br>95 31 02.426  | 85 08 45.9<br>278 59 45.3<br>343 12 16.0   | 264 59 33.2<br>94 03 20.0<br>163 16 23.3  | Elevation....<br>Kanwaka....<br>Simmons....   | 4.326746<br>4.022467<br>4.396460                                     | 21220.0<br>10530.9<br>24014.9                                 | 69619<br>31550<br>81742                              |
| Kellam's house<br>chimney, 1887.                                     | 38 56 22.830<br>95 31 45.398  | 54 41 39.8<br>103 33 40.1<br>242 50 36.9<br>334 24 52.8                              | 234 31 59.9<br>283 24 54.7<br>82 55 38.4<br>154 28 26.9                               | Mabon....<br>Elevation....<br>Kanwaka....<br>Simmons....                            | 4.426574<br>4.315682<br>4.112020<br>4.280406                         | 27235.9<br>20886.3<br>12969.4<br>19072.4                      | 89052<br>67808<br>42550<br>62573                     |
| Stenger, 1887.....   | 38 49 53.636<br>95 45 10.815  | 30 47 53.0<br>97 00 42.9<br>124 19 35.6<br>177 32 09.2<br>239 50 33.8<br>280 34 03.0 | 216 46 38.6<br>278 46 52.1<br>304 12 59.7<br>357 31 50.5<br>88 04 01.0<br>100 46 01.7 | Mabon....<br>Clark....<br>Powell....<br>Elevation....<br>Kanwaka....<br>Simmons.... | 3.670516<br>4.507534<br>4.284788<br>4.228229<br>4.553438<br>4.440536 | 4781.0<br>32176.1<br>18397.9<br>16835.6<br>35703.3<br>28153.7 | 15636<br>105564<br>60380<br>55235<br>117333<br>92368 |
| Carbondale school-<br>house (stone), cu-<br>pola, 1887.              | 38 49 07.096<br>95 41 13.707  | 74 28 59.4<br>101 08 21.7<br>119 20 24.8<br>160 35 47.8<br>279 40 59.3               | 254 23 16.4<br>284 03 52.9<br>290 20 20.1<br>340 33 00.0<br>99 60 29.2                | Mabon....<br>Stenger....<br>Powell....<br>Elevation....<br>Simmons....              | 3.949969<br>3.770627<br>4.380518<br>4.286844<br>4.347733             | 8911.9<br>5896.9<br>24017.0<br>19357.3<br>22270.7             | 29238<br>19347<br>78796<br>63508<br>73006            |
| Prominent wind-<br>mill, 1888. <sup>1</sup>                          | 38 47 38.08<br>95 40 48.85    | 02 06 22<br>123 23 03  | 272 02 24<br>303 20 19  | Mabon....<br>Stenger....  | 3.968339<br>3.87894  | 9191.6<br>7567.3  | 30156<br>24827                                       |
| Scranton school-<br>house, south end<br>cupola, 1888. <sup>1</sup>   | 38 46 54.18<br>95 43 56.26    | 110 05 51<br>161 59 54   | 290 03 50<br>341 59 07  | Mabon....<br>Stenger....  | 3.09594<br>3.76483   | 4965.2<br>5818.8  | 16290<br>19091                                       |
| Knox Knob, top, 1888.  | 39 00 34.696<br>95 44 10.854  | 36 19 18.6<br>64 37 23.1<br>97 42 15.5   | 216 18 21.9<br>244 22 52.9<br>277 29 31.4   | Elevation....<br>Clark....<br>Adams....   | 3.583311<br>4.567588<br>4.469067                                     | 3055.0<br>36946.1<br>29448.8                                  | 12003<br>121214<br>96817                             |
| Martins Hill, 1888....   | 39 03 47.946<br>95 45 40.394  | 0 04 35.1<br>55 04 28.9<br>85 43 41.4  | 180 04 34.8<br>234 50 52.3<br>265 31 53.1   | Elevation....<br>Clark....<br>Adams....   | 3.949747<br>4.580709<br>4.433049                                     | 8907.8<br>38081.1<br>27105.0                                  | 29223<br>124938<br>88927                             |
| Topeka Insane Asy-<br>lum cupola, 1887. <sup>1</sup>                 | 39 03 54.40<br>95 42 38.86    | 25 44 00<br>87 24 28   | 205 42 05<br>287 22 33  | Elevation....<br>Martins Hill....   | 4.00466<br>3.84110   | 10107.9<br>4370.2   | 33162<br>14358                                       |
| Topeka Methodist<br>Episcopal Church<br>spire, 1887.                 | 39 03 09.46<br>95 40 39.33    | 43 14 44<br>99 20 23   | 223 11 34<br>279 17 13  | Elevation....<br>Martins Hill....   | 4.02507<br>3.86543   | 10594.2<br>7335.6   | 34758<br>24067                                       |
| Topeka First Pres-<br>byterian Church<br>spire, 1887.                | 39 02 57.12<br>95 40 44.78    | 44 10 17<br>89 17 21<br>102 27 56  | 224 07 11<br>269 02 27<br>282 24 50   | Elevation....<br>Adams....<br>Martins Hill....                                      | 4.00980<br>4.63328<br>3.86208  | 10228.2<br>34141.3<br>7278.8                                  | 33557<br>112012<br>23881                             |
| Topeka State House,<br>west wing, flag-<br>staff, 1887. <sup>1</sup> | 39 02 53.71<br>95 40 42.17    | 44 50 03<br>103 09 19  | 224 46 55<br>283 06 11  | Elevation....<br>Martins Hill....   | 4.00850<br>3.86706   | 10197.6<br>7383.1   | 33457<br>24157                                       |
| Topeka State House,<br>west wing, cupola,<br>1887. <sup>1</sup>      | 39 02 53.52<br>95 40 41.51    | 44 55 16<br>103 10 18  | 224 52 08<br>283 07 10  | Elevation....<br>Martins Hill....   | 4.00880<br>3.86806   | 10204.7<br>7380.1   | 33480<br>24213                                       |
| Stone house center,<br>1888.   | 38 59 12.18<br>95 49 21.02    | 53 09 15<br>62 46 42<br>108 35 29<br>274 19 17                                       | 233 05 16<br>242 35 26<br>286 28 01<br>94 21 35                                       | Powell....<br>Clark....<br>Adams....<br>Elevation....                               | 4.05829<br>4.46408<br>4.35512<br>3.72061                             | 11436.4<br>29112.5<br>22682.7<br>5328.6                       | 37521<br>95513<br>74320<br>17482                     |
| White house on hill,<br>center chimney,<br>1888.                     | 38 50 57.68<br>95 53 30.79    | 95 29 53<br>150 24 53<br>217 17 19<br>279 15 29                                      | 275 21 16<br>339 23 31<br>37 22 14<br>90 20 43  | Clark....<br>Powell....<br>Elevation....<br>Stenger....                             | 4.30046<br>3.95221<br>4.27113<br>4.08704                             | 10973.8<br>3858.0<br>18609.4<br>12219.1                       | 65531<br>28390<br>61251<br>40089                     |
| Burlingame school-<br>house cupola, 1888.                            | 38 45 11.86<br>95 50 21.75    | 117 15 23<br>220 47 13<br>223 39 46  | 297 04 48<br>40 50 29<br>43 41 48   | Clark....<br>Stenger....<br>Mabon....   | 4.43910<br>4.05998<br>3.82739  | 27491.0<br>11481.0<br>6720.3                                  | 90193<br>37667<br>22048                              |
| Eskridge schoolhouse<br>cupola, 1888. <sup>1</sup>                   | 38 51 26.14<br>95 06 12.48    | 123 39 43<br>243 40 04   | 303 39 03<br>63 46 40   | Clark....<br>Powell....   | 3.261112<br>4.22938  | 1824.4<br>18958.2   | 5986<br>55637  |

<sup>1</sup> No check on this position.

## GEOGRAPHIC POSITIONS—Continued.

Thirty-ninth parallel—Continued.

| Station.  | Latitude and longitude.      | Azimuth.   | Back azimuth.  | To station.  | Logarithm of distance in meters.                         | Meters.  | Feet.                                     |
|---|------------------------------|--|--|--|--|--|---|
| <i>Supplementary points—Continued.</i>            | <i>° ° "</i>                 | <i>° ° "</i>   | <i>° ° "</i>   |  |  |  |   |
| Small house, 1888....                             | 38 53 26.58<br>96 06 50.29   | 12 39 40<br>191 35 52<br>251 20 51<br>256 41 26                        | 192 39 24<br>11 37 23<br>71 34 09<br>76 48 26                          | Clark.....<br>Adams.....<br>Elevation.....<br>Powell.....                    | 3.44230<br>4.24189<br>4.50849<br>4.21890                 | 2769.4<br>17453.8<br>32247.1<br>16653.9            | 9086<br>57263<br>105797<br>54311          |
| Buffalo Mound, azimuth mark, 1888.                | 39 03 42.898<br>96 04 24.034 | 359 48 30.0<br>95 31 20.5  | 179 48 30.8<br>275 18 38.0   | Adams.....<br>Zean Dale.....   | 3.280092<br>4.405521                                     | 1909.8<br>29209.3                                  | 6266<br>95831                             |
| St. Mary's Catholic Church spire, 1888.           | 39 11 31.100<br>96 03 56.199 | 311 16 54.2<br>2 22 22.6<br>08 39 42.5                                 | 131 28 24.8<br>162 22 04.8<br>248 26 41.0                              | Elevation.....<br>Adams.....<br>Zean Dale.....                               | 4.545085<br>4.213838<br>4.504432                         | 35082.1<br>16362.1<br>31047.1                      | 115099<br>53681<br>104813                 |
| Moss Springs, Morgan's barn ventilator, 1888.     | 38 53 30.74<br>96 31 58.52   | 46 51 29<br>206 15 26<br>258 35 21                                     | 226 50 18<br>26 20 05<br>78 43 58                                      | Reinhard.....<br>Zean Dale.....<br>Meyer.....                                | 3.57073<br>4.38259<br>4.30563                            | 3773.4<br>24131.8<br>20213.0                       | 12380<br>70172<br>68315                   |
| Newbury Catholic Church spire, 1888. <sup>1</sup> | 39 05 05.40<br>96 10 27.28   | 297 00 42<br>90 40 25  | 117 04 31<br>270 31 31   | Adams.....<br>Zean Dale.....   | 3.99104<br>4.30876                                       | 9795.8<br>20359.2                                  | 32138<br>60795                            |
| Abernathy's windmill, 1888.                       | 38 51 26.33<br>96 32 17.23   | 70 03 24<br>118 36 38<br>203 35 20                                     | 249 56 11<br>298 35 37<br>23 40 11                                     | White City....<br>Reinhard.....<br>Zean Dale.....                            | 4.24687<br>3.41875<br>4.44407                            | 17655.1<br>2022.7<br>27801.6                       | 57023<br>8005<br>91212                    |
| United Brethren Church cupola, 1889. <sup>1</sup> | 38 56 33.71<br>96 33 41.00   | 1 58 04<br>144 28 03   | 181 57 57<br>324 26 17   | Reinhard.....<br>Humboldt.....   | 3.91529<br>4.03961                                       | 8227.9<br>10954.9                                  | 26994<br>35941                            |
| Dwight windmill, 1888. <sup>1</sup>               | 38 50 55.71<br>96 35 11.53   | 67 41 04<br>220 48 40  | 247 35 42<br>40 49 29  | White City....<br>Reinhard.....  | 4.12090<br>3.40339                                       | 13393.7<br>2006.6                                  | 43942<br>9536                             |
| Dwight M. E. Church cupola, 1888. <sup>1</sup>    | 38 50 42.58<br>96 35 36.22   | 68 21 04<br>223 45 36  | 248 15 58<br>43 46 41  | White City....<br>Reinhard.....  | 4.10340<br>3.55712                                       | 12690.0<br>3606.8                                  | 41034<br>11833                            |
| White City school-house cupola, 1889.             | 38 47 49.350<br>96 43 56.459 | 111 51 07.0<br>164 19 54.7<br>202 57 31.7<br>241 19 33.7               | 291 40 48.1<br>344 17 25.2<br>22 57 38.7<br>61 25 52.2                 | Taylor.....<br>Robbins.....<br>White City....<br>Reinhard.....               | 4.409995<br>4.326838<br>2.840703<br>4.219821             | 25703.7<br>21224.5<br>707.5<br>10580.0             | 84330<br>09034<br>2321<br>54426           |
| White City Baptist Church spire, 1889.            | 38 47 36.948<br>96 44 06.791 | 112 51 05.4<br>165 14 38.0<br>200 56 03.1<br>240 35 47.0               | 292 40 51.0<br>345 12 15.0<br>26 56 16.6<br>60 42 12.0                 | Taylor.....<br>Robbins.....<br>White City....<br>Reinhard.....               | 4.408553<br>4.333000<br>3.064311<br>4.230261             | 25618.5<br>21258.1<br>1159.6<br>10992.6            | 84050<br>70030<br>3804<br>55750           |
| Fort Riley reservoir, top, 1889.                  | 39 04 14.044<br>96 47 28.905 | 3 32 56.1<br>41 58 09.2<br>104 42 31.7<br>207 15 00.4<br>291 19 26.3   | 183 32 39.9<br>221 50 00.3<br>284 33 08.8<br>27 18 00.8<br>111 25 21.2 | Robbins.....<br>Taylor.....<br>Wilmer.....<br>Ericssen.....<br>Humboldt..... | 3.998020<br>4.447399<br>4.345779<br>4.175175<br>4.162766 | 9968.4<br>28015.5<br>22170.7<br>14968.4<br>14540.4 | 32705<br>01914<br>72738<br>49109<br>47724 |
| Hollinger's house cupola, 1889. <sup>1</sup>      | 38 53 57.96<br>96 58 22.16   | 58 28 17<br>106 50 50  | 238 20 59<br>346 48 19   | Taylor.....<br>Wilmer.....   | 3.545154<br>4.402808                                     | 3508.8<br>25281.8                                  | 11512<br>82945                            |
| Grand View school-house belfry, 1889.             | 39 01 07.733<br>96 48 14.047 | 353 37 05.3<br>49 30 30.7<br>119 13 22.8<br>202 35 29.4<br>208 08 12.2 | 173 37 17.7<br>229 22 50.0<br>290 04 28.6<br>22 38 58.0<br>88 14 35.5  | Robbins.....<br>Taylor.....<br>Wilmer.....<br>Ericssen.....<br>Humboldt..... | 3.624446<br>4.365599<br>4.367923<br>4.315069<br>4.105024 | 4211.6<br>23205.9<br>23330.4<br>20657.1<br>14042.8 | 13818<br>76135<br>76543<br>67773<br>49041 |
| Abilene Catholic College cupola, 1890.            | 38 56 35.246<br>97 12 54.456 | 59 54 10.5<br>139 27 22.7<br>201 59 07.4<br>290 16 58.5                | 239 43 00.6<br>319 20 47.0<br>22 00 42.4<br>110 24 48.3                | Iron Mound....<br>Vine Creek....<br>Froy.....<br>Taylor.....                 | 4.473024<br>4.365391<br>3.987171<br>4.283398             | 29759.4<br>23194.8<br>9708.9<br>19226.4            | 97636<br>70098<br>31853<br>63079          |
| German Lutheran church spire, 1892.               | 38 42 53.948<br>98 54 44.316 | 61 07 44.1<br>105 49 44.5<br>200 57 59                                 | 241 04 16.3<br>15 51 15.7<br>21 01 17                                  | Fairmount.....<br>Allen.....<br>Russell NW. base.                            | 3.902559<br>4.109818<br>4.327083                         | 9174.0<br>12877.1<br>21236.8                       | 30098<br>42248<br>69674                   |
|   |                              | 215 02 53  | 35 07 40   | Russell SE. base.  | 4.282325   | 19156.9  | 62851                                     |

<sup>1</sup> No check on this position.

## GEOGRAPHIC POSITIONS—Continued.

*Thirty-ninth parallel*—Continued.

| Station.  | Latitude<br>and<br>longitude. | Azimuth.  | Back<br>azimuth.  | To station.   | Loga-<br>rithm of<br>distance<br>in meters.               | Meters.                                  | Distance.                           |
|---|-------------------------------|---|---|---|---|--|-------------------------------------|
| <i>Supplementary points—Continued.</i>                    |                               |   |   |   |   |  |                                     |
| Ellsworth water tower pole, 1891.                         | 38 44 10.400<br>98 13 55.321  | 29 10 10.5<br>122 40 45.2<br>232 45 53.2<br>311 52 07.0 | 209 00 53.0<br>302 31 08.7<br>52 52 44.8<br>132 00 50.4 | Bossing.....<br>Wilson.....<br>Heath.....<br>Sherman.....                       | 4.195598<br>4.420043<br>4.208921<br>4.435074              | 15689.1<br>26357.4<br>19903.1<br>27231.7 | 51473<br>86474<br>65299<br>89343    |
| Ellsworth astronomical station, 1891.                     | 38 43 48.76<br>98 13 44.98    | 159 29 28.4   | 339 29 21.9   | Ellsworth water tower.  | 2.85280   | 712.5                                    | 2338                                |
| Ellsworth north base, 1891.                               | 38 43 57.51<br>98 13 38.74    | 29 00 59<br>134 47 34                                   | 209 00 55<br>314 47 24                                  | Ellsworth astronomical station.<br>Ellsworth water tower.                       | 2.49018<br>2.75132  | 309.2<br>564.0                           | 1014<br>1850                        |
| Ellsworth south base, 1891.                               | 39 43 52.21<br>98 13 44.28    | 9 06 17<br>154 34 30<br>219 14 25                       | 180 00 16<br>334 34 23<br>39 14 20                      | Ellsworth astronomical station.<br>Ellsworth water tower.<br>Ellsworth N. base. | 2.03232<br>2.70320<br>2.32475                             | 107.7<br>621.2<br>211.23                 | 353<br>2038<br>603.0                |
| Ellsworth school-house cupola, 1890.                      | 38 43 50.06<br>98 13 44.13    | 27 18 26<br>176 54 02<br>209 29 16                      | 207 16 25<br>356 54 02<br>29 29 19                      | Ellsworth astronomical station.<br>Ellsworth S. base.<br>Ellsworth N. base.     | 1.65358<br>1.82239<br>2.42185                             | 45.0<br>66.4<br>264.1                    | 148<br>218<br>860                   |
| Salina west baseline-station, 1890. <sup>1</sup>          | 38 51 07.67<br>97 38 10.51    | 90 00   | 270 00  | Salina W. base.   | 0.89597   | 7.87                                     | 25.8                                |
| Salina, Phillip's house, dome, 1890.                      | 38 50 20.26<br>97 34 52.83    | 140 15 11<br>299 16 49<br>01 21 27                      | 320 05 51<br>119 19 26<br>270 43 50                     | Thompson.....<br>Iron Mound.....<br>Heath.....                                  | 4.525148<br>3.842040 <sup>2</sup><br>4.600082             | 33508.0<br>6951.0<br>40052.0             | 100034<br>22805<br>133372           |
| Salina, St. John's Military College, vane on tower, 1890. | 38 51 45.51<br>97 36 30.95    | 140 29 58<br>305 33 30<br>87 08 15                      | 320 21 39<br>125 37 09<br>200 51 39                     | Thompson.....<br>Iron Mound.....<br>Heath.....                                  | 4.470745<br>4.015470<br>4.583506                          | 20974.0<br>10382.8<br>38827.1            | 98340<br>33999<br>125745            |
| Salina paper mill, tall brick chimney, 1895.              | 38 50 54.29<br>97 35 55.80    | 138 41 38<br>175 47 13<br>300 23 43                     | 318 41 28<br>355 46 51<br>120 27 00                     | Salina west buso.<br>North Pole Mound.<br>Iron Mound..                          | 2.739881<br>4.064041<br>3.944022                          | 549.4<br>11612.9<br>8700.7               | 1802<br>38100<br>28841              |
| Soldier Cap Mound, 1890. <sup>1</sup>                     | 38 42 58.46<br>97 47 51.84    | 176 04 43<br>247 34 20                                  | 360 03 32<br>87 45 05                                   | Thompson.....<br>Iron Mound...  | 4.590052<br>4.429643                                      | 39450.5<br>20893.2                       | 129431<br>88232                     |
| Sugar Loaf Mound, rock pile, 1890.                        | 38 49 28.37<br>97 55 50.04    | 102 10 52<br>163 50 19<br>197 50 17<br>272 42 11        | 282 06 23<br>333 43 57<br>17 54 07<br>92 57 57          | Heath.....<br>Lincoln.....<br>Thompson.....<br>Iron Mound ..                    | 4.023851<br>4.518848<br>4.453185<br>4.501540              | 10501.5<br>33025.4<br>28720.0<br>36437.5 | 34660<br>108351<br>94226<br>119545  |
| Lincoln College cupola, 1891.                             | 39 01 59.80<br>98 08 50.84    | 337 54 14<br>06 18 09<br>121 58 19                      | 157 57 55<br>248 12 08<br>301 43 23                     | Heath.....<br>Golden Belt.....<br>Meades Ranch.                                 | 4.354201<br>4.178301<br>4.603016                          | 22804.8<br>15070.0<br>40143.6            | 74103<br>40474<br>131704            |
| Turkey Point, 1891..                                      | 38 50 17.33<br>98 10 45.08    | 112 00 00<br>202 15 04<br>234 00 57<br>312 38 26        | 292 04 11<br>22 18 06<br>64 14 11<br>132 43 19          | Golden Belt...<br>Lincoln.....<br>Thompson.....<br>Heath.....                   | 4.076417<br>4.204583<br>4.528134 <sup>3</sup><br>4.185374 | 11923.9<br>18390.1<br>33798.1<br>15324.1 | 30120<br>60335<br>110692<br>50276   |
| Small peak, 1891....                                      | 39 15 22.39<br>98 27 11.91    | 300 44 08<br>337 38 24<br>3 55 00<br>04 59 40           | 120 57 35<br>157 41 57<br>183 53 42<br>244 56 24        | Lincoln.....<br>Golden Belt...<br>Wilson.....<br>Meades Ranch.                  | 4.552388<br>4.522776<br>4.039759<br>3.925901              | 35677.0<br>33225.4<br>33027.4<br>8432.6  | 117050<br>109335<br>110326<br>27088 |
| Lone tree (cotton-wood), 1891. <sup>1</sup>               | 39 03 36.31<br>97 59 48.92    | 71 27 54<br>111 33 53                                   | 251 16 11<br>291 30 01                                  | Golden Belt...<br>Lincoln.....  | 4.452110<br>3.970979                                      | 28321.5<br>9483.7                        | 92913<br>31114                      |

<sup>1</sup> No check on this position.

## GEOGRAPHIC POSITIONS—Continued.

Thirty-ninth parallel—Continued.

| Station.  | Latitude<br>and<br>longitude. | Azimuth.  | Back<br>azimuth.   | To station.  | Loga-<br>rithm of<br>distance<br>in meters.                          | Meters.   | Feet.  |
|---|-------------------------------|---|--|--|--|---|--|
| <i>Supplementary points—Continued.</i>                        |                               |   |  |  |  |   |  |
| Bunker Hill water tower, 1892.                                | 38 52 15.48<br>98 42 18.17    | 50 13 06<br>71 15 37<br>110 02 26<br>161 38 32<br>272 13 51             | 230 01 51<br>251 09 20<br>289 47 33<br>341 33 48<br>02 22 02           | Fairmount....<br>Allen.....<br>Blue Hill.....<br>Waldo.....<br>Wilson.....                     | 4.530502<br>4.184600<br>4.500794<br>4.537229<br>4.276088             | 33923.6<br>15296.8<br>36374.2<br>34453.2<br>18883.7           | 111298<br>50188<br>119338<br>113035<br>61954         |
| Bunker Hill Methodist Church spire, 1892.                     | 38 52 34.29<br>98 42 08.46    | 69 32 01<br>160 57 45<br>274 02 17                                      | 249 25 38<br>340 52 54<br>94 10 22                                     | Allen.....<br>Waldo.....<br>Wilson.....  | 4.190234<br>4.531207<br>4.271418                                     | 15712.1<br>33978.7<br>18081.8                                 | 51549<br>111478<br>61292                             |
| Bunker Hill school-house cupola, 1892.                        | 38 52 34.81<br>98 42 01.34    | 69 41 51<br>160 40 52<br>199 31 27<br>274 07 34                         | 249 35 24<br>340 35 57<br>19 37 27<br>04 15 35                         | Allen.....<br>Waldo.....<br>Meades Ranch.<br>Wilson.....                                       | 4.200817<br>4.531734<br>4.612491<br>4.267450                         | 15878.8<br>34020.1<br>40878.1<br>18511.9                      | 52096<br>111614<br>134114<br>60734                   |
| Bunker Hill flouring mill iron chimney, 1892.                 | 38 52 30.80<br>98 42 24.02    | 49 27 24<br>69 25 06<br>161 37 02                                       | 229 18 13<br>249 18 53<br>341 32 21                                    | Fairmount....<br>Allen.....<br>Waldo.....  | 4.533007<br>4.185338<br>4.630973                                     | 34119.8<br>15322.8<br>33960.4                                 | 111041<br>50272<br>111418                            |
| Russell tripod, 1892..  | 38 54 39.51<br>98 48 54.96    | 294 51 35<br>27 41 08<br>177 19 01                                      | 114 55 43<br>207 39 00<br>357 18 26                                    | Bunker Hill...<br>Allen.....<br>Waldo.....   | 4.020404<br>4.024410<br>4.451514                                     | 10481.0<br>10578.2<br>28282.3                                 | 34386<br>34705<br>92790                              |
| Russell high school cupola pole, 1892.                        | 38 53 19.51<br>98 51 40.44    | 116 50 25<br>184 55 44<br>218 20 10<br>278 09 03<br>7 37 04<br>27 45 17 | 206 41 26<br>4 50 53<br>38 42 15<br>98 14 54<br>187 36 40<br>207 39 54 | Blue Hill.....<br>Waldo.....<br>Meades Ranch.<br>Bunker Hill...<br>Allen.....<br>Fairmount.... | 4.384199<br>4.489008<br>4.668248<br>4.134714<br>3.842802<br>4.428079 | 23131.2<br>30832.4<br>46371.3<br>13630.2<br>6963.1<br>26790.6 | 75890<br>101156<br>152137<br>44738<br>22845<br>87915 |
| Russell northwest base, 1892.                                 | 38 53 36.93<br>98 49 29.00    | 283 28 32<br>28 49 37<br>112 36 52<br>179 02 16                         | 103 33 01<br>208 47 50<br>292 20 30<br>359 02 03                       | Bunker Hill...<br>Allen.....<br>Blue Hill....<br>Waldo.....                                    | 4.026250<br>3.928910<br>4.411376<br>4.470701                         | 10623.1<br>8490.0<br>25785.5<br>30185.0                       | 34853<br>27854<br>84598<br>99032                     |
| Russell south east base, 1892.                                | 38 51 22.30<br>98 47 08.07    | 66 20 03<br>117 22 07<br>140 43 05<br>173 32 05<br>250 26 19            | 246 16 48<br>297 10 17<br>320 41 36<br>353 30 24<br>76 20 20           | Allen.....<br>Blue Hill....<br>Russell north-<br>west base.<br>Waldo.....                      | 3.912819<br>4.488045<br>3.729321<br>4.538486<br>3.853213             | 8181.2<br>30022.8<br>5364.1<br>34553.0<br>7132.0              | 26841<br>100468<br>17600<br>113363<br>23399          |
| Russell north school tall cupola, 1892.                       | 38 53 53.99<br>98 51 32.10    | 280 02 45<br>282 42 03<br>306 17 30<br>184 43 12                        | 100 04 02<br>102 47 49<br>126 20 15<br>4 44 18                         | Russell north-<br>west base.<br>Bunker Hill...<br>Russell south-<br>east base.<br>Waldo.....   | 3.478980<br>4.134543<br>3.897543<br>4.473570                         | 3012.9<br>13631.5<br>7898.5<br>29755.7                        | 9885<br>44723<br>25014<br>97623                      |
| Blue Hill, U. S. G. S., 1891. <sup>1</sup>                    | 39 20 29.61<br>98 18 59.83    | 325 49 25<br>358 47 26  | 145 57 41<br>178 47 49   | Lincoln.....<br>Golden Bell...   | 4.525527<br>4.805379   | 33537.2<br>40306.9  | 110030<br>132240                                     |
| Russell southeast base astronomic station, 1892. <sup>1</sup> | 38 51 22.30<br>98 47 07.81    | 90  | 270  | Russell south-<br>east base.   | 0.78958  | 6.16  | 20.2   |
| New Cambria church (stone), white spire, 1890. <sup>1</sup>   | 38 52 44.04<br>97 30 24.78    | 2 57 18<br>132 54 30  | 182 57 07<br>312 50 40   | Iron Mound...<br>North Pole<br>Mound.  | 3.894658<br>4.080887   | 7846.2<br>12047.2   | 25742<br>36525                                       |
| Section 31, T. 13, R. 12, SW.cor., stone, 1891. <sup>1</sup>  | 38 52 15.02<br>98 42 22.88    | 232 53 37   | 52 53 39   | Bunker Hill....  | 1.86096  | 72.6  | 238  |
| Section 13, T. 11, R. 1, NW.cor., stone, 1886. <sup>1</sup>   | 39 00 52.08<br>97 23 22.70    | 352 19 48   | 172 19 48  | Vine Creek....   | 2.15305  | 142.2   | 467  |
| Section 22, T. 14, R. 14, NW.cor., stone, 1892. <sup>1</sup>  | 38 49 38.06<br>98 52 23.47    | 302 27 11   | 122 27 14  | Allen.....   | 2.13413  | 130.2   | 447  |

<sup>1</sup> No check on this position.

## GEOGRAPHIC POSITIONS—Continued.

Thirty-ninth parallel—Continued.

| Station.   | Latitude<br>and<br>longitude. | Azimuth.  | Back<br>azimuth.  | To station.   | Loga-<br>rithm of<br>distance<br>in meters.              | Meters.   | Distance.                                    |
|--|-------------------------------|---|---|---|--|---|--|
| <i>Supplementary points—Continued.</i>                               |                               |   |   |   |  |   |  |
| Gorham elevator,<br>1892.  | 38 52 52.090<br>99 01 21.654  | 33 59 48.0<br>99 44 40.2<br>149 24 17.1<br>294 50 38.5<br>350 04 27.5 | 213 50 33.2<br>278 35 18.4<br>329 21 23.6<br>114 56 19.1<br>176 05 08.2 | La Crosse.....<br>Hays.....<br>Blue Hill.....<br>Allen.....<br>Fairmount..... | 4.584904<br>4.340073<br>4.116122<br>4.159351<br>4.360784 | 38450.7<br>21881.3<br>13065.4<br>14432.8<br>22950.1 | 126150<br>71789<br>42865<br>47353<br>75295   |
| Walker schoolhouse<br>cupola, 1892.                                  | 38 52 09.717<br>99 04 28.270  | 20 03 33.8<br>100 22 52.6<br>170 15 28.2<br>285 02 38.7               | 208 56 14.7<br>286 15 27.8<br>350 14 31.9<br>105 16 18.4                | La Crosse.....<br>Hays.....<br>Blue Hill.....<br>Allen.....                   | 4.543639<br>4.250216<br>4.105613<br>4.260628             | 34965.4<br>17791.0<br>12753.0<br>18223.3            | 114716<br>58371<br>41840<br>50788            |
| Hertzog Catholic<br>Church tower, 1892.                              | 38 51 23.044<br>99 09 01.355  | 19 35 58.3<br>121 34 04.1<br>197 29 30.0<br>327 46 30.2               | 100 31 30.1<br>301 29 30.8<br>173 21 25.3<br>147 51 58.8                | La Crosse.....<br>Hays.....<br>Blue Hill.....<br>Fairmount.....               | 4.490335<br>4.090335<br>4.106976<br>4.376320             | 30928.1<br>12312.2<br>14688.5<br>23785.9            | 101470<br>40394<br>48191<br>78038            |
| Katherinestadt<br>Catholic Church<br>spire, 1892.                    | 38 55 38.213<br>99 12 59.075  | 7 07 05.0<br>73 18 18.8<br>238 46 14.9<br>290 23 30.7<br>320 37 30.3  | 187 05 05.5<br>253 18 14.6<br>68 50 39.7<br>110 38 29.2<br>140 45 34.1  | La Crosse.....<br>Hays.....<br>Blue Hill.....<br>Allen.....<br>Fairmount..... | 4.671680<br>3.666586<br>4.073877<br>4.504073<br>4.525004 | 37207.5<br>4972.6<br>11854.3<br>31920.7<br>33503.8  | 122267<br>16314<br>38952<br>104720<br>100920 |
| Victoria, stable cu-<br>pola west of, 1892.                          | 38 50 48.995<br>99 10 22.285  | 131 15 45.3<br>202 54 11.3<br>322 29 04.9                             | 311 12 02.7<br>226 56 57.3<br>142 35 24.0                               | Hays.....<br>Blue Hill.....<br>Fairmount.....                                 | 4.055439<br>4.213503<br>4.380941                         | 11361.6<br>10349.4<br>24040.4                       | 37276<br>53640<br>78873                      |
| Ellis schoolhouse<br>tower, 1893. <sup>1</sup>                       | 38 55 58.59<br>99 33 35.98    | 274 36 35<br>00 39 46   | 04 47 28<br>240 36 50   | Hays.....<br>Trego.....   | 4.390900<br>3.888033                                     | 25118.3<br>7738.1                                   | 82409<br>25387                               |
| Round Top Mound,<br>1893.  | 38 54 50.076<br>99 38 53.768  | 93 15 46.3<br>270 16 21.8<br>335 01 33.5                              | 273 00 02.8<br>90 30 34.2<br>158 01 57.3                                | Big Creek.....<br>Hays.....<br>Trego.....                                     | 4.350378<br>4.514404<br>3.330447                         | 22406.7<br>32093.7<br>2161.0                        | 73513<br>107283<br>7090                      |
| State forestry sta-<br>tion, large wind-<br>mill, 1893. <sup>1</sup> | 38 59 37.31<br>99 44 11.65    | 310 26 22<br>61 00 07   | 130 30 43<br>241 00 21  | Trego.....<br>Big Creek.....  | 4.102404<br>4.180037                                     | 14534.6<br>15157.8                                  | 47686<br>49730                               |
| Wakeeney court-<br>house cupola, 1893. <sup>1</sup>                  | 39 01 34.37<br>99 52 58.66    | 303 34 30<br>10 28 58   | 123 43 45<br>190 20 05  | Trego.....<br>Big Creek.....  | 4.407080<br>4.046305                                     | 25532.1<br>11130.3                                  | 83767<br>36517                               |
| Ransom schoolhouse<br>cupola, 1893. <sup>1</sup>                     | 38 38 03.97<br>99 56 03.62    | 123 14 51<br>260 33 01  | 303 10 20<br>80 39 46   | Schmidt.....<br>Skaggs.....   | 4.097878<br>4.201409                                     | 12527.9<br>15900.4                                  | 41102<br>52167                               |
| Ransom gristmill<br>smokestack, 1893. <sup>1</sup>                   | 38 37 59.50<br>99 56 02.80    | 123 43 34<br>280 02 57  | 303 39 03<br>80 09 41   | Schmidt.....<br>Skaggs.....   | 4.101036<br>4.201651                                     | 12019.3<br>15905.6                                  | 41402<br>52184                               |
| Castle Rock, 1890....  | 38 51 23.309<br>100 10 06.518 | 40 38 38.4<br>92 39 48.6<br>250 40 31.5<br>330 54 30.3                | 226 28 32.4<br>272 28 14.5<br>70 50 24.2<br>150 58 32.7                 | Canyon.....<br>Indian Creek.....<br>Big Creek.....<br>Schmidt.....            | 4.507812<br>4.420433<br>4.381716<br>4.308497             | 32106.7<br>20605.5<br>24083.3<br>20346.8            | 105032<br>87583<br>70013<br>66754            |
| Bluff, 1890.....   | 38 51 32.004<br>100 12 02.059 | 42 35 52.3<br>96 16 05.1<br>253 19 29.3<br>324 52 33.0                | 222 20 50.0<br>272 05 44.9<br>73 30 35.1<br>144 58 02.3                 | Canyon.....<br>Indian Creek.....<br>Big Creek.....<br>Schmidt.....            | 4.483267<br>4.378000<br>4.425007<br>4.344083             | 30427.5<br>23878.1<br>20600.6<br>22084.3            | 99828<br>78340<br>87489<br>72455             |
| Hill, 1890.....  | 38 40 11.113<br>100 29 30.088 | 100 34 45.5<br>126 48 22.0<br>183 36 54.3<br>280 36 41.2              | 280 20 40.4<br>306 33 35.4<br>3 37 30.3<br>106 38 43.3                  | Beaver.....<br>Monument.....<br>Indian Creek.....<br>Canyon.....              | 4.516719<br>4.020439<br>4.341775<br>4.092810             | 32863.9<br>42602.9<br>21067.2<br>4929.7             | 107821<br>139773<br>72071<br>16174           |
| Russell Springs<br>schoolhouse cupola,<br>1891. <sup>1</sup>         | 38 54 48.32<br>101 10 51.98   | 08 18 57<br>192 55 13   | 248 12 25<br>12 50 04   | Sheridan.....<br>Gopher.....  | 4.200906<br>3.946028                                     | 16214.6<br>8831.4                                   | 53197<br>28074                               |
| Russell Springs<br>courthouse cupola,<br>1891. <sup>1</sup>          | 38 54 44.63<br>101 10 47.98   | 08 48 51<br>192 09 27   | 248 42 10<br>12 10 10   | Sheridan.....<br>Gopher.....  | 4.211180<br>3.950449                                     | 10262.2<br>8921.7                                   | 53354<br>29271                               |
| Russell Springs<br>church spire, 1891. <sup>1</sup>                  | 38 54 58.24<br>101 10 17.52   | 08 23 49<br>187 51 20   | 248 10 55<br>7 51 56  | Sheridan.....<br>Gopher.....  | 4.232063<br>3.923271                                     | 17098.7<br>8380.5                                   | 56008<br>27495                               |

<sup>1</sup> No check on this position.

## **GEOGRAPHIC POSITIONS.—Continued.**

*Thirty-ninth parallel.*—Continued.

| Station.  | Latitude<br>and<br>longitude. | Azimuth.  | Back<br>azimuth.  | To station.   | Loga-<br>rithm<br>of<br>distance<br>in meters.                       | Distance.   |
|---|-------------------------------|---|---|---|--|---|
| <i>Supplementary<br/>points—Continued.</i>                      |                               |   |   |   |  |   |
| Winona old school-<br>house cupola, 1891.                       | 39 03 43.46<br>101 14 28.36   | 317 41 29<br>03 30 56   | 137 44 37<br>273 22 01  | Gopher.....<br>Teeters Hill....   | 4.028181<br>4.309820   | Meters, 10670.4<br>35008<br>20400.2<br>06959  |
| Winona new school-<br>house tower, 1891.                        | 39 03 45.255<br>101 14 43.599 | 22 48 00.7<br>93 25 07.1<br>316 18 22.6   | 202 43 53.5<br>273 16 22.6<br>136 31 18.9   | Sheridan.....<br>Teeters Hill....<br>Gopher.....  | 4.388617<br>4.301829<br>4.030831                                     | Ft., 24409.0<br>80279<br>20400.1<br>05748<br>10960.5<br>35980   |
| Sheridan Butte, 1891.   | 39 00 36.155<br>101 22 24.477 | 45 28 37.4<br>128 07 46.6<br>276 25 00.0<br>354 26 07.7                               | 225 20 44.3<br>303 03 52.7<br>98 33 07.6<br>174 26 50.2                               | Wallace Bluffs.....<br>Teeters Hill....<br>Gopher.....<br>Sheridan.....                               | 4.405974<br>4.054871<br>4.272200<br>4.225581                         | Meters, 25460.8<br>11346.7<br>18758.6<br>10810.5<br>\$3552<br>37227<br>61544<br>55132   |
| McAllaster school-<br>house spire, 1891.                        | 38 59 51.385<br>101 23 21.667 | 45 20 53.4<br>137 40 13.1<br>318 53 35.2  | 225 13 36.5<br>317 30 55.3<br>168 50 53.6   | Wallace Bluffs.....<br>Teeters Hill....<br>Sheridan.....  | 4.372030<br>4.091791<br>4.190901                                     | Ft., 23584.7<br>11212.9<br>15736.2<br>77377<br>36788<br>51628   |
| Pond, 1801.....   | 38 58 52.068<br>101 43 37.018 | 17 09 10.6<br>105 21 13.3<br>149 48 59.8<br>214 42 10.5<br>292 36 34.3<br>319 28 42.1 | 197 07 05.2<br>285 15 10.9<br>329 47 50.5<br>01 51 38.0<br>112 50 36.2<br>139 31 08.4 | Curlew.....<br>McLane.....<br>Turtle.....<br>Teeters Hill....<br>Sheridan.....<br>Wallace Bluffs..... | 4.212932<br>4.327639<br>3.716250<br>4.379535<br>4.544098<br>4.285206 | Meters, 16328.0<br>21261.7<br>5203.0<br>23062.7<br>35002.4<br>19284.1<br>\$3569<br>69768<br>17070<br>78618<br>114837<br>63209 |
| Wallace latitude sta-<br>tion, 1885.                            | 38 54 44.339<br>101 35 31.505 | 61 19 11.0<br>123 12 18.2<br>285 51 49.4<br>353 19 53.3                               | 244 12 00.9<br>303 07 13.0<br>100 00 45.9<br>173 20 14.7                              | Curlew.....<br>Pond.....<br>Sheridan.....<br>Wallace Bluffs.....                                      | 4.263303<br>4.145097<br>4.350800<br>3.840843                         | Ft., 18353.9<br>13966.8<br>21422.0<br>7070.9<br>60157<br>45823<br>70282<br>23218  |
| Gilbert, 1908 .....   | 38 51 39.408<br>101 42 40.920 | 174 13 16.0<br>211 07 13.4<br>270 44 31.6   | 354 12 40.8<br>61 11 43.0<br>96 49 22.4   | Pond.....<br>Wallace.....<br>Wallace Bluffs.....  | 4.127370<br>4.072456<br>4.051346                                     | Meters, 13408.2<br>11815.6<br>11255.0<br>13990<br>38765<br>36928  |
| Wallace Railway<br>office (stone) chim-<br>ney, 1891.           | 38 54 43.870<br>101 35 33.490 | 64 17 42.8<br>123 21 43.4<br>130 29 24.7<br>285 47 28.7<br>352 55 56.5                | 244 10 34.0<br>303 16 39.4<br>310 23 12.2<br>105 56 26.5<br>172 56 19.1               | Curlew.....<br>Pond.....<br>Turtle.....<br>Sheridan.....<br>Wallace Bluffs.....                       | 4.202132<br>4.144100<br>4.272637<br>4.331713<br>3.849313             | Ft., 18286.0<br>13934.8<br>18734.3<br>21444.1<br>7008.3<br>59995<br>45718<br>61464<br>70420<br>23100                          |
| Wallace church<br>spire, 1891.                                  | 38 54 50.931<br>101 35 34.293 | 63 08 31.8<br>121 59 55.9<br>129 31 30.8<br>286 48 20.7<br>353 10 02.2                | 243 01 23.5<br>301 54 52.4<br>309 28 27.8<br>106 57 19.0<br>173 10 25.3               | Curlew.....<br>Pond.....<br>Turtle.....<br>Sheridan.....<br>Wallace Bluffs.....                       | 4.205045<br>4.136759<br>4.260245<br>4.334362<br>3.873343             | Meters, 18447.8<br>13701.2<br>14060.6<br>21595.4<br>70470.4<br>60524<br>44051<br>60566<br>70851<br>24500                      |
| Wallace schoolhouse<br>cupola, 1891.                            | 38 55 03.062<br>101 35 32.500 | 62 36 20.5<br>121 07 48.1<br>128 58 15.1<br>287 23 21.4<br>353 40 41.0                | 242 29 11.0<br>301 02 43.5<br>308 52 02.0<br>107 32 18.6<br>173 41 03.0               | Curlew.....<br>Pond.....<br>Turtle.....<br>Sheridan.....<br>Wallace Bluffs.....                       | 4.209100<br>4.134313<br>4.263790<br>4.334819<br>3.885415             | Ft., 18584.9<br>13624.3<br>18350.5<br>21018.2<br>7681.0<br>60974<br>44699<br>60225<br>70928<br>25200                          |
| Sharon Springs<br>schoolhouse cu-<br>pola, 1891.                | 38 54 01.286<br>101 45 06.505 | 21 49 33.4<br>178 01 46.9<br>193 30 19.4<br>277 24 17.9<br>291 10 08.0                | 201 48 24.3<br>358 01 34.9<br>13 31 15.8<br>97 39 15.3<br>111 16 30.9                 | Curlew.....<br>Turtle.....<br>Pond.....<br>Sheridan.....<br>Wallace Bluffs.....                       | 3.851447<br>4.129457<br>3.904874<br>4.541077<br>4.197295             | Meters, 7147.4<br>13172.8<br>0223.0<br>34750.8<br>15750.5<br>23449<br>44202<br>30259<br>114041<br>51675                       |
| Sharon Springs<br>church spire, 1891.                           | 38 53 49.837<br>101 45 00.667 | 24 00 31.9<br>192 11 21.3<br>276 51 21.6<br>290 08 20.1                               | 203 59 19.1<br>12 12 13.9<br>97 09 15.2<br>110 14 44.5                                | Curlew.....<br>Pond.....<br>Sheridan.....<br>Wallace Bluffs.....                                      | 3.837395<br>3.979393<br>4.538780<br>4.190174                         | Ft., 6870.9<br>9535.9<br>34576.4<br>15494.4<br>22562<br>31288<br>113349<br>50835  |
| Kansas and Colorado<br>boundary mark<br>73 <sup>1</sup> , 1891. | 38 55 31.028<br>102 02 43.411 | 13 56 03.8<br>123 08 09.8<br>210 53 07.0<br>292 18 43.8                               | 103 54 10.5<br>303 00 27.3<br>30 56 12.9<br>112 28 38.1                               | Arapahoe.....<br>Monotony.....<br>McLane.....<br>Curlew.....  | 4.257504<br>4.324074<br>4.139220<br>4.302351                         | Meters, 18092.7<br>21119.0<br>13770.1<br>24680.3<br>59350<br>69288<br>45207<br>80872  |
| Weskan schoolhouse<br>cupola, 1891.                             | 38 51 50.606<br>101 57 52.929 | 46 05 44.0<br>128 22 31.4<br>133 23 01.4  | 220 00 48.8<br>300 11 46.6<br>313 19 59.0   | Arapahoe.....<br>Monotony.....<br>Colorado 73 <sup>1</sup>  | 4.108122<br>4.403024<br>3.983537                                     | Ft., 15780.5<br>30642.5<br>9028.0<br>24900.5<br>81011<br>50833<br>31588   |
|   |                               | 226 02 53.8<br>279 57 05.0  | 46 10 43.4<br>100 03 56.7   | Turtle.....<br>Curlew.....  | 4.397358<br>4.205978   |   |

<sup>1</sup> No check on this position.

## GEOGRAPHIC POSITIONS.—Continued.

*Thirty-ninth parallel.*—Continued.

| Station.                                    | Latitude<br>and<br>longitude.     | Azimuth.                                       | Back<br>azimuth.                                | To station.  | Loga-<br>rithm of<br>distance<br>in meters. | Meters.                      | Feet.                   |
|---|-----------------------------------|--|---|--|---|------------------------------|-------------------------|
| <i>Supplementary points</i> —Continued.     |                                   |  |   |  |   |                              |                         |
| Kansas and Colorado boundary mark 68, 1891. | 30° 00' 22.642<br>102° 02' 45.002 | 98° 13' 44.5<br>248° 17' 04.7<br>308° 45' 28.5 | 278° 06' 02.7<br>68° 20' 10.9<br>128° 55' 24.4  | Monotony.....<br>McLane.....<br>Curlew.....                  | 4.251113<br>3.884009<br>4.407329            | 17828.4<br>7650.1<br>29331.1 | 58492<br>25118<br>96230 |
| Kansas and Colorado boundary mark 78, 1891. | 38° 51' 30.148<br>102° 02' 42.480 | 23° 22' 26.0<br>136° 58' 33.1<br>170° 40' 41.7 | 203° 20' 32.3<br>316° 50' 50.4<br>350° 49' 41.1 | Arapahoe.....<br>Monotony.....<br>Kansas and<br>Colorado 734 | 4.042002<br>4.414155<br>3.870864            | 11038.3<br>25951.1<br>7427.9 | 36215<br>85141<br>24370 |
| Kansas and Colorado boundary mark 83, 1891. | 38° 47' 00.287<br>102° 02' 41.793 | 04° 35' 15.6<br>179° 51' 20.0<br>255° 00' 49.8 | 244° 33' 21.6<br>359° 51' 19.0<br>75° 10' 42.1  | Arapahoe.....<br>Kansas and<br>Colorado 734<br>Curlew .....  | 3.687264<br>4.180541<br>4.372833            | 4806.9<br>15471.8<br>23500.0 | 15967<br>50760<br>77415 |

*Ninety-eighth meridian.*

| Principal points.            | °   °   "                        | °   °   "                        | °   °   "                        |   |                                     | Meters.                          | Feet.                           |
|------------------------------|----------------------------------|----------------------------------|----------------------------------|---|-------------------------------------|----------------------------------|---------------------------------|
| Dial, 1897.....              | 39° 15' 03.832<br>98° 40' 07.314 | 278° 37' 23.35<br>29° 22' 38.20  | 98° 46' 00.02<br>200° 20' 17.44  | Meades Ranch.....<br>Waldo.....                 | 4.2070402<br>4.0375973              | 19817.10<br>10004.29             | 65016.8<br>35775.2              |
| Kill Creek, 1897.....        | 39° 16' 51.330<br>98° 53' 52.373 | 268° 31' 07.37<br>335° 35' 37.51 | 106° 30' 01.72<br>155° 38' 10.00 | Dial.....<br>Waldo.....                         | 4.0050305<br>4.1481348              | 11631.36<br>14074.56             | 38160.6<br>40176.3              |
| Lawrence 2, 1897.....        | 39° 31' 13.088<br>98° 51' 27.586 | 345° 35' 22.00<br>72° 26' 19.19  | 165° 38' 45.23<br>187° 24' 51.29 | Dial.....<br>Kill Creek.....                    | 4.4809688<br>4.4281460              | 30858.07<br>26800.75             | 101240.2<br>87028.8             |
| Old Well 2, 1897.....        | 39° 38' 42.774<br>98° 33' 58.200 | 357° 12' 00.17<br>23° 35' 17.61  | 177° 13' 04.86<br>203° 27' 34.51 | Meades Ranch.....<br>Dial.....<br>Lawrence 2... | 4.0345318<br>4.0403753<br>4.4319121 | 43105.42<br>43689.32<br>27034.11 | 141421.7<br>14337.4<br>88694.4  |
| Brown, 1898.....             | 39° 46' 37.100<br>98° 42' 10.680 | 327° 00' 59.85<br>24° 47' 36.18  | 147° 06' 18.22<br>204° 41' 44.06 | Old Well 2....<br>Lawrence 2...                 | 4.3393020<br>4.4960538              | 21842.53<br>31380.06             | 71661.7<br>102952.7             |
| Lipps, 1898.....             | 39° 50' 40.677<br>98° 51' 20.619 | 331° 25' 06.55<br>359° 56' 49.80 | 151° 31' 01.13<br>179° 56' 51.10 | Brown.....<br>Lawrence 2...                     | 4.4304220<br>4.7213133              | 27505.66<br>52663.94             | 90241.5<br>172781.6             |
| Lebanon, 1897.....           | 39° 49' 41.533<br>98° 31' 37.195 | 7° 58' 23.47<br>09° 33' 43.40    | 187° 50' 53.36<br>249° 20' 54.10 | Old Well 2....<br>Brown.....                    | 4.3847352<br>4.2106006              | 24251.31<br>10240.88             | 70504.5<br>53293.6              |
| Cooper, 1898.....            | 39° 58' 41.087<br>98° 35' 23.029 | 342° 04' 23.34<br>23° 43' 35.08  | 182° 06' 48.79<br>203° 30' 11.05 | Lebanon.....<br>Brown.....<br>Lipps.....        | 4.2434644<br>4.3876039<br>4.3614101 | 17517.19<br>24412.03<br>22983.18 | 57471.0<br>60901.8<br>73404.0   |
| Herrick(Nebr.), 1898.....    | 40° 14' 55.800<br>98° 45' 05.248 | 335° 19' 24.04<br>17° 54' 24.71  | 155° 25' 39.49<br>197° 50' 17.02 | Cooper.....<br>Lipps.....                       | 4.5190400<br>4.4721177              | 33040.00<br>20856.35             | 108398.7<br>97297.5             |
| Blue Hill (Nebr.), 1898..... | 40° 17' 33.261<br>98° 30' 35.502 | 11° 05' 42.51<br>42° 00' 50.97   | 191° 02' 36.64<br>221° 47' 22.49 | Cooper.....<br>Lipps.....<br>Herrick.....       | 4.5508824<br>4.6478475<br>4.3245648 | 35553.50<br>44447.50<br>21113.72 | 116645.1<br>145824.8<br>69270.6 |
| Bossing, 1899.....           | 38° 36' 40.004<br>98° 19' 11.381 | 152° 26' 50.21<br>222° 19' 44.31 | 332° 20' 32.17<br>42° 20' 53.14  | Wilson.....<br>Heath.....                       | 4.4981445<br>4.5422149              | 31487.06<br>34850.98             | 103306.7<br>114340.3            |
| Sherman, 1899.....           | 38° 34' 20.138<br>97° 59' 57.623 | 90° 15' 02.35<br>127° 20' 39.03  | 279° 03' 02.65<br>307° 11' 20.37 | Bossing.....<br>Wilson.....<br>Heath.....       | 4.4515087<br>4.7270785<br>4.4848911 | 28281.91<br>53416.88<br>30541.55 | 92788.2<br>175231.9<br>100201.7 |
| Loder, 1899.....             | 38° 38' 23.587<br>97° 52' 14.058 | 56° 14' 51.64<br>145° 39' 22.32  | 236° 10' 02.39<br>325° 32' 39.08 | Sherman.....<br>Heath.....<br>Iron Mound..      | 4.1302208<br>4.4394202<br>4.5610154 | 13490.77<br>27537.23<br>36392.80 | 44280.7<br>90345.1<br>119308.7  |
| Central, 1900.....           | 38° 27' 05.342<br>98° 10' 05.630 | 143° 30' 33.40<br>227° 39' 30.99 | 323° 30' 53.49<br>47° 44' 40.59  | Bossing.....<br>Sherman.....                    | 4.3474336<br>4.2902526              | 22255.31<br>10018.32             | 73016.0<br>65348.7              |
| Little River, 1900.....      | 38° 23' 38.060<br>98° 03' 03.308 | 121° 55' 26.48<br>130° 04' 10.71 | 301° 51' 04.06<br>315° 54' 08.06 | Central.....<br>Bossing.....<br>Sherman.....    | 4.0514874<br>4.5283670<br>4.3071831 | 12063.89<br>33757.25<br>20285.38 | 30570.6<br>110751.9<br>66533.0  |

## GEOGRAPHIC POSITIONS—Continued.

## Ninety-eighth meridian—Continued.

| Station.                           | Latitude<br>and<br>longitude. | Azimuth.                                     | Back<br>azimuth.                             | To station.   | Loga-<br>rithm<br>of<br>distance<br>in meters. | Meters.                          | Distance.                       |
|------------------------------------|-------------------------------|--|--|---|--|----------------------------------|---------------------------------|
| <i>Principal points—Continued.</i> |                               |  |  |   |  |                                  |                                 |
| Chase, 1900.....                   | 38 20 43.445<br>98 25 26.850  | 197 00 56.14<br>242 08 31.94<br>260 28 42.72 | 17 04 40.78<br>62 18 04.14<br>80 42 36.67    | Bossing.....<br>Central.....<br>Little River....      | 4.4919752<br>4.4025377<br>4.5192814            | 31043.82<br>25266.07<br>33058.37 | 101849.6<br>82803.8<br>108459.0 |
| Savage, 1901.....                  | 38 09 23.350<br>98 15 49.341  | 146 14 26.08<br>215 09 22.38                 | 326 08 29.43<br>35 17 16.86                  | Chase.....<br>Little River....                        | 4.4020371<br>4.5089601                         | 25234.07<br>32281.98             | 82798.3<br>105011.8             |
| Gilmore, 1901.....                 | 38 10 00.041<br>97 57 12.395  | 87 39 18.63<br>115 49 34.96<br>161 20 15.00  | 267 27 48.49<br>295 32 05.70<br>341 18 37.57 | Savage.....<br>Chase.....<br>Little River....         | 4.4348333<br>4.6000456<br>4.4251572            | 27216.56<br>45713.62<br>20616.88 | 80203.0<br>149078.8<br>87325.5  |
| Partridge, 1901.....               | 37 50 14.373<br>98 06 14.834  | 143 19 50.05<br>213 30 20.56                 | 323 14 04.78<br>33 35 55.00                  | Savage.....<br>Gilmore....                            | 4.3096418<br>4.3787725                         | 23422.06<br>23920.62             | 70846.8<br>78479.6              |
| Arlington, 1901.....               | 37 52 33.788<br>98 12 07.340  | 170 09 00.08<br>214 50 52.56                 | 350 06 43.35<br>34 54 29.26                  | Savage.....<br>Partridge....                          | 4.4096061<br>4.1776758                         | 31504.11<br>15054.83             | 103655.0<br>49302.4             |
| Sunflower, 1901.....               | 37 51 40.281<br>97 51 28.036  | 03 13 22.53<br>122 57 15.35                  | 273 00 41.77<br>302 48 10.31                 | Arlington.....<br>Partridge....<br>Gilmore....        | 4.4819001<br>4.4114100<br>4.5435651            | 30336.13<br>25789.68<br>34950.49 | 90527.8<br>84111.6<br>114696.3  |
| Pretty Prairie, 1901..             | 37 46 16.111<br>98 00 19.195  | 123 58 26.60<br>232 23 03.13                 | 303 51 12.34<br>52 28 29.80                  | Arlington.....<br>Sunflower....                       | 4.3105135<br>4.2140120                         | 20869.57<br>10301.28             | 68460.6<br>53777.1              |
| Cheney, 1901.....                  | 37 40 37.440<br>97 49 56.508  | 124 27 06.51<br>173 45 07.31                 | 304 20 45.51<br>353 44 11.25                 | Pretty Prairie..<br>Sunflower....                     | 4.2607325<br>4.3129776                         | 18481.30<br>20557.84             | 60034.1<br>67446.8              |
| Kingman, 1901.....                 | 37 35 10.420<br>98 09 12.015  | 172 20 17.04<br>212 26 51.97                 | 352 24 30.10<br>32 32 18.02                  | Arlington.....<br>Pretty Prairie..<br>Cheney.....     | 4.5112232<br>4.3801820<br>4.4783835            | 32450.63<br>24332.28<br>30087.32 | 100465.1<br>7930.2<br>95711.5   |
| Belmont, 1901.....                 | 37 31 13.481<br>97 58 18.214  | 114 30 34.01<br>215 15 00.74                 | 294 23 55.15<br>35 20 06.84                  | Kingman.....<br>Cheney.....                           | 4.2466390<br>4.3284190                         | 17045.70<br>21301.03             | 57892.6<br>69885.1              |
| Prairie, 1901.....                 | 37 22 27.027<br>98 07 49.380  | 175 02 12.60                                 | 355 01 22.01                                 | Kingman.....<br>Belmont....                           | 4.3730014<br>4.3313402                         | 23604.80<br>21445.70             | 77443.6<br>20550.8              |
| Sumner, 1901.....                  | 37 24 25.061<br>97 48 15.243  | 82 57 10.37<br>130 24 21.00                  | 262 45 23.38<br>310 18 14.24                 | Prairie.....<br>Belmont....<br>Cheney.....            | 4.4640217<br>4.2888105<br>4.4782908            | 29108.62<br>19445.12<br>30050.90 | 95500.5<br>63796.2<br>98600.4   |
| Quarry, 1901.....                  | 37 14 28.323<br>97 58 19.839  | 136 32 25.54<br>218 55 39.35                 | 316 26 40.35<br>39 01 45.03                  | Prairie.....<br>Sumner....                            | 4.3000486<br>4.3740950                         | 20372.70<br>23604.42             | 68630.4<br>77639.0              |
| Rutherford, 1901.....              | 37 08 57.928<br>98 06 31.618  | 175 37 00.52<br>220 50 10.27                 | 355 36 13.44<br>50 01 07.57                  | Prairie.....<br>Quarry....                            | 4.3985420<br>4.1096908                         | 25034.68<br>15837.98             | 82134.6<br>51901.8              |
| Anthony NW. base,<br>1901.         | 37 12 35.542<br>98 04 03.454  | 247 39 23.75<br>28 35 40.88                  | 67 42 51.02<br>208 34 11.34                  | Quarry.....<br>Rutherford....                         | 4.9617440<br>3.8830644                         | 9150.81<br>7639.49               | 30042.0<br>25063.0              |
| Anthony SE. base,<br>1901.         | 37 10 00.285<br>98 01 34.133  | 75 20 00.03<br>142 20 23.72                  | 255 17 09.52<br>322 27 53.20                 | Rutherford....<br>Anthony NW.<br>base.                | 3.8797122<br>3.7804960                         | 7580.75<br>6034.705              | 24871.2<br>10798.9              |
|                                    |                               | 210 07 45.48                                 | 30 00 43.11                                  | Quarry.....   | 3.0802437                                      | 9555.20                          | 31349.3                         |
| Miller, 1902.....                  | 37 02 20.903<br>97 55 43.908  | 127 28 17.95<br>140 58 55.23                 | 307 21 47.30<br>326 53 53.75                 | Rutherford....<br>Anthony NW.<br>base.                | 4.3040518<br>4.3542135                         | 20139.64<br>22605.47             | 66074.8<br>74184.8              |
|                                    |                               | 148 35 34.07                                 | 328 32 02.64                                 | Anthony SE.<br>base.                                  | 4.2109872                                      | 16595.38                         | 54440.7                         |
|                                    |                               | 170 18 26.57                                 | 350 14 52.43                                 | Quarry.....   | 4.3569871                                      | 22750.30                         | 74039.9                         |
| Fowler, 1902.....                  | 37 07 35.852<br>97 48 50.372  | 46 29 33.16<br>103 21 00.06                  | 226 25 23.81<br>275 45 42.68                 | Miller.....<br>Rutherford....<br>Anthony SE.<br>base. | 4.1480378<br>4.4202009<br>4.2872287            | 14060.87<br>20314.85<br>19374.42 | 46220.8<br>88334.0<br>93564.2   |
|                                    |                               | 132 11 59.70                                 | 312 06 15.59                                 | Quarry.....   | 4.2775618                                      | 18047.06                         | 62162.1                         |
|                                    |                               | 181 35 26.40                                 | 1 35 47.07                                   | Summer.....   | 4.4930920                                      | 31123.70                         | 102111.9                        |

## GEOGRAPHIC POSITIONS—Continued.

*Ninety-eighth meridian—Continued.*

| Station.  | Latitude<br>and<br>longitude. | Azimuth.                                       | Back<br>azimuth.                                 | To station.   | Loga-<br>rithm of<br>distance<br>in meters.  | Meters.                                  | Distance.                         |
|---|-------------------------------|--|--|---|--|--|-----------------------------------|
|   |                               |  |  |   |  | 3.377                                    | Feet.                             |
| <i>Supplementary<br/>points.</i>                        | °   °   °   "                 | °   °   °   "                                  | °   °   °   "                                    |   |  |  |                                   |
| Lawrence, U. S. G. S.,<br>1897. <sup>1</sup>            | 39 31 13.081<br>98 51 27.445  | 03 27  | 273 27   | Lawrence 2....  | 0.52853                                      |  |                                   |
| Old Well, U. S. G. S.,<br>1897.                         | 39 36 42.824<br>98 33 50.502  | 67 58 10.7<br>272 52 31                        | 217 47 03.2<br>92 52 32                          | Lawrence,<br>U. S. G. S.<br>Old well 2....                      | 4.431413<br>1.48961                          | 27003.1<br>30.875                        | 88593<br>101.3                    |
| Tipton, U. S. G. S.,<br>1897.                           | 39 21 33.77<br>98 31 50.31    | 3 07 33<br>59 32 42<br>122 38 05<br>174 04 40  | 183 07 12<br>239 23 43<br>302 25 41<br>354 03 22 | Meads Ranch.<br>Dial.....<br>Lawrence 2....<br>Old well 2....   | 4.177338<br>4.374231<br>4.521433<br>4.450009 | 15043.1<br>23671.8<br>33222.6<br>28184.4 | 40354<br>77603<br>108008<br>92468 |
| Medicine Peak, 1897. <sup>1</sup>                       | 39 21 37.40<br>98 36 48.44    | 47 51 36<br>70 18 29                           | 227 45 42<br>250 07 40                           | Dial.....<br>Kill Creek....                                     | 4.25701<br>4.41607                           | 18072<br>26066                           | 59291<br>85518                    |
| Covert, 1897.....                                       | 39 21 40.58<br>98 42 27.77    | 23 17 00<br>61 31 02<br>143 52 31<br>203 35 32 | 203 14 41<br>241 23 48<br>323 46 48<br>23 40 56  | Dial.....<br>Kill Creek....<br>Lawrence 2....<br>Old well 2.... | 4.124439<br>4.271104<br>4.330882<br>4.482466 | 13318.0<br>18068.3<br>21871.7<br>30371.5 | 43094<br>61248<br>71757<br>09644  |
| Sec. 16, T. 5, R. 11,<br>SE. corner, 1897. <sup>1</sup> | 30 36 30.57<br>98 33 39.12    | 102 14 44                                      | 282 14 32  | Old well 2....  | 2.00839                                      | 466.0                                    | 1529                              |
| Hardiloo, U. S. G. S.,<br>1897.                         | 39 50 52.82<br>98 57 01.67    | 205 48 53<br>290 27 21<br>347 37 40            | 25 52 26<br>110 36 48<br>167 41 13               | Lipps.....<br>Brown.....<br>Lawrence 2....                      | 4.257426<br>4.351769<br>4.571003             | 18089.5<br>22378.6<br>7214.5             | 50349<br>73749<br>122193          |
| Smith Center stand-<br>pipe, 1898.                      | 39 46 30.90<br>98 46 34.26    | 163 46 41<br>270 46 05<br>13 46 20             | 343 43 33<br>90 48 50<br>193 43 22               | Lipps.....<br>Brown.....<br>Lawrence 2....                      | 4.390306<br>3.787487<br>4.408749             | 25082.2<br>0130.4<br>29426.6             | 82201<br>20113<br>96544           |
| Smith Center court-<br>house cupola, 1898.              | 39 46 33.57<br>98 40 53.49    | 164 54 01<br>280 00 48                         | 344 51 04<br>89 03 45                            | Lipps.....<br>Brown.....  | 4.400181<br>3.818786                         | 25146.7<br>6588.5                        | 82502<br>21616                    |
| Lebanon Methodist<br>Church spire, 1898.                | 30 48 36.36<br>98 33 10.66    | 2 34 44<br>74 04 50<br>229 38 22               | 182 34 17<br>253 59 04<br>49 39 26               | Old well 2....<br>Brown.....<br>Lebanon.....                    | 4.343017<br>4.125940<br>3.491949             | 22030.1<br>13364.1<br>3104.2             | 72277<br>43845<br>10184           |
| Lebanon school-<br>house cupola, 1898. <sup>1</sup>     | 30 48 38.39<br>98 33 21.35    | 73 41 18<br>231 48 50                          | 253 35 35<br>51 50 05                            | Brown.....<br>Lebanon.....                                      | 4.123012<br>3.498443                         | 13274.3<br>3151.0                        | 43551<br>10338                    |
| Kansas and Nebraska<br>state line A, 1898.              | 40 00 08.37<br>98 51 28.78    | 108 19 13<br>270 03 08                         | 18 23 20<br>96 43 28                             | Herrick.....<br>Cooper.....<br>Lipps.....                       | 4.450971<br>4.302579<br>2.931366             | 28838.4<br>32045.1<br>854.21             | 91614<br>76007<br>2903            |
| Kansas and Nebraska<br>state line B, 1898.              | 40 00 08.42<br>98 50 25.03    | 195 28 36<br>277 01 14<br>60 28 54             | 15 32 03<br>97 10 54<br>240 28 12                | Herrick.....<br>Cooper.....<br>Lipps.....                       | 4.453307<br>4.333746<br>3.239061             | 28403.2<br>21504.8<br>1736.4             | 93180<br>70751<br>5607            |
| Kansas and Nebraska<br>state line 1, 1898. <sup>1</sup> | 40 00 08.38<br>98 50 20.86    | 277 03 27<br>90 33 17                          | 97 13 04<br>270 33 14                            | Cooper.....<br>K.-N. state<br>line B.                           | 4.331331<br>2.08001                          | 21445.2<br>120.4                         | 70353<br>395                      |
| Kansas and Nebraska<br>state line 2, 1898. <sup>1</sup> | 40 00 08.37<br>98 50 20.88    | 276 50 08<br>260 07 12                         | 97 08 51<br>89 07 14                             | Cooper.....<br>K.-N. state<br>line B.                           | 4.335014<br>1.97218                          | 21657.8<br>93.8                          | 71056<br>308                      |
| Kansas and Nebraska<br>state line C, 1898. <sup>1</sup> | 40 00 08.67<br>98 34 30.28    | 25 27 51<br>151 10 10                          | 205 27 17<br>331 09 21                           | Cooper.....<br>Herrick.....                                     | 3.471423<br>4.404438                         | 2060.0<br>31220.4                        | 9714<br>102429                    |
| German Church<br>spire, 1890.                           | 38 49 15.480<br>98 15 43.310  | 12 17 22.1<br>103 49 13.9                      | 192 15 12.0<br>283 40 44.5                       | Bossing.....<br>Wilson.....<br>Loder.....<br>Sherman.....       | 4.373847<br>4.304007<br>4.270408             | 23650.0<br>20165.4<br>19638.4            | 77505<br>66159<br>61149           |
| Oxido, 1890.....  | 38 41 26.501<br>98 13 21.800  | 44 22 00.2<br>129 59 36.9                      | 224 18 21.0<br>309 40 39.7                       | Bossing.....<br>Wilson.....<br>Loder.....<br>Sherman.....       | 4.082513<br>4.477267<br>4.494083<br>4.370983 | 12002.5<br>30010.1<br>31106.1<br>23479.2 | 39673<br>98458<br>102251<br>77031 |
| Heath's barn cupola,<br>1890.                           | 38 50 37.396<br>98 03 12.974  | 42 00 59.3<br>324 49 29.9                      | 221 59 59.7<br>144 60 22.3                       | Bossing.....<br>Loder.....<br>Sherman.....                      | 4.538352<br>4.441897<br>4.484323             | 34542.4<br>27682.9<br>30501.6            | 113328<br>90757<br>100071         |

<sup>1</sup> No check on this position.

## GEOGRAPHIC POSITIONS—Continued.

Ninety-eighth meridian—Continued. .

| Station.  | Latitude<br>and<br>longitude. | Azimuth.  | Back<br>azimuth.  | To station.  | Loga-<br>rithm of<br>distance<br>in meters.              | Meters.  | Feet.                                      |
|---|-------------------------------|---|---|--|--|--|--|
| <i>Supplementary<br/>points—Continued.</i>                | ° ° ° ° ° ° ° °               | ° ° ° ° ° ° ° °   | ° ° ° ° ° ° ° °   |  |  |  |  |
| Genesee schoolhouse,<br>tower, 1899.                      | 38 31 04.324<br>98 09 34.100  | 5 55 28.0<br>127 03 36.9<br>194 44 43.8<br>246 33 42.7<br>325 22 57.2 | 185 55 08.4<br>306 57 37.0<br>14 48 51.1<br>66 39 41.9<br>145 27 00.2 | Central.....<br>Bossing.....<br>Heath.....<br>Sherman.....<br>Little River...                | 3.809724<br>4.243092<br>4.574112<br>4.182135<br>4.222482 | 7408.4<br>17502.2<br>37507.0<br>15210.2<br>16691.0 | 24306<br>57422<br>123054<br>49002<br>54760 |
| Lyons salt works<br>tower, 1899.                          | 38 21 20.324<br>98 11 34.738  | 86 51 03.0<br>158 50 42.3<br>191 28 47.8<br>250 50 30.1               | 266 42 26.4<br>338 45 58.0<br>11 29 43.1<br>71 04 47.4                | Chase.....<br>Bossing.....<br>Central.....<br>Little River...                                | 4.306167<br>4.485912<br>4.035658<br>4.118108             | 20237.5<br>30613.4<br>10855.7<br>13125.3           | 66396<br>100437<br>35616<br>43082          |
| Butte highest point,<br>1891.                             | 38 39 59.633<br>97 41 31.048  | 70 16 18.0<br>122 33 29.5<br>202 20 03.7<br>224 51 14.8               | 259 09 36.4<br>302 20 03.7<br>44 58 01.6                              | Loder.....<br>Heath.....<br>Iron Mound...  | 4.199426<br>4.566200<br>4.346722                         | 15828.0<br>36830.4<br>22218.9                      | 51929<br>120834<br>72897                   |
| Sterling College<br>tower, 1900.                          | 38 13 16.422<br>98 12 27.324  | 34 23 38.7<br>215 29 00.4<br>285 04 09.1                              | 214 21 33.8<br>35 34 58.0<br>105 13 34.4                              | Savage.....<br>Little River...<br>Gilmore....  | 3.939867<br>4.372473<br>4.302900                         | 8707.0<br>23570.2<br>23065.3                       | 28566<br>77360<br>75073                    |
| Hutchinson Salt<br>Works, largest<br>stack, 1900.         | 38 02 25.241<br>97 57 10.755  | 65 53 51.6<br>180 25 58.0<br>336 47 30.1                              | 245 48 20.2<br>0 26 00.7<br>166 51 04.6                               | Partridge.....<br>Gilmore.....<br>Sunflower....  | 4.167900<br>4.147397<br>4.335670                         | 14384.7<br>14050.7<br>21631.0                      | 47194<br>40098<br>70968                    |
| Table Mountain<br>cairn, 1899.                            | 38 37 03.120<br>98 13 29.931  | 86 22 24.6<br>205 17 34.4<br>284 10 12.4                              | 266 18 51.5<br>302 20 03.7<br>104 24 30.1                             | Bossing.....<br>Loder.....<br>Sherman....  | 3.917904<br>4.490320<br>4.307280                         | 8277.6<br>30001.4<br>20290.2                       | 27157<br>101579<br>66569                   |
| Marquette church<br>spire, 1899. <sup>1</sup>             | 38 32 47.05<br>97 40 50.21    | 101 05 48<br>161 28 03  | 280 59 29<br>341 26 33  | Sherman.....<br>Loder.....   | 4.175633<br>4.039235                                     | 14984.2<br>10946.5                                 | 49161<br>36910                             |
| Langley church<br>spire, 1899. <sup>1</sup>               | 38 32 43.67<br>97 57 52.25    | 134 25 42<br>217 57 23  | 314 24 24<br>38 00 54   | Sherman.....<br>Loder.....   | 3.628380<br>4.123792                                     | 4210.9<br>13298.2                                  | 13043<br>43029                             |
| White Cliffs, cairn,<br>1899. <sup>1</sup>                | 38 41 06.52<br>98 02 49.52    | 288 03 10<br>341 37 43  | 108 09 47<br>161 39 30  | Loder.....<br>Sherman....  | 4.208556<br>4.120057                                     | 10164.3<br>13202.5                                 | 53032<br>43315                             |
| North Sherman,<br>cairn, 1899. <sup>1</sup>               | 38 36 20.30<br>98 00 56.91    | 253 13 31<br>338 49 25  | 73 18 58<br>158 50 02   | Loder.....<br>Sherman....  | 4.120813<br>3.500140                                     | 13207.3<br>3973.2                                  | 43331<br>13035                             |
| Kanopolis salt works,<br>center hoist, 1899. <sup>1</sup> | 38 42 50.70<br>98 08 54.03    | 320 57 33<br>52 22 40   | 141 03 08<br>232 16 23  | Sherman.....<br>Bossing....  | 4.314192<br>4.275477                                     | 20015.4<br>18857.2                                 | 67636<br>61867                             |
| Bushton elevator,<br>1899. <sup>1</sup>                   | 38 30 53.46<br>98 23 42.58    | 211 06 29<br>289 29 11  | 81 09 18<br>109 37 39   | Bossing.....<br>Central.....   | 4.103788<br>4.322487                                     | 12699.5<br>21012.9                                 | 41865<br>68940                             |
| Frederic elevator,<br>1899. <sup>1</sup>                  | 38 30 54.09<br>98 16 02.00    | 157 06 39<br>309 12 10  | 337 04 41<br>129 15 58  | Bossing.....<br>Central.....   | 4.071144<br>4.047340                                     | 11780.0<br>11151.7                                 | 38484<br>36687                             |
| Windom water<br>tower, 1900. <sup>1</sup>                 | 38 23 14.47<br>97 54 32.70    | 93 29 18<br>107 32 28   | 273 24 01<br>287 22 48  | Little River...<br>Central.....  | 4.003068<br>4.375210                                     | 12415.0<br>23725.2                                 | 40734<br>77838                             |
| Loder's house chim-<br>ney, 1899. <sup>1</sup>            | 38 38 18.14<br>97 55 03.76    | 267 38 22<br>44 07 17   | 87 40 08<br>224 04 14   | Loder.....<br>Sherman....  | 3.013588<br>4.009384                                     | 4107.0<br>10218.4                                  | 13476<br>33525                             |
| Hutchinson court-<br>house, 1901. <sup>1</sup>            | 38 02 67.18<br>97 55 52.05    | 312 48 51<br>05 43 16   | 162 51 33<br>245 36 52  | Sunflower....<br>Partridge....   | 4.339298<br>4.221901                                     | 21842.3<br>16672.1                                 | 71661<br>54698                             |
| Harper standpipe,<br>1901.                                | 37 17 09.042<br>98 01 49.375  | 21 22 12<br>24 40 57<br>313 54 31<br>341 45 01<br>358 24 16           | 201 20 51<br>204 38 06<br>133 50 38<br>161 48 42<br>178 24 25         | Anthony NW.<br>base.<br>Rutherford....<br>Quarry.....<br>Miller.....<br>Anthony SE.<br>base. | 3.957760<br>4.222177<br>3.855435<br>4.460010<br>4.121926 | 9073.0<br>16679.3<br>7108.0<br>28841.4<br>13241.2  | 29767<br>54722<br>23519<br>04624<br>43442  |
| Anthony Baptist<br>Church spire, 1902.                    | 37 09 18.084<br>98 01 40.746  | 103 19 36.0<br>279 19 43.0<br>325 08 18.2                             | 13 19 44.3<br>99 27 31.8<br>145 11 57.1                               | Anthony SE.<br>base.<br>Fowler.....<br>Miller.....   | 3.110913<br>4.288280<br>4.105560                         | 1318.0<br>19421.6<br>15687.0                       | 4324<br>63719<br>51468                     |

<sup>1</sup> No check on this position.

## GEOGRAPHIC POSITIONS—Continued.

*Ninety-eighth meridian—Continued.*

| Station.   | Latitude<br>and<br>longitude. | Azimuth.                   | Back<br>azimuth.           | To station.                                  | Loga-<br>rithm of<br>distance<br>in meters. | Meters.            | Distance.      |
|--|-------------------------------|----------------------------|----------------------------|--|---|--------------------|----------------|
| <i>Supplementary<br/>points—Continued.</i>                       |                               |                            |                            |  |   |                    |                |
| Anthony school-<br>house, tower, 1901.                           | 37 09 02.176<br>98 01 35.377  | 88 59 55.5<br>150 58 03.8  | 208 56 56.6<br>330 56 34.4 | Rutherford...<br>Anthony NW.<br>base.        | 3. 864016<br>3. 870433                      | 7311.7<br>7523.7   | 23988<br>24684 |
|  |                               | 180 44 41.1                | 0 44 41.7                  | Anthony SE.<br>base.                         | 3. 253217                                   | 1791.5             | 5878           |
|  |                               | 205 36 28.2                | 25 38 26.5                 | Quarry.....                                  | 4. 047314                                   | 11151.0            | 36585          |
|  |                               | 277 57 29.8                | 98 05 11.7                 | Fowler.....                                  | 4. 280300                                   | 19067.8            | 62558          |
|  |                               | 324 54 37.4                | 144 58 09.5                | Miller.....                                  | 4. 170259                                   | 15100.8            | 49573          |
| Bluff City school-<br>house belfry, 1902                         | 37 04 14.280<br>97 52 34.900  | 53 13 10.1<br>128 43 56.9  | 233 11 16.2<br>308 38 31.3 | Miller.....<br>Anthony SE.<br>base.          | 3. 765816<br>4. 232085                      | 5832.0<br>17064.2  | 19134<br>55985 |
|  |                               | 221 43 24.1                | 41 45 39.5                 | Fowler.....                                  | 3. 020534                                   | 8327.9             | 27322          |
| Anthony elevator<br>stack, 1901.                                 | 37 00 10.398<br>98 02 10.228  | 86 36 39.4<br>158 10 51.6  | 200 34 01.4<br>336 09 43.2 | Rutherford...<br>Anthony NW.<br>base.        | 3. 810353<br>3. 839680                      | 6461.8<br>6013.3   | 21200<br>22681 |
|  |                               | 209 52 00.0                | 20 52 21.6                 | Anthony SE.<br>base.                         | 3. 248805                                   | 1773.4             | 5818           |
|  |                               | 210 04 59.3                | 30 07 18.5                 | Quarry.....                                  | 4. 054178                                   | 11328.6            | 37167          |
| Anthony roller mill<br>stack, 1901.                              | 37 00 05.062<br>98 02 08.080  | 156 10 40.0<br>205 59 59.2 | 336 18 30.3<br>26 00 19.5  | Anthony NW.<br>base.<br>Anthony SE.<br>base. | 3. 850350<br>3. 277392                      | 7085.2<br>1894.0   | 23245<br>6214  |
|  |                               | 322 40 30.2                | 142 44 21.8                | Miller.....                                  | 4. 194752                                   | 15058.6            | 51373          |
| Freeport (gothic)<br>church spire, 1902.                         | 37 12 01.252<br>97 51 20.080  | 19 59 10.3<br>70 12 49.3   | 190 59 31.4<br>250 00 38.4 | Miller.....<br>Anthony SE.<br>base.          | 4. 270402<br>4. 192880                      | 10032.3<br>15591.5 | 62442<br>51153 |
|  |                               | 335 36 09.5                | 155 37 40.3                | Fowler.....                                  | 3. 053417                                   | 8982.9             | 29471          |
| Freeport east spire,<br>1902. <sup>1</sup>                       | 37 12 01.10<br>97 51 14.76    | 330 20 47<br>76 21 29      | 150 28 14<br>258 15 15     | Fowler.....<br>Anthony SE.<br>base.          | 3. 050326<br>4. 190796                      | 8919.2<br>15732.4  | 29262<br>51615 |
| Bluff City elevator<br>(red), north gable,<br>1902. <sup>7</sup> | 37 04 47.53<br>97 52 34.83    | 125 56 31<br>220 52 08     | 305 51 05<br>46 54 23      | Anthony SE.<br>base.<br>Fowler.....          | 4. 215098<br>3. 880378                      | 16443.6<br>7592.4  | 53949<br>24009 |
| Bluff City mill, iron<br>stack, 1902. <sup>1</sup>               | 37 04 46.54<br>97 52 25.62    | 125 34 08<br>225 30 10     | 305 28 37<br>45 32 20      | Anthony SE.<br>base.<br>Fowler.....          | 4. 221312<br>3. 872118                      | 16646.1<br>7449.3  | 54613<br>24440 |
| Hinton elevator,<br>north gable, 1902. <sup>1</sup>              | 37 10 01.08<br>97 55 24.74    | 204 40 11<br>89 52 37      | 114 44 09<br>200 48 54     | Fowler.....<br>Anthony SE.<br>base.          | 4. 020903<br>3. 960044                      | 10712.8<br>9121.0  | 35147<br>20024 |
| Sec. 35, T. 18, R. 8<br>W., NW.cor., 1900. <sup>1</sup>          | 38 26 58.18<br>08 10 50.20    | 260 20 27                  | 80 21 00                   | Central.....                                 | 3. 119751                                   | 1317.5             | 4322           |
| Sec. 24, T. 19, R. 7<br>W., NW.cor., 1900. <sup>1</sup>          | 38 23 27.74<br>98 03 11.38    | 209 59 49                  | 29 59 54                   | Little River...                              | 2. 589637                                   | 388.72             | 1275           |
| Sec. 3, T. 20, R. 10<br>W., NW.cor., 1900. <sup>1</sup>          | 38 20 51.57<br>98 23 28.17    | 352 46 07                  | 172 46 08                  | Chase.....                                   | 2. 402433                                   | 252.6              | 829            |
| Sec. 36, T. 34, R. 6<br>W., SW.cor., 1902. <sup>1</sup>          | 37 02 14.18<br>97 55 44.82    | 180 08 38                  | 6 08 30                    | Miller.....                                  | 2. 322674                                   | 210.22             | 600            |
| Sec. 36, T. 33, R. 5<br>W., SW.cor., 1902. <sup>1</sup>          | 37 07 29.15<br>97 49 11.58    | 248 27 36                  | 68 27 40                   | Fowler.....                                  | 2. 750403                                   | 502.08             | 1847           |
| Sec. 13, T. 29, R. 7<br>W., NW.cor., 1902.                       | 36 59 54.905<br>97 54 45.639  | 53 07 32.0<br>101 49 11.7  | 233 00 05.1<br>341 48 30.0 | Sand Hill....<br>Miller eccentric            | 4. 362214<br>3. 071180                      | 23025.8<br>4690.1  | 75544<br>15387 |
|  |                               | 200 09 34.1                | 110 17 01.4                | Renfrow.....                                 | 4. 324237                                   | 21007.8            | 09218          |
| Boundary stone 160,<br>1902.                                     | 36 50 54.982<br>97 54 01.075  | 89 52 30.9<br>150 18 16.3  | 260 52 10.7<br>330 17 14.4 | Sec. corner 13...<br>Miller eccentric        | 3. 032290<br>3. 706884                      | 1077.2<br>5127.2   | 3534<br>10821  |
|  |                               | 150 45 43.4                | 330 44 41.8                | Miller.....                                  | 3. 712448                                   | 5157.0             | 10921          |
|  |                               | 300 39 51.4                | 120 46 52.5                | Renfrow.....                                 | 4. 304601                                   | 20165.1            | 68158          |

<sup>1</sup> No check on this position.

## GEOGRAPHIC POSITIONS—Continued.

Ninety-eighth meridian—Continued.

| Station.   | Latitude<br>and<br>longitude. | Azimuth.                                  | Back<br>azimuth.                          | To station.  | Loga-<br>rithm of<br>distance<br>in meters. | Meters.                    | Feet.                 |
|--|-------------------------------|---|---|--|---|----------------------------|-----------------------|
| <i>Supplementary<br/>points—Continued.</i>             |                               |   |   |  |   |                            |                       |
| Red barn, near sec.<br>13, south gable,<br>1902.       | 37 01 00.800<br>97 53 59.674  | 1 36 22.9<br>29 10 33.5<br>133 02 24.1    | 181 36 21.5<br>209 10 05.9<br>313 01 20.8 | Boundary<br>stone 160.<br>Sec. corner 13..<br>Miller eccentric | 3.307434<br>3.366683<br>3.550694            | 2029.7<br>2320.4<br>3553.1 | 6659<br>7033<br>11657 |
| Livingood's house<br>chimney, 1902.                    | 37 00 10.546<br>97 56 44.176  | 200 16 56.1<br>279 19 27.7                | 20 17 31.9<br>99 20 39.1                  | Miller eccentric<br>Sec. corner 13..                           | 3.627011<br>3.473168                        | 4236.5<br>2972.7           | 13899<br>9753         |
| First auxiliary, 1902.                                 | 36 59 54.827<br>97 56 44.901  | 182 07 10.7<br>198 26 21.0<br>269 56 37.3 | 2 07 11.1<br>18 26 57.2<br>89 57 49.1     | Livingood's<br>house.<br>Miller eccentric<br>Sec. corner 13..  | 2.085635<br>3.672069<br>3.470028            | 484.0<br>4099.7<br>2951.4  | 1501<br>15419<br>9683 |
| Second auxiliary,<br>1902.                             | 37 00 02.287<br>97 57 16.103  | 252 09 14.9<br>280 33 53.0                | 72 09 34.1<br>106 34 11.8                 | Livingood's<br>house.<br>First auxiliary                       | 2.919534<br>2.906500                        | 830.9<br>806.5             | 2726<br>2046          |
| Boundary stone 163,<br>1902.                           | 36 59 54.725<br>97 57 16.453  | 181 45 40.0<br>238 34 23.2                | 1 45 41.1<br>58 34 42.6                   | Second auxil-<br>iary.<br>Livingood's<br>house.                | 2.387604<br>2.970030                        | 233.1<br>935.3             | 765<br>3069           |
| Camchester school-<br>house belfry, 1902. <sup>1</sup> | 37 00 04.00<br>98 02 06.38    | 245 54 13<br>27 59 24                     | 65 58 04<br>207 56 22                     | Miller.....<br>Sand Hill.....                                  | 4.015121<br>4.203675                        | 10354.3<br>15933.6         | 33971<br>52440        |

## DESCRIPTION OF STATIONS.

This list 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  $360^{\circ}$ , south being  $0^{\circ}$ , west  $90^{\circ}$ , north  $180^{\circ}$ , and east  $270^{\circ}$ . Where magnetic azimuths are given they are indicated as such.

In general, except where the contrary is specifically stated, the surface and underground mark 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 in cases 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.

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.

## GENERAL NOTES IN REGARD TO STATION MARKS.

*Note 1.*—For each station referred to this note, 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 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.

*Note 2.*—Around each station referred to this note a circular trench 4 to 8 feet in diameter, 9 to 18 inches deep, and 6 to 12 inches wide, was dug and partly filled with coal.

*Note 3.*—For each station referred to this note the marking is the same as that indicated in Note 1, except that the buried bottle is stated to be a stone bottle or jug.

*Note 4.*—For each station referred to this note 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.*—For each station referred to this note 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.*—For each station referred to this note the surface mark is 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.*—For stations referred to this note the underground mark is a bottle incased in concrete and buried with the mouth  $2\frac{1}{2}$  to 4 feet below the surface of the ground. The surface mark is a 6-inch drain tile pipe 2 feet long, filled with concrete and buried with flange end flush with surface of ground, the intersection of a cross on a bronze plate embedded in the concrete marking center of station. The bronze plate has a stem 76 millimeters long, which is securely fastened in the concrete by a wedge driven in the lower end. The top of the bronze mark is a shallow cup about 60 millimeters in diameter and 12 millimeters deep inside, with a flange or rim 10 millimeters thick. The marking plate is about 37 millimeters in diameter and raised about 3 millimeters above the bottom of the cup, where the letters U. S. C. & G. S. are cast.

Witness marks are placed  $4\frac{1}{2}$  to 7 feet north and south of the station and consist of 4-inch drain tile pipes 2 feet long, filled with concrete and buried with top flush with ground. An iron nail is set in the concrete of each witness mark.

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

## THIRTY-NINTH PARALLEL.

## PRINCIPAL POINTS.

*Bowler* (Jackson County, Mo., F. D. Granger, 1884).—In NW.  $\frac{1}{4}$  of SW.  $\frac{1}{4}$  sec. 18, T. 47 N., R. 31 W., on a small hill about one-third of a mile west of the dwelling house of J. O. Bowler, owner of the land, and about  $2\frac{1}{2}$  miles southwest of the town of Lees Summit. The geodetic point is about 20 yards south of an apple orchard. (See notes 1 and 6.) Pieces of soft coal are mixed in the earth around it.

*Fulton* (Cass County, Mo., F. D. Granger, 1883).—In NE.  $\frac{1}{4}$  sec. 2, T. 44 N., R. 31 W., about 168.5 feet from northwest corner of quarter, 71.1 feet south of fence

forming the northern boundary of Fulton's farm and separating it from main road, and 71.5 feet east from a small house. (See note 1.<sup>1</sup>) Central post bears F. D. G. 1883 on north face.

*Berry* (Cass County, Mo., F. D. Granger, 1884).—In SW.  $\frac{1}{4}$  sec. 10, T. 33 N., R. 46 W., about  $1\frac{1}{2}$  miles west of the town of Belton, near the east center of a cultivated field belonging to Mrs. R. C. Berry. A forked cottonwood tree, marked with cut triangle 3 feet from ground, on side toward station, bears  $93^{\circ} 23'$ , 279 $\frac{1}{2}$  feet distant. (See notes 1 and 3.<sup>1</sup>) Earth around central post is mixed with charcoal.

*Marty* (Johnson County, F. D. Granger, 1884).—In SE.  $\frac{1}{4}$  sec. 19, T. 12 S., R. 25 E., about 4 miles northeast of the town of Lenexa. The geodetic point is in an open cultivated field about one-fourth mile south of John Marty's house, 12 yards north of a farm road, and 22 yards west of a hedge. (See notes 1 and 3.<sup>1</sup>) Central post is surrounded by charcoal.

*Haskin* (Johnson County, F. D. Granger, 1885).—In SW.  $\frac{1}{4}$  sec. 18, T. 15 S., R. 25 E., about  $7\frac{1}{2}$  miles east of the town of Spring Hill, 45 $\frac{1}{2}$  feet northeast of U. A. Haskin's barn and nearly due south of his dwelling house. The corner of secs. 13, 18, 19, and 24 is 665 $\frac{1}{2}$  feet distant, and the southeasterly tree in grove is 23 $\frac{1}{2}$  feet distant. (See notes 1 and 3.<sup>1</sup>) Central post is surrounded by charcoal.

*Thomas* (Johnson County, F. D. Granger, 1885).—In sec. 7, T. 14 S., R. 23 E., on Mr. Thomas's place about 2 miles south and 4 miles west of Olathe, 358 $\frac{1}{4}$  feet west of a hedge fence which is  $\frac{1}{8}$  mile west of section line, and 64 feet north of middle of road. (See note 1.<sup>1</sup>) The azimuths and distances to certain points are: To southeast corner Thomas house,  $92^{\circ} 15'$ , 163 feet; to cottonwood tree near barn,  $195^{\circ} 41'$ , 84 feet; to cottonwood tree near fence,  $240^{\circ} 43'$ , 134 feet; to double tree near hedge,  $267^{\circ} 25'$ . Around the central post is a bed of charcoal 4 feet in diameter and 18 inches deep.

*Eckman* (Leavenworth County, F. D. Granger, 1885; 1887).—About 502 feet south and 93 feet west of the northeast corner of sec. 6, T. 12 S., R. 22 E., in the immediate vicinity of Daisy post office. (See note 1.<sup>1</sup>) The azimuths and distances to certain points are: To northeast corner of Daisy post office and hotel,  $355^{\circ} 24'$ , 29 feet 1 inch; to northwest corner of post office,  $17^{\circ} 46'$ , 77 feet 10 inches; to middle of road, east 93 feet 4 inches; to E. Martin's house,  $292^{\circ} 22'$ . A bed of charcoal 4 feet in diameter and 18 inches deep surrounds the central post.

*Bebe Mound* (Douglas County, F. D. Granger, 1887).—In Palmyra Township,  $\frac{1}{4}$  mile west of county line between Johnson and Douglas Counties and  $2\frac{1}{4}$  miles north of county line between Franklin and Douglas Counties. The azimuths and distances to certain points are: To northwest corner of orchard, 305 feet; to northeast corner of orchard, 129 feet; to fence, south, 38 feet; to center of Mr. Dwyer's house,  $7^{\circ} 09'$ , 466 feet. (See notes 1 and 2.<sup>1</sup>) The center post tapers to 3 by 3 inches at bottom and has F. D. G. 1887 cut on one side near the top.

*Kanwaka* (Douglas County, F. D. Granger, 1887).—In the northeast corner of NW.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  sec. 22, T. 12 S., R. 18 E., Kanwaka Township, on land owned by Thomas Anderson, in a pasture 109 feet south of the "Old California Road," 10 miles northwest of Lawrence and about 5 miles south of Le Compton. Quarter section corner of sections 22 and 23 is 1447.0 feet distant, north and east. Quarter section corner of sections 22 and 27 is 2810.3 feet distant, south and west. George Anderson's house is 1251.5 feet distant, north and west. (See notes 1, 2, and 3.<sup>1</sup>) The center post is also marked on south side near the top with F. D. G. 1887.

*Simmons* (Douglas County, F. D. Granger, 1887).—Near the center of SW.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  sec. 32, T. 14 S., R. 18 E., on the summit of a prominent hill about 14 miles west of Baldwin City, on land owned by P. A. Simmons, of Lapeer. The underground mark is a drill hole in the head of an iron bolt tightly wedged in a hole drilled into a ledge of limestone 2.3 feet below the surface of the ground. (See notes 1 and 2.<sup>1</sup>)

<sup>1</sup> See p. 35.

The azimuths and distances to certain points are: To northwest corner stone wall,  $272^{\circ} 52'$ , 142.2 feet; to southeast corner stone sec. 32,  $291^{\circ} 36'$ , 2176.5 feet; to northwest corner Simmons's house,  $854^{\circ} 50'$ , 287.3 feet. A farmyard gate bears about west, 73 feet.

*Elevation* (Shawnee County, F. D. Granger, 1887).—Near the southwest corner of N.  $\frac{1}{2}$  of NW.  $\frac{1}{4}$  south of Reserve line in sec. 28, T. 12 S., R. 15 E. "Elevation" is a well-known point about 10 miles southwest of Topeka; on its summit stands the Wesleyan Methodist Church, and on its south face or slope, about 60 yards from the church, stands the Elevation schoolhouse. (See notes 1, 2, and 3.<sup>1</sup>) The azimuths and distances to certain points are: To cupola Elevation schoolhouse,  $14^{\circ} 28'$ , 288 feet; to stone northwest corner school acre,  $35^{\circ} 38'$ , 273.7 feet; to stone northwest corner sec. 28,  $166^{\circ} 32'$ , 701.1 feet; to northeast corner stone coal house,  $339^{\circ} 06'$ , 41 feet; to northwest corner Elevation church, 22', 59.1 feet; to tombstone of Phebe McCool, 111.5 feet. The center stone has F. D. G. 1887 cut on south face near the top.

*Mabon* (Osage County, F. D. Granger, 1887).—Near the south center of SW.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  sec. 30, T. 14 S., R. 15 E., on the summit of a small elevation, on land owned by James Mabon, about 7 miles southwest of Carbondale and 5 miles northeast of Burlingame. The azimuths and distances to certain points are: To stone southeast corner sec. 30,  $276^{\circ} 43'$ , 1924.5 feet; to quarter-section stone,  $70^{\circ} 17'$ , 778.2 feet. (See notes 1, 2, and 3.<sup>1</sup>) The marble post has F. D. G. 1887 cut on south face near the top. The hill on which station is located is rocky and has never been cultivated.

*Powell* (Shawnee County, F. D. Granger, 1887).—In NE.  $\frac{1}{4}$  sec. 14, T. 13 S., R. 13 E., on land owned by Powell & Sage, 194 feet north of a new schoolhouse and 88 feet west of the center of the road. (See notes 1 and 3.<sup>1</sup>) The marble post has F. D. G. 1887 cut on south side near top. The azimuths and distances to certain points are: To quarter-section stone,  $356^{\circ} 20'$ , 1481.1 feet; to northeast corner of schoolhouse porch,  $358^{\circ} 56'$ , 194.4 feet; to chimney of schoolhouse,  $9^{\circ} 28'$ , 205.1 feet; to northwest corner of schoolhouse,  $10^{\circ} 22'$ , 193.5 feet; to stone northeast corner sec. 14,  $184^{\circ} 32'$ , 1185.8 feet; to wire fence east, 60.5 feet.

*Adams* (Wabaunsee County, F. D. Granger, 1888).—In SW.  $\frac{1}{4}$  sec. 34, T. 11 S., R. 12 E., Maple Hill Township, on land owned by Frank Adams, of Maple Hill. It is on a high point 1.2 miles due south of Buffalo Mound, a prominent and well-known butte 4 miles southwest of Maple Hill. The summit of the hill is rough and the soil poor and rocky and suitable only for cattle grazing. About 150 yards west there is a good spring of water near the head of a ravine. Station is  $207\frac{1}{2}$  feet north of section-line fence, and 50 feet south and 44 feet east of brow of hill. A railroad tie was used as a pier for the artificial horizon and has not been removed. It is 6 feet 3 inches north of the center of the station. (See note 1.<sup>1</sup>) The marble post is marked F. D. G. 1888 on south side near the top.

*Clark* (Wabaunsee County, F. D. Granger, 1888).—In NE.  $\frac{1}{4}$  sec. 6, T. 14 S., R. 12 E., Eskridge Township, on the summit of a high ridge, on land owned by John Clark, about 1 mile west-northwest from center of the town of Eskridge. To the west of station, 420 feet, is a public road which terminates at a road running north and south, the station being situated about 8 to 10 feet to the north of the prolongation of the south side of this road. About 2000 feet east is a good spring. (See note 1.<sup>1</sup>) The marble post has F. D. G. 1888 cut on the south face.

*Meyer* (Wabaunsee County, F. D. Granger, 1888).—In NE.  $\frac{1}{4}$  sec. 16, T. 10 S., R. 13 E., on the crest of a large prairie about 6 miles south and 1 mile west from the town of Alma, on land owned by W. C. Meyer, of Fairview, and used as a cattle range. To the south about 600 feet is a public road, which at this point from being a north and south road turns abruptly to the east and runs again north and south about a mile east of the station. A private road runs 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 station is a good spring and horse pond. About 1000 or more feet to

<sup>1</sup> See p. 35.

the east of the station is a section-line fence. (See note 1.<sup>1</sup>) The center post has F. D. G. 1888 cut on south side.

*Zean Dale* (Riley County, F. D. Granger, 1888).—This station is 29 feet 3 inches southwest of intersection of secs. 15, 16, 21, and 22, and is also south of section fence to the north 23 feet 1 inch and west of section fence to the east 18 feet 9 inches. It is on the crest of a large broken prairie which at this point falls off abruptly to the valley of the Kaw River on the north, and is about 10 miles northwest of the town of Alma, Wabaunsee County, on land owned by C. W. Allendorph, of Topeka, and used as a cattle range. To the northeast and northwest are deep ravines and the hilltop is very rocky. In a little ravine about  $\frac{1}{2}$  mile to the east is a well of good water. (See note 1.<sup>1</sup>) On south face of center post is cut F. D. G. 1888.

*Reinhard* (Morris County, F. D. Granger, 1888).—In W.  $\frac{1}{2}$  of NE.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  sec. 6, T. 14 S., R. 18 E., on the crest of a large prairie about  $2\frac{1}{2}$  miles northeast of the town of Dwight. It is about  $215\frac{1}{4}$  feet north of the prolongation of the west side of the house of Mrs. L. C. Reinhard, on whose land it is, the land being used for grass and pasture. (See note 1.<sup>1</sup>) On the south face of center post is cut F. D. G. 1888. Northwest corner of Reinhard's house bears  $353^{\circ} 11'$ .

*Humboldt* (Geary County, F. D. Granger, 1889).—This station is 200 feet north and 880 feet west of southeast corner of NE.  $\frac{1}{4}$  sec. 10, T. 12 S., R. 7 E., Winfield Township, on the dividing ridge between Humboldt and McDowell Creeks, about 14 miles east of Junction City and 35 miles south of Westgate post office, on land supposed to belong to the Union Pacific Railroad. The ridge runs in a northwesterly and southeasterly direction, varying in width from 1500 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. (See notes 1, 2, and 3.<sup>1</sup>) The distances and azimuths to certain points are: To southwest corner sec. 10,  $57^{\circ} 07'$ , 5242 feet; to quarter-section stone,  $87^{\circ} 09'$ , 4406 feet; to clump of trees at W. Roper's house,  $109^{\circ} 55'$ , about  $1\frac{1}{2}$  miles; stone pile on cone-shaped hill near Ogden,  $158^{\circ} 03'$ ; to hill at end of range to northeast,  $196^{\circ}$ , about 8 miles; to hill east of station,  $263^{\circ} 35'$ , about 2.5 miles.

*Ericssen* (Riley County, F. D. Granger, 1889).—In SE.  $\frac{1}{4}$  of SW.  $\frac{1}{4}$  sec. 12, T. 10 S., R. 6 E., about 9 miles west of Manhattan and 13 miles east of Milford, on the main road between these towns crossing Overalls Ridge, 479 feet north of the center of the road and 1988 feet from stone marking the southwest corner of section 12, on land belonging to Hans Christopher. (See notes 1, 2, and 3.<sup>1</sup>) The azimuths and distances to certain points are: To stone at southwest corner sec. 12,  $77^{\circ} 07'$ , 1988 feet; to northeast corner of Christopher's house, 76.5 feet.

*Robbins* (Geary County, F. D. Granger, 1889).—In SE.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  sec. 30, T. 12 S., R. 6 E., at the south end of a cultivated field belonging to James Barnard. It is north of a small grove of cottonwood trees, 125 feet west of the main road and 15 feet north of the fence. West of the grove is a peach orchard and a ranch building, the whole surrounded by a wire fence. (See notes 1, 2, and 3.<sup>1</sup>) The surface marks are in an east and west line 17.9 feet south of station. The arrows on the limestone witness posts point to the station. The azimuths and distances to the surface marks and certain other points are: To east limestone post (No. 1),  $325^{\circ} 00'$ , 21.93 feet; to marble post,  $0^{\circ} 00'$ , 17.90 feet; to west limestone post (No. 2),  $35^{\circ} 00'$ , 21.93 feet; to stone northeast corner sec. 30,  $183^{\circ} 19'$ , 1823.3 feet; to quarter-section stone,  $192^{\circ} 11'$ , 518.2 feet; to northeast cottonwood,  $287^{\circ} 38'$ , 76.6 feet; to northeast corner ranch building,  $35^{\circ} 11'$ , 200.6 feet.

*White City* (Morris County, F. D. Granger, 1888).—In NE.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  sec. 26, T. 14 S., R. 6 E., on a level prairie, about  $\frac{1}{2}$  mile east-northeast of White City, about 1750 feet east-northeast of crossing of Chicago, Rock Island & Pacific and Missouri,

<sup>1</sup> See p. 35.

Kansas & Texas Railways on land of Nelson Burnham, of Peoria, Ill. (Garret Inedeker, of White City, agent). (See notes 1 and 2.<sup>1</sup>) Marble post has F. D. G. 1888 cut on south side. The azimuths and distances to certain points are: To cupola of school-house at White City,  $22^{\circ} 58'$ ; to west post ( $\frac{1}{2}$  mile to White City),  $76^{\circ} 14'$ , 1,025 feet; to north post (2000 feet to Chicago, Rock Island & Pacific and Missouri, Kansas & Texas Railroad crossing),  $157^{\circ} 21'$ , 609 feet.

*Taylor* (Dickinson County, F. D. Granger, 1889).—In NE.  $\frac{1}{4}$  sec. 32, T. 13 S., R. 4 E., about 6 miles south and 1 mile east of Chapman, on land owned by Clarence Taylor. (See notes 1 and 2.<sup>1</sup>) The distances to certain points are: To north hedge, 925.5 feet; to line of east hedge, 47 feet; to west face of coal house, 137.1 feet; to north line of cherry trees, 54.6 feet; to northeast corner sec. 32, 2096.9 feet; to large cottonwood, 67.3 feet.

*Wilmer* (Dickinson County, F. D. Granger, 1889).—In SE.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  sec. 1, T. 11 S., R. 3 E., on land owned by Rudolph Wilmer, who lives three-fourths of a mile to the southwest. The nearest towns are Wakefield, about 8 miles to north-northeast, and Milford, 10 miles to the east-northeast, both on the Union Pacific Railroad. (See notes 1, 2, and 3.<sup>1</sup>) The azimuths and distances to certain points are: To southeast corner of sec. 1,  $325^{\circ} 24'$ , 1283 feet; to wire fence east, 428 feet; to fence south, 1060 feet.

*Frey* (Dickinson County, F. D. Granger, 1890).—In the NW.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  sec. 11, T. 12 S., R. 2 E., about 8.5 miles north of Abilene, on land owned 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 and buried 20 inches below the surface of the ground. The surface marks, consisting of one marble and two limestone posts, each 6 inches square by 2.3 feet long, are in an east-and-west line in the hedge 8.91 feet to the north. The arrows on the limestone witness posts point to station. The azimuths and distances to surface marks and certain other points from the center of the station are: To west limestone post (No. 1),  $138^{\circ}$ , 11.93 feet; to marble post,  $180^{\circ}$ , 8.91 feet; to stone northeast corner sec. 11,  $215^{\circ} 06'$ ; to east limestone post (No. 2),  $222^{\circ}$ , 12.01 feet; to stone northeast corner of W.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  sec. 11,  $268^{\circ} 03'$ , 575 feet.

*Vine Creek* (Ottawa County, F. D. Granger, 1886).—In NW.  $\frac{1}{4}$  sec. 13, T. 11 S., R. 1 W. The nearest railroad stations are Vine Creek,  $2\frac{1}{2}$  miles to the northwest, and Manchester, 4 miles east, both on the Santa Fe Railroad. (See note 1.<sup>1</sup>) Each reference mark is distant 10.01 feet from the central marble post. The azimuths and distances to additional reference marks are as follows: The northeast corner of McDade's house,  $53^{\circ} 30'$ , 270.5 feet; stone at northwest corner of sec. 13,  $172^{\circ} 19'$ , 466.7 feet; southwest corner of old stone stable,  $263^{\circ} 08'$ , 218.6 feet; stone on the sixth principal meridian at the southeast corner of the NE.  $\frac{1}{4}$  of sec. 13,  $292^{\circ} 48'$ , 5680 feet; and the northwest corner of stone "dugout,"  $294^{\circ} 29'$ , 124.6 feet.

*Iron Mound* (Saline County, F. D. Granger, 1886; 1900).—On a prominent and well-known butte in the NW.  $\frac{1}{4}$  sec. 26, T. 14 S., R. 2 W., about 7 miles southeast of Salina. (See note 3.<sup>1</sup>) When visited in 1900, no witness marks could be found.

*Salina west base* (Saline County, F. D. Granger, 1895).—In the northeast part of Salina, east of the tanks of the Standard Oil Co. The geodetic point is marked by the intersection of cross lines on a copper bolt set in a limestone post, 6 inches square and 2 feet long, sunk 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 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 a surface mark. The two

<sup>1</sup> See p. 35.

blocks are cemented together and are surrounded by a body of concrete several inches thick. The exposed top of the block bears the inscription U. S. C. & G. Survey, 1896. The following distances to reference marks are given: The geodetic point is 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., 79 feet northwest of the north rail of the main track of the Union Pacific Railroad. It is also 79.7 feet west of a telegraph pole and 35.2 feet a little east of north of the fence corner of the Standard Oil Co.'s property.

*Salina east base* (Saline County, F. D. Granger, 1895).—About 1 mile west of the village of New Cambria, on land owned by Mrs. Mary Marlin, Salina. The geodetic point is marked, both underground and at the surface, in practically the same manner as Salina west base station, the only points 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. The geodetic point is 78.8 feet a little south of west from a wire fence on the Marlin farm; 22.43 feet a little west of north of a wire fence alongside the railroad; 35.05 feet from the second telegraph pole, marked with a triangle, west of the gate entrance to the Marlin farm, and 70.3 feet in the same direction from the north rail of the Union Pacific Railroad track.

*North Pole Mound* (Saline County, F. D. Granger, 1890).—On a prominent and well-known hill in the NW.  $\frac{1}{4}$  sec. 1, T. 14 S., R. 3 W., and about 8.5 miles north of Salina. The geodetic point is marked by a bottle filled with ashes, buried 1 foot below the surface of the ground. Over this was placed a limestone block, 1 foot square by 5 inches thick, with two cross lines and the letters U. S. C. S. cut on its top surface, which was covered with several inches of earth.

*Heath* (Ellsworth County, F. D. Granger, 1890; 1900).—In the SW.  $\frac{1}{4}$  sec. 12, T. 14 S., R. 7 W., on land owned by William Heath, who lives in a stone house about  $\frac{1}{2}$  of a mile to the southwest. The nearest towns are Brookville, 14 miles to the southeast, and Ellsworth, 18 miles to the southwest, both on the Union Pacific Railroad. (See note 1.<sup>1</sup>) One of the reference marks is 7.51 feet south and the other 7.16 feet north of the central marble post.

*Thompson* (Ottawa County, F. D. Granger, 1890).—About 12 miles southwest of the town of Minneapolis, in the NW.  $\frac{1}{4}$  sec. 25, T. 11 S., R. 5 W., on a prominent round-topped hill belonging to Judge R. F. Thompson, of Minneapolis, Kans. (See note 1.<sup>1</sup>) One of the reference marks is 13.18 feet north and the other 14.10 feet south of the central marble post.

*Lincoln* (Lincoln County, F. D. Granger, 1891).—On the high prairie  $3\frac{1}{2}$  miles north and  $3\frac{1}{2}$  miles east of the town 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 by a mortgage and investment company of Lincoln. It is about 15 yards south of the main road from Lincoln to Barnard, and the nearest house, which is about  $\frac{1}{2}$  mile to the northeast on the Barnard road, is owned and occupied by Mr. Parks. The reference stones are 10.09 feet north and 11.41 feet south of the station. (See notes 1 and 2.<sup>1</sup>)

*Golden Belt* (Lincoln County, F. D. Granger, 1891).—Near the south end of the northernmost of two prominent hills situated in the SE.  $\frac{1}{4}$  sec. 27, T. 12 S., R. 9 W., on land owned by Mr. Marshall, of Lincoln Center, 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. The two reference marks are placed 9.55 feet north and 9.05 feet south of the station. (See note 1.<sup>1</sup>)

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<sup>1</sup> See p. 35.

*Wilson* (Russell County, F. D. Granger, 1891; 1900).—In the SE.  $\frac{1}{4}$  sec. 1, T. 14 S., R. 11 W., about  $\frac{1}{2}$  mile west and  $2\frac{1}{2}$  miles north of the town of Wilson, Ellsworth County. A road running north along the line, separating Ellsworth and Russell counties, passes over the ridge within 100 yards to the west of the station. The two reference marks are placed one 8.03 feet north and the other 15.08 feet south of the station. (See note 1.)

*Bunker Hill* (Russell County, F. D. Granger, 1891).—In the SW.  $\frac{1}{4}$  sec. 31, T. 13 S., R. 12 W., in the southwest part of the town of Bunker Hill, in an open lot west of the town water tower. The nearest corner of the water tower is 187.4 feet from the station and the stone marking the southwest corner of sec. 31, T. 13 S., R. 12 W., is 238.2 feet from the station. The two reference marks are 8 feet north and 8 feet south of the station. (See notes 2 and 3.)

*Allen* (Russell County, F. D. Granger, 1892).—In the NW.  $\frac{1}{4}$  sec. 22, T. 14 S., R. 14 W., and about 1 mile west and 4 miles south of Russell, Russell County, on land owned by Mr. Montgomery, of Ohio, and under the management of Mr. Clements, who lives 1 mile south of the station. The azimuths and distances to certain points are: To stone marking the northwest corner of sec. 22,  $122^{\circ} 27' 14''$ , 446.8 feet; to the north chimney of the house of H. A. Allen, who rents the land on which the station stands,  $99^{\circ} 36'$ , about 150 yards; to the north chimney of an old house,  $158^{\circ} 18'$ , and the southeast chimney of the house is 90 feet from the station. The station is 237 feet south of the center of the road. The reference marks are 9 feet north and 9 feet south of the station. (See notes 2 and 3.)

*Blue Hill* (Ellis County, F. D. Granger, 1892).—On a prominent ridge forming a part of the Blue Hills and in the S.  $\frac{1}{2}$  sec. 21, T. 12 S., R. 16 W. To reach the station from Walker, travel due north to the foot of the hills, thence to the northwest, passing to the eastward of a stone house and grove of small trees. Follow this road about 2 miles, and when well up on the ridge take the first trail bearing off to the west. This trail passes near the head of two deep canyons, which make up from the valley of the Saline River. After passing the head of the second canyon leave the trail and pass to the top of the ridge, which is narrow at the point and almost surrounded by ravines. There is a ravine in azimuth  $63^{\circ} 46'$  and distant 112 feet; the head of a ravine in azimuth  $133^{\circ} 34'$ , distant 154 feet; the head of a ravine in azimuth  $254^{\circ} 25'$ , distant 213 feet; the head of a ravine in azimuth  $288^{\circ} 34'$ , distant 342 feet; and an old sod house in azimuth  $340^{\circ} 59'$  from the station. The two reference marks are 8 feet north and 8 feet south of the station. (See notes 2 and 3.)

*Waldo* (Osborne County, F. D. Granger, 1892; 1897).—On the highest ground in the SE.  $\frac{1}{4}$  sec. 24, T. 10 S., R. 14 W., and about 4.5 miles northwest of Waldo, Russell County, on land said to belong to the Union Pacific Railroad Co. A well-traveled road from Waldo ascends the hill from the southwest and turning north passes some 20 yards to the east of the station. The two reference marks are 9 feet north and 9 feet south of the station. (See note 1.<sup>1</sup> Note 2 also applies, except that the circular trench is 11 feet in diameter and  $1\frac{1}{2}$  feet deep.)

*Meade's Ranch* (Osborne County, F. D. Granger, 1891; 1897).—On the highest part of a prominent ridge in sec. 34, T. 9 S., R. 11 W., and about  $\frac{1}{2}$  mile northeast of Meade's ranch house. A good road passes up from the house and crosses the hill within 100 feet west of the station. The nearest town is Lucas, or Elbon, 12 miles to the south on the Union Pacific Railroad, Lincoln Branch. The azimuths and distances to certain points are: To the chimney of Meade's ranch house,  $8^{\circ} 30'$ , about  $\frac{1}{2}$  mile; to stone marking southwest corner of sec. 34, T. 9 S., R. 11 W.,  $34^{\circ} 33'$ , 625 yards. The two reference marks are 8.70 feet north and 8.62 feet south of the station. (See notes 1 and 2.)

*Fairmount* (Barton County, F. D. Granger, 1892).—In NE.  $\frac{1}{4}$  sec. 8, T. 16 S., R. 15 W., near the northeast corner of Fairmount schoolhouse lot. (See notes 1, 2, and 3.)

<sup>1</sup> See p. 35.

The azimuths and distances to certain points are: To north line of schoolhouse lot, north, 29 feet; to northeast corner of schoolhouse lot,  $225^{\circ}$ , 41 feet; to east line of schoolhouse lot, east, 29 feet; to center of well,  $353^{\circ} 22'$ , 131.1 feet; to center of road, south, 238 feet; to northeast corner of schoolhouse,  $20^{\circ} 20'$ , 127.8 feet.

*Hays* (Ellis County, F. D. Granger, 1892).—Near the north center of sec. 24, T. 13 S., R. 18 W., just south of the road separating sections 24 and 13, and about 4 miles northeast of Hays City. The only house in the immediate vicinity is built of stone and is situated about 500 yards to the southwest. It is occupied by Mrs. Margaret Middlemeyer, who owns the land south of the station. The land to the north is owned by Andrew Meyer. (See notes 1, 2, and 3.<sup>1</sup>) The distances to certain points are: To northwest corner of sec. 24, about 2550 feet; to center of road, north, 29 feet; to end of hedge, east, 190 feet; to hedge, south, 12.5 feet.

*La Crosse* (Rush County, F. D. Granger, 1892).—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 belonging to George Schwab. A stone house, formerly occupied by a Mr. Schmidt, stands on the summit of a prominent hill about 1 mile northwest of the station. The nearest town is La Crosse, about 5.5 miles to the southwest. The azimuths and distances to certain points are: To magnetic mark (chimney of house),  $205^{\circ} 50'.5$ , 2.5 miles; to highest point of ridge to southeast,  $321^{\circ} 35'$ ; to well and windmill,  $353^{\circ} 05'$ , 633 feet; to fence on line to windmill, 405 feet; to fence west of station, 350 feet; to northwest corner sec. 12,  $134^{\circ} 55'$ . (See notes 1, 2, and 3.<sup>1</sup>)

*Smoky Hill* (Ellis County, F. D. Granger, 1893).—In the south central part of sec. 21, T. 15 S., R. 20 W., on the highest point of a prominent hill overlooking the Smoky Hill River, about 14 miles due north of McCracken and  $2\frac{1}{2}$  miles south-southeast of Stock Range post office. It is in the southern part of a large cattle range (10 000 acres) operated by Frank Meserve, and is 1000 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) nearer this sudden slope. There are two hills to the west of station, a prominent one with nearly the same elevation as that on which the station is situated, 600 feet distant, and a smaller one 375 feet away. There is also a small hill to the east 430 feet, and one to the south 550 feet. There is a deep ravine to the east and a lesser one to the west and a steep bluff to the north. James K. Hardwick's house is  $\frac{1}{8}$  of a mile south of station. The underground mark is a  $\frac{1}{2}$ -gallon stone jug filled with small magnesia fragments and buried 3 feet below the surface, a tack in the cork marking the center of station. (See also notes 1, 2, and 3.<sup>1</sup>) The limestone witness posts are distant 14 and 12.83 feet, respectively, north and south of station. Windmill at stock range bears  $159^{\circ} 20'$ .

*Trego* (Trego County, F. D. Granger, 1893).—In the northeast part of sec. 27, T. 18 S., R. 21 W., about 500 yards from the northeast corner of the section and about 120 yards south of the wire fence following the northern boundary of the section. The station is about 50 feet north of the highest point of a hill locally known as High Top and about 60 feet west of a well-traveled road to Ellis. The road after passing the station leads through a gate to the northeast and between two prominent round mounds locally called "The Nipples." A branch of the road runs south of the southern "Nipple" to Stapelin's stone house. A little west of north, about  $\frac{3}{4}$  mile distant, is a very prominent round hill standing alone in the valley and known as Round Top Mound. (See notes 1, 2, and 8.<sup>1</sup>) The surface mark is a marble post, as in note 1. The azimuths and distances to certain points are: To Round Top Mound,  $155^{\circ}$ ; to northern "Nipple,"  $227^{\circ}$ , 625 yards; to southern "Nipple,"  $239^{\circ} 30'$ , 550 yards; to northeast corner of section 27,  $256^{\circ} 21'$ , 500 yards; to stone pile on top of prominent mound,  $64^{\circ} 40'$ , about  $1\frac{1}{4}$  miles.

*Skaggs* (Ness County, F. D. Granger, 1893).—In the southeastern part of sec. 16, T. 16 S., R. 22 W., on the land of G. W. Skaggs, about  $1\frac{1}{4}$  miles north and  $\frac{1}{4}$  mile

<sup>1</sup> See p. 85.

west of the town of Brownell, and about 200 yards from Mr. Skaggs's house. 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's house. (See notes 1, 2, and 8.<sup>1</sup>) The surface mark is a marble post as in note 1. The azimuths and distances to certain points are: To southwest corner of Mr. Skaggs's barn, 227° 20'; to chimney of Mr. Skaggs's house, 244° 36', 200 yards; to southeast corner of section 16, 335° 02'; to belfry of schoolhouse at Brownell, 343° 51'; to corner post of fence southeast, 83.1 feet; to corner post of fence southwest, 106.6 feet; to corner post of fence northwest, 105 feet. The witness posts are distant 19.45 and 12.30 feet, respectively, north and south from the center.

*Big Creek* (Trego County, F. D. Granger, 1893).—In the extreme southwest corner of NE.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  of NW.  $\frac{1}{4}$  of NW.  $\frac{1}{4}$  sec. 17, T. 13 S., R. 23 W., 1,048 feet from the northwest corner stone of the section and 296 feet south of the center of the well-used trail which runs along the section line until a little east of station and then turns northeast. The town of Wakeeney is 7 miles distant, the west cupola of the stone courthouse being nearly due north (magnetic). A wide prominent fire guard was plowed around the signal and the camp, which was situated southeast of signal. About 200 yards to the northeast are the ruins of the foundation of the stone house belonging to Mr. Ferris, county surveyor. (See notes 1, 2, and 8.<sup>1</sup>) Surface mark is as in note 1. The witness posts are of soft magnesia stone, distant 11.64 and 10.34 feet, respectively, north and south of station. The azimuths and distances to certain points are: To northwest corner stone, section 17, 105° 32', 1048 feet; to McCormick's windmill, 203° 13'.

*Schmidt* (Neosho County, F. D. Granger, 1893).—In the northeast corner of NE.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  of NW.  $\frac{1}{4}$  sec. 2, T. 16 S., R. 25 W., on land belonging to Mr. Schmidt, of Wakeeney, just north of his deserted stone house, which is on the highest ground in that vicinity and is a prominent and well-known landmark. The station is just south of the county line and is nearly in line with the west face of Schmidt's house. About 70 feet to west of station is a trail, little used, running north and south. The nearest towns are Ransom and Utica, distant 9 miles southeast and southwest, respectively. (See notes 1, 2, and 8.<sup>1</sup>) Surface mark as in note 1, but 5 by 5 inches. The azimuths and distances to certain points are: To quarter section corner, 240° 53', 125.2 feet; to northeast corner of Schmidt's house, 351° 49', 154.3 feet; to northwest corner of Schmidt's house, 1° 33', 152.3 feet.

*Indian Creek* (Gove County, F. W. Perkins, 1891).—In the northeast corner of SE.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  of NW.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  of NW.  $\frac{1}{4}$  sec. 6, T. 14 S., R. 28 W., about 7 miles south from Gove City, on the 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 best way to reach the station is from Grainfield, on the Union Pacific Railroad, via Gove City, to a point 7 miles almost due south from the latter place. (See note 8.<sup>1</sup>) Two white-oak witness stakes were buried approximately north and south of station, a tin tack in top of each being 5 feet from station. Some pieces of broken jar were scattered in and on ground around station.

*Canyon* (Lane County, F. W. Perkins, 1891).—In the southwest corner of SE.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  of SW.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  sec. 17, T. 16 S., R. 28 W., 2½ miles north and  $\frac{1}{2}$  mile east of Shields railroad station. (See note 8.<sup>1</sup>) Some pieces of broken jars were mixed with the earth and also left on the surface around the station mark.

*Beaver* (Logan County, F. W. Perkins, 1891).—In the NW.  $\frac{1}{4}$  of SW.  $\frac{1}{4}$  sec. 27, T. 16 S., R. 32 W., near the northern edge of the plateau which extends south from the Smoky Hill River. Hell Creek Canyon is close to the northeast and the draws of the Beaver close to the north and west. Elkader, the nearest post office, is 4 miles north. The mail route from Oakley to Scott City passes  $\frac{1}{4}$  mile west of station and a well-marked trail passes 100 yards to the north. (See note 8.<sup>1</sup>) Two white-oak witness stubs were placed north and south of station 5 feet distant. Some pieces of broken

<sup>1</sup> See p. 35.

jars were mixed with the earth in filling the hole around the station and some pieces were left on the surface. The azimuths and distances to certain points are: To northeast corner of section 27,  $231^{\circ} 28'.6$ , 945 paces; to southwest corner of section 27,  $39^{\circ} 58'$ ; to southeast corner of section 27,  $325^{\circ} 41'$ ; to prominent mound at edge of bluff in section 22,  $147^{\circ} 30'$ .

*Monument* (Logan County, F. W. Perkins, 1891).—In the southeast corner of NE.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  of NW.  $\frac{1}{4}$  of NW. sec. 28, T. 13 S., R. 32 W., on the first high ground north from the Smoky Hill River, about  $5\frac{1}{2}$  miles from the river and  $1\frac{1}{2}$  miles southwest of the house of Warren A. Wharton. Cabbell post office is about  $2\frac{1}{2}$  miles northeast. The road from Oakley to Scott City passes about  $1\frac{1}{2}$  miles east of station. A road leading from Wharton's house to Russell Springs passes within  $\frac{1}{4}$  mile of station to eastward. The station is on the timber claim of Burton Smith. (See note 8.<sup>1</sup>) Two triangular white-oak stakes were placed approximately north and south, with a tin tack in center of each, distant 5 feet from station.

*Gopher* (Logan County, F. W. Perkins, 1891).—In the NW.  $\frac{1}{4}$  of NW.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  of SW.  $\frac{1}{4}$  sec. 24, T. 12 S., R. 35 W., on the highest ground in the pasture of Vincent W. Battreall, and  $\frac{1}{8}$  mile southwest from his house. Russell Springs is about 5 miles due south, and Winona is about  $5\frac{1}{2}$  miles northwest, the road between these two places passing within a short distance of the station. The underground mark is a 4-gallon stone jar buried 3 feet 8 inches below the surface, a  $\frac{1}{4}$ -inch hole in bottom marking station. Above this was placed a triangular white-oak post 2 feet 6 inches long with top flush with surface, a tack in center of post marking station. Two triangular white-oak stakes 2 feet long, with tin tack in center of each, were placed north and south (magnetic), distant 5 feet from station. A sod wall was built around the observing tent.

*Sheridan* (Logan County, F. W. Perkins, 1891).—In the SE.  $\frac{1}{4}$  of NW.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  sec. 7, T. 14 S., R. 36 W., on the northern edge of the table-land, 4 miles south of Smoky Hill River, 11 miles southwest of Russell Springs, 11 miles south of McAllaster, and 13 miles east southeast of Wallace. The azimuths and distances to certain points are: To northeast corner section 7,  $236^{\circ} 18'.3$ , 340 paces; to south gable of Freeman's stone house,  $265^{\circ} 26'$ ; to ridge of Wurst's stone granary,  $266^{\circ} 18'$ ; to north gable of Jessie Wagner's stone house,  $320^{\circ} 36'$ . The underground mark is a stone jar placed bottom up 3 feet below the surface, a  $\frac{1}{4}$ -inch hole marking station. Above this was placed a mass of bricks which had been partly melted and run together in baking. The surface mark is a white-oak stub, with a tin tack marking the center of station. Four white oak witness stubs were set north, south, east, and west at a distance of 5 feet. A sod wall was built around the observing tent. Broken bricks were mixed with the earth in filling the hole around the station mark.

*Teeters Hill* (Logan County, F. W. Perkins, 1891).—In the southwest corner of NW.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  of SW.  $\frac{1}{4}$  of NW.  $\frac{1}{4}$  sec. 30, T. 11 S., R. 37 W., on the highest of the bluffs on the south of the north fork of the Smoky Hill River, about 2 miles south of J. F. Teeter's ranch and  $\frac{3}{4}$  mile west of the road running from McAllaster to Teeter's ranch. Wallace is 18 miles southwest and McAllaster is  $7\frac{1}{2}$  miles southeast. To reach the station, take the road leading north from James Burr's place, 12 miles northeast of Wallace, and proceed about 3 miles to the middle of the McDermott claim; then turn east on a road to the station, which is about  $1\frac{1}{8}$  miles from the McDermott claim. The underground mark is a 1-gallon earthenware jar placed bottom up 4 feet below the surface, a  $\frac{1}{4}$ -inch hole in bottom marking station. Above the jar a  $5\frac{1}{2}$ -inch drain tile 25 inches long was placed with top 22 inches below the surface, the center of tile marking station. Above the tile a white-oak post painted red was placed with top projecting about 4 inches above the ground, a galvanized tack in stub marking the center of station. Four witness stakes, with tack in top of each, were placed approximately north, east, south, and west, 5 feet distant. Pieces of broken drain

<sup>1</sup> See p. 35.

tile were mixed with the earth about the point, and about 6 inches below the surface a paving of broken tile was made about 2 feet square. Some broken tile was left on the surface around the point. A sod wall was built around the observing tent.

*Wallace Bluffs* (Wallace County, F. W. Perkins, 1891; 1908).—In NW.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  sec. 7, T. 14 S., R. 38 W., on the south bluffs of the south forks of the Smoky Hill River about  $4\frac{3}{4}$  miles south of the town of Wallace. The station is about 500 meters from the road from Wallace on the highest land in the section. It is marked by a nail in a stake set flush with the surface of the ground. There are two underground marks, the first a tile with the top about 20 inches below the ground and the second a gallon earthenware jar placed bottom up, with a small hole at the center, about 4 feet below the ground. There are 4 heavy oak reference stubs each 5 feet from the station, north, east, south, and west, respectively.

*Turtle* (Wallace County, F. W. Perkins, 1891).—In the northwest corner of NE.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  of 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, 9 miles almost due north from Sharon Springs and  $5\frac{1}{2}$  miles north of Smoky Hill River. The road running north from Sharon Springs passes about  $\frac{1}{4}$  mile west of station, while the Goodland road (so called) passes about 1 mile to the east. The house of John Wesley Bouslog is  $3\frac{1}{4}$  miles south. (See note 8.<sup>1</sup>) Two white-oak posts painted red were placed approximately north and south of station, with a tack in each, 5 feet distant.

*Curlew* (Wallace County, F. W. Perkins, 1891).—In the northeast corner of SW.  $\frac{1}{4}$  of SW.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  sec. 17, T. 14 S., R. 40 W., 4 miles south and  $1\frac{1}{2}$  miles west of Sharon Springs, near the northern edge of the plateau, which, commencing about 6 or 7 miles south of the Smoky Hill River, extends south to the Arkansas. (See note 8.<sup>1</sup>) Four white-oak reference stubs, painted red, were placed about north by east, east by south, south by west, and west by north, with a tack in center of each, distant 7 feet from station. Some broken earthenware was mixed with the earth around the center post and a load of small stone was piled up over the center.

*McLane* (Wallace County, F. W. Perkins, 1891).—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. Lister post office is about  $\frac{3}{4}$  of a mile northwest of station. To reach the station from Sharon Springs, take the road running northwest to Halsey's place, then follow a road up a ravine toward the westward to a gradually ascending plain, whence the elevation upon which the station is located can be seen. It is about 4 miles east of the Colorado border. The underground mark is a 1-gallon earthenware jar placed bottom up 4 feet 2 inches below the surface, a  $\frac{1}{4}$ -inch hole in bottom marking center of station. Above the jar a  $5\frac{1}{2}$ -inch drain tile 25 inches long was placed, with top 21 inches below the surface of ground, the center of tile marking station. Above the tile was placed a white-oak stub, painted red, with top projecting 3 inches above the ground, a tin tack in center marking the station. Four white-oak reference stakes, painted red, were placed approximately north, south, east, and west, with a tin tack in center of each, distant 5 feet from center of station. A circle of brickbats was laid just above the top of the tile, and 6 inches below the surface 4 beer bottles were placed at right angles, with their necks pointing toward the center post and distant about 1 inch from it. Fragments of broken jar were left on the surface about the point.

*Arapahoe* (Cheyenne County, Colo., F. W. Perkins, 1891).—About 7 miles southeast of Arapahoe, 11 miles southwest of Weskan, and 3 miles from the Kansas border, on the highest hill in the vicinity. From Weskan take the road that leads to the schoolhouse near James A. Johnson's and then bear a little westward to Daniel Dellenger's, from which place the trail leads nearly west to the signal. (See note 8.<sup>1</sup>)

<sup>1</sup> See p. 85.

*Monotony* (Cheyenne County, Colo., F. W. Perkins, 1891).—About 14 miles north by west of Arapahoe, and  $4\frac{1}{2}$  miles east of the road leading from Cheyenne Wells to Burlington, on a round-topped hill. In going north from Arapahoe, after crossing the hill about 2 miles north of the Smoky Hill River, the hill upon which the station is located will appear to the northward and remain in sight the rest of the way. The road made in hauling lumber from Arapahoe to the signal should be distinguishable for many years. (See note 8.<sup>1</sup>) Fragments of earthenware were scattered around the station, both above and below the surface of the ground.

#### SUPPLEMENTARY POINTS.

*Kansas City astronomic station* (Jackson County, Mo., C. H. Sinclair, 1882).—In the grounds of the Franklin school, corner of Washington and Fourteenth Streets, 20 feet east of building and 16 feet 9 inches south of north end. The pier is made of two 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 stones is placed a smaller one with top just above the ground and a cross marking the center of station. (In 1900 the Survey was informed that a contract had been let for a building which would cover this station.)

*State line 1* (Johnson County, F. D. Granger, 1885).—This station is 51 feet 11 inches north of west from the Missouri boundary stone, which is at southeast corner of southwest fractional quarter of sec. 35, T. 13 S., R. 25 E.,  $1\frac{1}{2}$  miles south of New Santa Fe, Mo., at intersection of State Line and Belton-Olathe roads.

*State line 2* (Johnson County, F. D. Granger, 1885).—At the northeast corner of the northwest fractional quarter of sec. 28, T. 12 S., R. 25 E., and 9 feet 6 inches west of south from the half-mile stone situated midway between two east and west roads on the State line.

*Base 1* (Johnson County, F. D. Granger, 1885).—Between two east and west roads, east of station Marty, about 670 feet south of road to north and 2,470 feet west of State line road to east, on property of Tryon brothers. Marked by a bottle  $2\frac{1}{4}$  feet below surface.

*Base 2* (Johnson County, F. D. Granger, 1885).—This station is 889 feet 11 inches from base 1 in azimuth  $18^{\circ} 43'$ .

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

*Section line 1* (Johnson County, F. D. Granger, 1885).—This station is at intersection of two roads 479 meters north  $37^{\circ} 55'$  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 south  $34^{\circ} 14'$  east of station Marty.

*Blue Mound* (Douglas County, F. D. Granger, 1887).—In SW.  $\frac{1}{4}$  sec. 22, T. 22 S., R. 13 E., on a prominent hill about 8 miles southeast of Lawrence on land belonging to Obadiah Stett. The underground mark is a white glass bottle filled with ashes and buried 2 feet 10 inches below the surface. The surface mark is a limestone post  $2\frac{1}{2}$  feet long and 6 inches square at top, buried flush with ground, marked with letters U. S. C. S. and two grooves at right angles. The south face has F. D. G. 1887 cut near top.

*Carson* (Douglas County, F. D. Granger, 1887).—In the SE.  $\frac{1}{4}$  sec. 22, T. 13 S., R. 19 E., about 7 miles south-southwest of Lawrence and about 2 miles northwest of the Three Sisters, well-known hills on the Lawrence-Willow Springs road. The station is on land belonging to Samuel Carson, and the point has been recently chris-

<sup>1</sup> See p. 35.

tened Hazel Hill. The underground mark is a glass bottle filled with ashes and buried 2 feet 6 inches below the surface of ground. The surface mark is a limestone post  $2\frac{1}{4}$  feet long and 6 inches square, marked on top by two rectangular grooves and the letters U. S. C. S. The distances to certain points are: To lone oak, north of east, 550 feet; to corner of stone fence (northwest corner quarter section), north of west, 206 feet; to fence north, 38 feet.

*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., 4 feet north and 950 feet east of southwest corner of the section.

*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 NE.  $\frac{1}{4}$  of SW.  $\frac{1}{4}$  sec. 16, T. 14 S., R. 15 E. The underground mark is a dark-colored glass bottle filled with ashes and buried  $1\frac{1}{2}$  feet below the surface. The surface mark is a nail in top of a pine stub 2 by 4 by 16 inches. Surrounding the stub some flat limestone rocks were placed on end and the whole covered with earth.

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

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

*Topeka First Presbyterian Church* (Shawnee County, F. D. Granger, 1887).—The spire of the church on the west side of Harrison Street between Eighth Avenue and Ninth Street.

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

*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.

*Salina west base latitude station* (Saline County, F. D. Granger, 1890).—This station is 7.87 meters east of the Salina west base and is marked by a pier of stone and brick laid in cement.

*Castle Rock* (Gove County, F. D. Granger, 1890).—Near sec. 1, T. 14 S., R. 26 W., about 11 miles south and 2 miles west of Collyer. 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).—In SW.  $\frac{1}{4}$  sec. 3, T. 14 S., R. 26 W., about 2 miles west of Castle Rock. About  $\frac{1}{2}$  mile south of station is a sod house occupied by a Mr. McCartney.

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

*Pond* (Wallace County, F. W. Perkins, 1891; 1908).—In the southeast corner of the SW.  $\frac{1}{4}$  of NW.  $\frac{1}{4}$  of NE.  $\frac{1}{4}$  of NW.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  sec. 26, T. 12 S., R. 40 W.,  $5\frac{1}{2}$  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. A road running north from Sharon Springs passes 1 mile west of station, and a road running northward along the section line  $\frac{1}{4}$  mile east of Sharon Springs passes within  $\frac{1}{2}$  mile of station. The house of John Wesley Bouslog, who lives in NW.  $\frac{1}{4}$  sec. 34, bears about west southwest from 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 center of bottom marking the station. Above the jar was placed a drain tile pipe  $5\frac{1}{2}$  inches in diameter and 25 inches long, the top of tile 22 inches below the surface. Above the tile a white-oak post painted red,  $3\frac{1}{2}$  by  $3\frac{1}{2}$  inches, 2 feet long, was placed with top projecting 3

inches above ground, the center of station being marked by a galvanized tack. Four reference stakes of white oak,  $3\frac{1}{2}$  inches square by 2 feet, painted red, with tack in center of each, were placed approximately north, east, south, and west, 5 feet from center. Pieces of tiles and earthenware jars were mixed with the earth in filling the hole. About 6 inches below the surface a paving of broken tiles and earthenware jars was laid around the center about 2 feet square. A small quantity of broken jar was left on the surface. A sod wall was built around station. A pine stake was put in place of the old oak stake in 1908.

*Wallace latitude station* (Wallace County, E. Smith, 1885; 1908).—In the northeastern corner of the small park belonging to the Union Pacific Railway Co. at Wallace. It is marked in a permanent manner by two limestone piers, each 5 feet in length, and 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.

*Gilbert* (Wallace County, W. H. Burger, 1908).—In the SE.  $\frac{1}{4}$  of SW.  $\frac{1}{4}$  sec. 1, T. 14 S., R. 40 W., about 7 miles S.  $60^{\circ}$  W. from Wallace and 3 miles south of the Union Pacific Railway. 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.

*Kansas and Colorado boundary monument 73 $\frac{1}{2}$*  (Wallace County, F. W. Perkins 1891).—At the point formerly occupied by the stone monument marking the State line. The original monument had been carried away, but the position was recovered approximately and is now marked by a 1-gallon jug buried with mouth up 2 feet 8 inches below the surface, the center of mouth of jug marking station. The jug was covered with 1 foot of earth and two thicknesses of 1-inch boards 2 feet square were placed above it. A tack in boards marks center. Surface mark is a cross chiseled on hard conglomerate sandstone, 20 by 15 inches, 6 inches deep. The stone is an inch above the surface and is marked B. M. 73 $\frac{1}{2}$ . The surface mark is covered with a mound of limestone, forming a prominent object.

#### NINETY-EIGHTH MERIDIAN.

##### PRINCIPAL POINTS.

*Dial* (Osborne County, F. D. Granger, 1897).—On a prominent hill locally known as Sand Mound, near the west center of the SW.  $\frac{1}{4}$  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 the letters U. S. C. S., and with a drill hole marking the exact point 6 inches deep, 0.7 inch in diameter, plugged with pine. The underground mark is a copper bolt 3 inches long and 0.6 inch in diameter, set in a drill hole in a flat ledge of rock in its original position and firmly wedged in with wire nails. A cross is cut in top of the bolt to mark the exact point. 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 to a loan company. The nearest house is distant about 0.2 mile west, and is owned and occupied 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, 19.8 feet from the former and 16.35 feet from the latter. The line from the old well to the house is approximately northwest. The azimuth of the stone marking the southwest

corner of section 9 is  $17^{\circ} 42' 27''$  and of the stone marking the northwest corner of section 9 is  $174^{\circ} 37' 47''$ . 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 its top surface. (See note 4.<sup>1</sup>)

*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 County, Kans., on a swell of ground near the center of the west side of sec. 23, T. 6 S., R. 14 W., and about on the highest point. Permanent mark: Cross and U. S. G. S. cut on top on 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 referred to had been broken up, but the jug with cross cut on it remained undisturbed.

*Lawrence 2* (Osborne County, F. D. Granger, 1897).—The station is 8.377 meters in azimuth  $93^{\circ} 27'$  from the station Lawrence U. S. G. S. described above. The surface mark is a limestone post 1.6 feet long and 6 inches square, with two rectangular curves and the letters U. S. C. S. cut on its top. (See note 5.<sup>1</sup>)

*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 County, Kans., in the SW.  $\frac{1}{4}$  of the SE.  $\frac{1}{4}$  sec. 16, T. 5 S., R. 11 W., and is 42 feet north and 138.75 feet west of the northwest corner of a stone foundation for a building. The 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.

*Old well 2* (Smith County, F. D. Granger, 1897).—The azimuths and distances to certain points are: From this station to Old Well U. S. G. S. described above,  $92^{\circ} 52' 32''$ , 30.875 meters; to the stone marking the southwest corner of sec. 16,  $282^{\circ} 14' 32''$ , 466.0 meters; to the center of Okke Bohlen's house,  $317^{\circ} 16'$ , 21.94 meters. The surface mark is a rough stone post 9.5 inches square and 2.2 feet long, with two V-shaped crosses at right angles and the letters U. S. C. S. cut on its top. (See note 4.<sup>1</sup>)

*Lebanon* (Smith County, F. D. Granger, 1897).—Near the northwest corner of the NE.  $\frac{1}{4}$  of the NE.  $\frac{1}{4}$  sec. 2, T. 2 S., R. 11 W., and about  $1\frac{1}{4}$  miles north and  $1\frac{3}{4}$  miles east of Lebanon. It 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. The highest ground in the vicinity lies about  $\frac{1}{6}$  mile to the north. The azimuths to certain points are: To Anderson's house,  $211^{\circ} 35'$ ; to the Church of the United Brethren,  $268^{\circ} 59' 42''$ ; to J. Housel's house,  $314^{\circ} 02'$ . 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. (See note 4.<sup>1</sup>) To the north, in the exact projection of the line from Old Well 2, at a distance of 2.832 meters, is a pine stub with a nail in it and underneath the stub at a depth of 30 inches a stone jug with the top upward.

*Brown* (Smith County, F. D. Granger, 1898).—About 4 miles east of Smith Center, on high ground near the northwest corner of the SE.  $\frac{1}{4}$  sec. 20, T. 3 S., R. 12 W., on land owned by Mrs. M. A. Brown, 264 feet south of the hedge row on the south side of the east and west half-section line road. (See notes 5 and 6.<sup>1</sup>)

*Lipps* (Smith County, F. D. Granger, 1898).—In the SW.  $\frac{1}{4}$  sec. 1, T. 1 S., R. 14 W., on land owned by Joseph Lipps, whose house stands near the center of the west side of the southwest quarter of the section. It is 600 feet east of the north and south road passing Mr. Lipps's house. (See notes 5 and 6.<sup>1</sup>)

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<sup>1</sup> See p. 35.

*Cooper* (Smith County, F. D. Granger, 1898).—Near the center of the NE.  $\frac{1}{4}$  of SW.  $\frac{1}{4}$  sec. 8, T. 1 S., R. 14 W., in a cultivated field belonging to E. M. Cooper, about 700 feet south and 325 feet west of the center of section 8. Red Cloud, the nearest town, is about 7.5 miles east and 7 miles north of the station. (See notes 4 and 6.<sup>1</sup>)

*Blue Hill* (Webster County, Nebr., F. D. Granger, 1898).—Near the south center of sec. 24, T. 4 N., R. 11 W., on land owned by Peter Paugh. It is about  $2\frac{1}{2}$  miles south and 3 miles west of the town of Blue Hill. The azimuths and distances to certain points are: To the standpipe at Blue Hill,  $228^{\circ} 33' 21''$ ; to W. W. Hogate's windmill,  $339^{\circ} 24'$ ; to Hogate's house,  $348^{\circ} 19'$ ; to the stone marking the south center of section 24,  $350^{\circ} 10'$ , 251.085 feet; to stone marking northwest corner of section 24,  $152^{\circ} 09'$ ; to the wire fence,  $90^{\circ}, 43.7$  feet. (See notes 5 and 6.<sup>1</sup>)

*Herrick* (Franklin County, Nebr., F. D. Granger, 1898).—In the SW.  $\frac{1}{4}$  of SE.  $\frac{1}{4}$  sec. 2, T. 3 N., R. 13 W., about  $3\frac{1}{2}$  miles south and  $1\frac{1}{4}$  miles west of the town of Campbell, on land owned by Lyman Herrick. The azimuths and distances to certain points are: To the stone marking the southeast corner of section 2,  $271^{\circ} 13' 4$ ; to Lyman Herrick's windmill,  $274^{\circ} 38' 4$ , 149.8 feet; to the stone marking the south center of section 2,  $84^{\circ} 27' 4$ ; to the stone marking the southwest corner of section 2,  $88^{\circ} 21' 4$ ; to the bellfry of the schoolhouse at Campbell,  $196^{\circ} 21' 25''$ ; to the southwest corner of Mr. Herrick's house,  $274^{\circ} .6$ , 118.6 feet; to the wire fence to the southward of the station, 89.3 feet. (See notes 5 and 6.<sup>1</sup>) Surface mark is of hard limestone.

*Bossing* (Ellsworth County, W. Eimbeck, 1899; 1900).—In SW.  $\frac{1}{4}$  sec. 33, T. 16 S., R. 9 W., on the little knob situated about 30 yards due north of Louis Bossing's house, about 5 miles west and 8 miles south of Ellsworth. The underground mark is a double brick (cemented together) buried 31 inches below the surface of the ground, with 8-inch or longitudinal edges due north and south. This brick is set in grouting and has a copper bolt for station mark. Three inches of dirt was placed over this, and then a pine board 1 by 12 by 14 inches was laid flat above it. The surface mark is a marble post 6 by 6 by 27 inches buried flush with the ground, with the letters U. S. C. & G. S. cut on top, the intersection of two rectangular grooves marking center of station. Two witness stones 4 by 4 by 27 inches were placed north and south of station about 25 feet, an arrowhead in each pointing toward the center of station. The nearest railroad station is Lorraine.

*Sherman* (Ellsworth County, W. Eimbeck, 1899; 1900).—About  $\frac{1}{4}$  mile north of 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, about  $2\frac{1}{2}$  miles southeast from the Sherman Middle Ranch buildings. The underground mark is a bolt in a double brick (cemented together) buried 33 inches below the surface of the ground. The surface mark is a marble post 6 by 6 by 27 inches buried flush with the ground. The top is marked with two rectangular grooves and the letters U. S. C. & G. S., the intersection of the grooves being center of station. Two witness posts 5 by 5 inches at top are placed 25 feet north and south of station. The nearest railroad station is Langley, 3 miles distant.

*Loder* (Saline County, W. Eimbeck, 1899; 1900).—Nearly in center of 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 to the Union Pacific Railroad. The nearest ranch is  $\frac{1}{2}$  mile west and occupied by William Gross. The underground mark is a bolt in a double brick (cemented together) buried 30 inches beneath the surface of the ground and surrounded with plaster of paris. The surface mark is a marble post 6 by 6 by 27 inches set flush with ground. The top of this post is marked with two rectangular grooves and the letters U. S. C. & G. S., the intersection of the grooves being center of station. Two witness stones 4 by 4 by 26 inches are placed about 25 feet north and south of center of station. The station is reached from Falun, Marquette, or Brookville.

<sup>1</sup> See p. 35.

*Central* (Rice County, A. T. Mosman, 1900).—In SW.  $\frac{1}{4}$  sec. 26, T. 18 S., R. 8 W. The underground mark is a glass quart bottle filled with ashes and buried with mouth  $2\frac{1}{2}$  feet below surface of ground, surrounded by concrete 3 inches thick. Above this is a 6-inch drain tile pipe 2 feet long filled with concrete and buried with top flush with ground, the center of station being marked by a cross on a copper bolt  $\frac{3}{8}$  inch in diameter sunk in the concrete. North and south of station were placed drain tile pipes 4 inches in diameter filled with concrete and with iron nail in top of each, distant 4.41 and 4.53 feet, respectively. The corner of sections 26, 27, 34, and 35 is distant 1317.54 meters, in azimuth  $80^\circ 21'$ .

*Little River* (Rice County, A. T. Mosman, 1900).—This station is in the SW.  $\frac{1}{4}$  sec. 13, T. 19 S., R. 7 W., on land belonging to Peter Lundstrum, 2 miles north and 9 miles east from Lyons and  $4\frac{1}{2}$  miles from Little River. The corner of sections 13, 14, 23, and 24 is distant 388.72 meters, in azimuth  $30^\circ 00' 1''$ . (See note 7.<sup>1</sup>)

*Chase* (Rice County, A. T. Mosman, 1900).—In the NW.  $\frac{1}{4}$  sec. 3, T. 20 S., R. 10 W., opposite the house of C. J. Wood. (See note 7.<sup>1</sup>) It is 4 miles west of Chase and 4 miles north of Raymond. The azimuths and distances to certain points are: To northeast corner of Mr. Wood's house,  $53^\circ 43'$ , 66.65 meters; to fence on east side of road running north and south, 20.52 meters; to section corner,  $172^\circ 46'$ , 252.6 meters.

*Savage* (Rice County, A. T. Mosman, 1901).—In the NE.  $\frac{1}{4}$  sec. 12, T. 22 S., R. 9 W., about 6 miles southwest of Sterling. (See note 7.<sup>1</sup>)

*Gilmore* (Reno County, A. T. Mosman, 1901).—On a sand hill about 300 yards south of Mr. Fenwick's house, 8 miles north and 2 miles west of Hutchinson and 6 miles east and 2 miles north of Nickerson. The west side of the sand hill is being scooped out by the wind, and the station will probably soon disappear. (See note 7.<sup>1</sup>)

*Partridge* (Reno County, A. T. Mosman, 1901).—One-fourth mile north of the southwest corner of sec. 4, T. 24 S., R. 7 W., on the farm of J. W. Hamilton,  $1\frac{1}{4}$  miles north and  $\frac{3}{4}$  mile west of Partridge. (See note 7.<sup>1</sup>)

*Arlington* (Reno County, A. T. Mosman, 1901).—On the north side of SE.  $\frac{1}{4}$  sec. 16, T. 25 S., R. 8 W., on land belonging to W. A. Brown,  $1\frac{3}{4}$  miles south of Arlington. (See note 7.<sup>1</sup>)

*Sunflower* (Reno County, A. T. Mosman, 1901).—In the northeast corner of SW.  $\frac{1}{4}$  sec. 22, T. 25 S., R. 5 W., on land belonging to A. C. Galbreath, who lives on the west line of the quarter section. (See note 7.<sup>1</sup>)

*Pretty Prairie* (Reno County, A. T. Mosman, 1901).—Near the middle of sec. 20, T. 26 S., R. 6 W.,  $\frac{1}{2}$  mile south and  $\frac{1}{2}$  mile east of town of same name, on land owned by Jacob R. Graber, who lives 4 miles east of station. The station is in the southeast corner of a pasture, 31.85 meters from south fence line and 33 meters from east fence line. U. S. C. & G. S. bench mark T<sub>4</sub> is distant 774.01 meters in azimuth  $150^\circ 33' 7''$ . (See note 7.<sup>1</sup>)

*Cheney* (Kingman County, A. T. Mosman, 1901).—In SE.  $\frac{1}{4}$  sec. 26, T. 27 S., R. 5 W., 200 yards northeast of schoolhouse on open prairie. (See note 7.<sup>1</sup>)

*Kingman* (Kingman County, A. T. Mosman, 1901).—On the west line of sec. 25, T. 28 S., R. 8 W., on land of Thomas Gillen, about 350 yards from the corner of sections 23, 24, 25, and 26, where there is a schoolhouse, and 43.2 feet from west fence line on road. U. S. C. & G. S. bench mark X<sub>4</sub> is distant 342.97 meters in azimuth  $177^\circ 55'$ . (See note 7.<sup>1</sup>)

*Belmont* (Kingman County, A. T. Mosman, 1901).—In SE.  $\frac{1}{4}$  sec. 16, T. 29 S., R. 8 W., on land owned by James Baldwin, on east side of quarter section, about  $\frac{1}{4}$  mile from southeast corner, near the road, and about 75 yards southeast of Mr. Baldwin's house. (See note 7.<sup>1</sup>)

*Prairie* (Harper County, A. T. Mosman, 1901).—About  $\frac{1}{2}$  mile north of southeast corner of sec. 1, T. 31 S., R. 8 W., on east section line, 3 miles west and  $\frac{5}{8}$  mile south of Duquois, on land of Andrew Titus, of Anthony. (See note 7.<sup>1</sup>)

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<sup>1</sup> See p. 35.

*Sumner* (Sumner County, A. T. Mosman, 1901).—In 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, Mat. Hamilton, who has charge of the land, lives  $1\frac{1}{8}$  miles south and  $\frac{1}{4}$  mile east of station. The nearest railroad station and post office is Norwich, 3 miles north and 2 miles west. (See note 7.)<sup>1</sup>

*Quarry* (Harper County, A. T. Mosman, 1901).—In SE.  $\frac{1}{4}$  sec. 21, T. 32 S., R. 8 W., about  $\frac{5}{8}$  mile west and 150 yards north of the southeast corner of section, on land owned 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  $\frac{3}{8}$  of a mile west of station. 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 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, a cross on head of bolt being center of station. The surface marks are the same as those described in note 7.<sup>1</sup>

*Rutherford* (Harper County, A. T. Mosman, 1901; 1902).—In 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 and about  $4\frac{1}{4}$  miles west of Anthony, on land belonging to a mortgage company and rented by Mr. Rutherford, who lives 1 mile south of the station. (See note 7.)<sup>1</sup>

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

*Anthony southeast base* (Harper County, A. L. Baldwin, 1900; 1902).—On the north line of east and west road,  $1\frac{1}{8}$  miles directly north of large schoolhouse at Anthony and 89 meters 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, was placed at north side of the east and west road and at east line of Springfield Avenue, with top 4 inches above ground. A hole  $\frac{1}{2}$  inch in diameter is drilled an inch deep in center of top of stone. It is distant from the station 89.320 meters, 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 land of George Miller and 22 meters north of the northwest corner of Miller's house. The distances and azimuths to certain points are: To reference mark, 202.509 meters,  $3^{\circ} 32' 2''$ ; to corner sections 35, 36, 1, and 2, 210.22 meters,  $6^{\circ} 08' 6''$ . The underground mark is a piece of 4-inch terra-cotta pipe 2 feet long filled with cement and buried with top  $2\frac{1}{2}$  feet below the surface of ground. A 60-penny wire nail set in cement with point projecting  $\frac{1}{4}$  inch marks center of station. Over this is placed 6 inches of sand. The surface mark is a 4-inch terra-cotta pipe 2 feet long filled with cement and placed with top flush with surface of ground, the center of station being marked by a 60-penny wire nail set in cement with point projecting  $\frac{1}{4}$  inch. Cement surrounds the pipe and covers the top to a depth of  $\frac{1}{2}$  inch. The reference mark in the southwest corner of section 36 is a 4-inch terra-cotta pipe 2 feet long filled and surrounded with cement and buried with top flush with surface of ground; a 60-penny wire nail set in the cement projects  $\frac{1}{4}$  inch.

<sup>1</sup> See p. 35.

*Fowler* (Harper County, W. Bowie, 1902).—In SW.  $\frac{1}{4}$  sec. 36, T. 33 S., R. 5 W., on land belonging to S. P. Joyner,  $3\frac{1}{4}$  miles east and 3 miles north from Bluff City. The azimuths and distances to certain points are: To stone at southwest corner of section,  $68^{\circ} 27' .8$ , 562.98 meters; to reference mark,  $348^{\circ} 17' .2$ , 193.294 meters; to chimney of main house of Mr. Joyner,  $329^{\circ} 57' .7$ , about 180 meters; to shaft of windmill at north roadside,  $353^{\circ} 48' .9$ , about 190 meters. The reference mark is set in field at corner of fence, 0.35 meter north of north road fence and 0.70 meter west of north and south fence along west side of Mr. Joyner's dooryard. Station and reference marks are same as at Miller, just preceding.

#### 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: "Permanent marks: Rock with cross and U. S. G. S. cut in the top." The station was recovered in 1891 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 County, 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.

*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 County, Kans., on 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.

*Cover* (Osborne County, F. D. Granger, 1897).—In the NW.  $\frac{1}{4}$  sec. 18, T. 8 N., R. 12 W., near the south end of a prominent range of hills about 5 miles south and 0.7 mile west of Osborne. 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.

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

*Kansas and Nebraska State line A* (F. D. Granger, 1898).—A stone at the southwest corner of sec. 96, T. 1 N., R. 14 W., Franklin County, Nebr.

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

*Kansas and Nebraska State line 1* (F. D. Granger, 1898).—A stone at the southeast corner of sec. 38, T. 1 N., R. 14 W., Franklin County, Nebr.

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

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

*Boundary stone 163* (Kansas and Oklahoma, W. Bowie, 1902).—On the southern line of sec. 15, T. 35 S., R. 6 W., of Kansas, 670 meters west of the southeast corner of sec. 15 and 157.3 meters 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 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," north side, "K," and south side, "I. T."

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

#### TABLE OF ELEVATIONS.

The datum for all the elevations is mean sea level.

The stations are in three classes: First, those fixed directly by the precise leveling, and of which the elevation is subject to a probable error of  $\pm 0.06$  meter; second, the primary stations fixed by reciprocal measures of vertical angles and which are subject to probable errors varying from  $\pm 0.1$  to  $\pm 0.7$  meter; third, the tertiary stations of which the elevations are fixed by measurements of vertical angles which are not reciprocal, the tertiary stations not being occupied. These elevations are subject to probable errors which may be as great as  $\pm 2$  meters in some cases. For more exact elevations of the stations fixed by the precise leveling and for an exact description of the point on each station mark to which such elevations are referred, the published results of precise leveling should be consulted.

The accuracy with which each elevation in the main scheme is determined depends mainly upon the remoteness of that station from the nearest one of which the elevation is fixed by precise leveling, as indicated in class 1 of the following table. Station Chase is probably least accurately determined of the stations to the southward of the thirty-ninth parallel triangulation, its probable error being  $\pm 0.7$  meter. Of the stations to the northward Brown is supposed to be the least accurately determined, having a probable error of  $\pm 0.3$  meter.

Table of elevations.

| Station.                                  | Point to which elevation refers. | Elevation. |        | Station.  | Point to which elevation refers. | Elevation. |      |
|---|----------------------------------|------------|--------|---|----------------------------------|------------|------|
| <i>Class 1.</i>                           |                                  |            |        |   |                                  |            |      |
| Bowler.....                               | Stone.....                       | 331.18     | 1086.5 | Old Well 2.....                                     | Stone.....                       | 549.6      | 1803 |
| Hays.....                                 | Stone.....                       | 662.60     | 2173.9 | Brown.....  | Stone.....                       | 589.8      | 1935 |
| Salina east base.....                     | Bolt.....                        | 886.20     | 1201.4 | Lebanon.....  | Stone.....                       | 587.6      | 1928 |
| Salina west base.....                     | Bolt.....                        | 372.30     | 1221.5 | Cooper.....   | Stone.....                       | 612.7      | 2010 |
| Bunker Hill (or B. M. S.).....            | Stone.....                       | 570.44     | 1871.5 | Lipps.....  | Stone.....                       | 651.8      | 2138 |
| Russell southeast base (or B. M. T.)..... | Stone.....                       | 573.50     | 1881.6 | Herrick (Nebr.).....                                | Stone.....                       | 630.4      | 2098 |
| Russell northwest base.....               | Stone.....                       | 661.16     | 1841.1 | Loder.....  | Station mark.                    | 492.2      | 1615 |
| Blue Hill (Nebr.).....                    | Stone.....                       | 622.47     | 2042.2 | Sherman.....  | Station mark.                    | 504.8      | 1666 |
| Pretty Prairie.....                       | Stone.....                       | 487.74     | 1600.2 | Bossing.....  | Station mark.                    | 576.6      | 1892 |
| Kingman.....                              | Stone.....                       | 500.09     | 1870.2 | Central.....  | Station mark.                    | 538.7      | 1767 |
| Anthony southeast base.....               | Stone.....                       | 419.91     | 1377.7 | Little River.....                                   | Station mark.                    | 534.9      | 1755 |
| Anthony northwest base.....               | Stone.....                       | 425.62     | 1896.4 | Chase.....  | Station mark.                    | 548.2      | 1799 |
| <i>Class 2.</i>                           |                                  |            |        |   |                                  |            |      |
| Berry.....                                | Stone.....                       | 341.4      | 1120   | Savage.....   | Station mark.                    | 529.0      | 1736 |
| Marty.....                                | Stone.....                       | 332.2      | 1090   | Gilmore.....  | Station mark.                    | 533.0      | 1749 |
| Haskin.....                               | Stone.....                       | 342.2      | 1128   | Partridge.....                                      | Station mark.                    | 500.2      | 1641 |
| Thomas.....                               | Stone.....                       | 381.5      | 1088   | Arlington.....                                      | Station mark.                    | 500.2      | 1641 |
| Bebe Mound.....                           | Stone.....                       | 343.9      | 1128   | Sunflower.....                                      | Station mark.                    | 481.4      | 1579 |
| Eckman.....                               | Stone.....                       | 307.1      | 1008   | Cheney.....   | Station mark.                    | 488.6      | 1504 |
| Kanawha.....                              | Stone.....                       | 345.2      | 1189   | Belmont.....  | Station mark.                    | 481.4      | 1579 |
| Simmons.....                              | Stone.....                       | 304.2      | 1195   | Sumner.....   | Station mark.                    | 455.9      | 1496 |
| Mabon.....                                | Stone.....                       | 378.3      | 1241   | <i>Class 3.</i>                                     |                                  |            |      |
| Elevation.....                            | Stone.....                       | 360.6      | 1183   | Lenexa Methodist Episcopal Church.....              | Spire.....                       | 342.3      | 1123 |
| Powell.....                               | Stone.....                       | 387.2      | 1270   | Dennis barn.....                                    | Cupola.....                      | 341.4      | 1120 |
| Adams.....                                | Stone.....                       | 400.3      | 1313   | Base 1.....   | Ground.....                      | 313.6      | 1029 |
| Clark.....                                | Stone.....                       | 479.6      | 1573   | Stateline 2.....                                    | Stone.....                       | 290.7      | 954  |
| Meyer.....                                | Stone.....                       | 447.7      | 1489   | Stateline 3.....                                    | Stone.....                       | 324.1      | 1063 |
| Zean Dale.....                            | Stone.....                       | 464.8      | 1526   | <i>Class 4.</i>                                     |                                  |            |      |
| Erricasen.....                            | Stone.....                       | 412.3      | 1363   | Spring Hill Presbyterian Church.....                | Spire.....                       | 352.4      | 1166 |
| Humboldt.....                             | Stone.....                       | 430.7      | 1413   | Ochiltree Church.....                               | Cupola.....                      | 342.2      | 1123 |
| Reinhard.....                             | Stone.....                       | 473.4      | 1558   | Olathe high school.....                             | Top of cupola                    | 339.7      | 1114 |
| White City.....                           | Stone.....                       | 452.4      | 1484   | Olathe Methodist Episcopal Church.....              | Spire.....                       | 333.6      | 1094 |
| Robbins.....                              | Ground.....                      | 406.2      | 1333   | Olathe Deaf and Dumb Asylum.....                    | Chimney.....                     | 342.6      | 1124 |
| Taylor.....                               | Stone.....                       | 400.0      | 1312   | <i>Class 5.</i>                                     |                                  |            |      |
| Wilmer.....                               | Stone.....                       | 407.4      | 1337   | Gardner Methodist Church.....                       | Cupola.....                      | 345.1      | 1132 |
| Frey.....                                 | Ground.....                      | 414.4      | 1380   | Lawrence, Kansas State University.....              | Top of north dome.               | 344.5      | 1130 |
| Fairmount.....                            | Stone.....                       | 614.4      | 2016   | Lawrence water tower.....                           | Wind vane.....                   | 343.4      | 1127 |
| La Crosse.....                            | Stone.....                       | 658.6      | 2181   | Kellam's house.....                                 | Chimney.....                     | 362.4      | 1189 |
| Smoky Hill.....                           | Stone.....                       | 712.8      | 2239   | Roberts's windmill.....                             | Axle.....                        | 353.4      | 1159 |
| Trego.....                                | Stone.....                       | 725.8      | 2381   | <i>Class 6.</i>                                     |                                  |            |      |
| Skaggs.....                               | Stone.....                       | 743.9      | 2441   | Big Springs windmill.....                           | Top.....                         | 349.4      | 1146 |
| Big Creek.....                            | Stone.....                       | 785.7      | 2512   | LeCompton, U. S. G. S. Carbondale school-house..... | Ground.....                      | 344.5      | 1130 |
| Schmidt.....                              | Stone.....                       | 781.6      | 2564   | Cupola.....   | 368.3                            | 1208       |      |
| North Pole Mound.....                     | Stone.....                       | 446.9      | 1468   | <i>Class 7.</i>                                     |                                  |            |      |
| Iron Mound.....                           | Stone.....                       | 456.6      | 1498   | Blue Mound.....                                     | Stone.....                       | 321.8      | 1056 |
| Vine Creek.....                           | Stone.....                       | 460.0      | 1509   | Stenger.....  | Ground.....                      | 374.9      | 1230 |
| Thompson.....                             | Stone.....                       | 486.6      | 1898   | <i>Class 8—Continued.</i>                           |                                  |            |      |
| Heath.....                                | Stone.....                       | 553.0      | 1817   | Carson.....   | Stone.....                       | 324.8      | 1066 |
| Lincoln.....                              | Stone.....                       | 518.3      | 1684   | Prominent windmill.....                             | Ground.....                      | 371.1      | 1218 |
| Golden Belt.....                          | Stone.....                       | 527.8      | 1732   | Scranton schoolhouse.....                           | South cupola.....                | 369.1      | 1178 |
| Wilson.....                               | Stone.....                       | 567.6      | 1862   | Stone house.....                                    | Roof.....                        | 374.0      | 1227 |
| Meades Ranch.....                         | Stone.....                       | 590.4      | 1967   | White house on hill.....                            | Center chimney.....              | 400.7      | 1315 |
| Allen.....                                | Stone.....                       | 579.7      | 1902   | <i>Class 9.</i>                                     |                                  |            |      |
| Blue Hill.....                            | Stone.....                       | 652.7      | 2141   | Knox Knob.....                                      | Ground.....                      | 348.0      | 1142 |
| Waldo.....                                | Stone.....                       | 619.0      | 2081   | Topeka First Presbyterian Church.....               | Spire.....                       | 386.8      | 1105 |
| Dial.....                                 | Stone.....                       | 624.0      | 2047   | Topeka Methodist Episcopal Church.....              | Spire.....                       | 324.4      | 1064 |
| Kill Creek.....                           | Stone.....                       | 623.1      | 2044   | <i>Class 10.</i>                                    |                                  |            |      |
| Lawrence 2.....                           | Stone.....                       | 569.4      | 1868   |   |                                  |            |      |

<sup>1</sup> No check on this elevation.

Table of elevations—Continued.

| Station.                                     | Point to which elevation refers. | Elevation. |       | Station.                           | Point to which elevation refers. | Elevation. |       |
|--|----------------------------------|------------|-------|------------------------------------|----------------------------------|------------|-------|
|  |                                  | Meters.    | Feet. |                                    |                                  | Meters.    | Feet. |
| <i>Class 3—Continued.</i>                    |                                  |            |       |                                    |                                  |            |       |
| Topeka State House <sup>1..</sup>            | West wing, cupola.               | 319.2      | 1047  | Lone tree(cottonwood)              | Ground.....                      | 497.2      | 1631  |
| Topeka Insane Asylum. <sup>1</sup>           | Cupola.....                      | 322.4      | 1058  | Bunker Hill water tower.           | Tank.....                        | 581.9      | 1909  |
| Buffalo Mound, azimuth mark. <sup>1</sup>    | Ground.....                      | 388.7      | 1275  | Russell high school....            | Top of cupola.                   | 585.4      | 1921  |
| Newbury Catholic Church. <sup>1</sup>        | Spire.....                       | 246.9      | 1138  | Russell north school....           | Top of cupola.                   | 577.8      | 1844  |
| St. Mary's Catholic Church. <sup>1</sup>     | Spire.....                       | 326.8      | 1072  | Russell tripod.....                | Ground.....                      | 565.6      | 1836  |
| Martins Hill <sup>1..</sup>                  | Ground.....                      | 332.2      | 1090  | Bunker Hill Methodist Church.      | Spire.....                       | 583.8      | 1915  |
| Fort Riley reservoir <sup>1..</sup>          | Top.....                         | 408.3      | 1340  | Bunker Hill school-house.          | Top of cupola.                   | 581.2      | 1907  |
| Grand View school-house.                     | Belfry.....                      | 402.3      | 1320  | Tipton, U. S. G. S....             | Ground.....                      | 583.1      | 1815  |
| White City school-house. <sup>1</sup>        | Cupola.....                      | 467.1      | 1532  | Covert.....                        | Ground.....                      | 581.9      | 1844  |
| Abilene Catholic College. <sup>1</sup>       | Cupola.....                      | 410.5      | 1347  | Medicine Peak.....                 | Ground.....                      | 541.6      | 1777  |
| Gorham elevator.....                         | Top.....                         | 597.4      | 1960  | Smith Center stand-pipe.           | Top.....                         | 589.7      | 1936  |
| Walker schoolhouse <sup>1..</sup>            | Roof.....                        | 600.4      | 1970  | Hardilee, U. S. G. S...<br>line 1. | Ground.....                      | 015.6      | 2020  |
| Katherinestadt Catholic Church. <sup>1</sup> | Spire.....                       | 652.8      | 2142  | Kansas-Nebraska State<br>line 1.   | Stone.....                       | 641.5      | 2105  |
| Hertzog Catholic Church.                     | Tower.....                       | 611.4      | 2006  | Kansas-Nebraska State<br>line B.   | Ground.....                      | 632.1      | 2074  |
| Castle Rock.....                             | Ground.....                      | 787.3      | 2583  | Kansas-Nebraska State<br>line 2.   | Stone.....                       | 627.6      | 2050  |
| Bluff.....                                   | Ground.....                      | 794.0      | 2605  | Kansas-Nebraska State<br>line C.   | Mound.....                       | 590.6      | 1938  |
| Indian Creek <sup>1..</sup>                  | Stone.....                       | 845.9      | 2775  | Oxide.....                         | Ground.....                      | 524.2      | 1720  |
| Canyon <sup>1..</sup>                        | Stone.....                       | 850.4      | 2790  | Genesee schoolhouse.               | Top of tower.                    | 554.6      | 1820  |
| Soldier Cap Mound....                        | Ground.....                      | 480.4      | 1578  | White Cliffs <sup>1..</sup>        | Cairn.....                       | 498.9      | 1637  |
| Sugar Loaf Mound....                         | Ground.....                      | 512.5      | 1681  | German Church <sup>1..</sup>       | Roof.....                        | 586.0      | 1824  |
| Salina, St. John's Military College.         | Top of cupola.                   | 408.7      | 1324  | Butte <sup>1..</sup>               | Highest point                    | 494.5      | 1622  |
| Salina, Phillips's house                     | Top of dome..                    | 411.6      | 1350  | Loder's house <sup>1..</sup>       | Chimney...                       | 484.1      | 1588  |
| Ellsworth water tower.                       | Top.....                         | 510.7      | 1676  | Kanopolis salt works.              | Center hoist..                   | 507.6      | 1665  |
| Turkey Point.....                            | Ground.....                      | 532.6      | 1747  | Frederic elevator.....             | Top of roof..                    | 554.8      | 1820  |
| Small Peak.....                              | Ground.....                      | 584.1      | 1851  | Bushton elevator <sup>1..</sup>    | Top of roof..                    | 537.6      | 1820  |
| Lincoln College.....                         | Top of cupola.                   | 452.6      | 1485  | North Sherman <sup>1..</sup>       | Top of cairn..                   | 502.5      | 1649  |
| Blue Hill, U. S. G. S..                      | Ground.....                      | 635.3      | 2106  | Windom water tower.                | Top.....                         | 519.3      | 1704  |
|  |                                  |            |       | Sterling College.....              | Top of tower.                    | 531.1      | 1742  |
|  |                                  |            |       | Anthony schoolhouse.               | Top of tower.                    | 439.1      | 1441  |

<sup>1</sup> No check on this elevation.

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| Abernathy's wind-mill.                      | 24             | .....                  | .....           | 2       | Cooper.....  | 20             | 50                     | 55              | 5       |
| Abilene Catholic College, cupola.           | 24             | .....                  | 56              | 2       | Covert.....  | 31             | 53                     | 56              | 5       |
| Adams.....                                  | 18             | 87                     | 55              | 2       | Curlew.....  | 20             | 45                     | .....           | 4       |
| Allen.....                                  | 19             | 41                     | 55              | 8, 4    | Dennis barn, cupola.   | 22             | .....                  | 55              | 2       |
| Anthony Baptist Church, spire.              | 32             | .....                  | .....           | 6       | Dial.....  | 29             | 48                     | 55              | 5       |
| Anthony elevator, stack.                    | 33             | .....                  | .....           | 6       | Dwight M. E. Church, cupola.                                 | 24             | .....                  | .....           | 2       |
| Anthony northwest base.                     | 30             | 52                     | 55              | 6       | Dwight windmill.   | 24             | .....                  | .....           | 2       |
| Anthony roller mill, stack.                 | 33             | .....                  | .....           | 6       | Eckman.....  | 18             | 36                     | 55              | 2       |
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| Anthony southeast base.                     | 30             | 52                     | 55              | 6       | Elevation.....   | 28             | .....                  | .....           | 2       |
| Arapahoe (Colo.)                            | 20             | 45                     | .....           | 4       | Ellis schoolhouse, tower.                                    | 27             | .....                  | .....           | 4       |
| Arlington.....                              | 30             | 51                     | 55              | 6       | Ellsworth astronomic station.                                | 25             | .....                  | .....           | 3       |
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| Belmont.....                                | 30             | 51                     | 55              | 6       | Erricksen.....   | 18             | 38                     | 55              | 2       |
| Belton South Methodist Church, spire (Mo.). | 21             | .....                  | .....           | 2       | Eskridge schoolhouse, cupola.                                | 23             | .....                  | .....           | 2       |
| Berry (Mo.)                                 | 18             | 36                     | 55              | 2       | Fairmount.....   | 19             | 41                     | 55              | 4       |
| Big Creek.....                              | 20             | 43                     | 55              | 4       | First auxiliary.....   | 34             | .....                  | .....           | 2       |
| Big Springs windmill.                       | 22             | .....                  | 55              | 2       | Fort Riley reservoir, top.                                   | 24             | .....                  | 56              | 2       |
| Blue Hill.....                              | 19             | 41                     | 55              | 3, 4    | Fowler.....  | 30             | 53                     | 55              | 6       |
| Blue Hill (Nebr.)                           | 29             | 50                     | 55              | 5       | Frederic elevator.   | 32             | .....                  | 56              | 6       |
| Blue Hill, U. S. G. S.                      | 26             | 53                     | 56              | 3       | Freeport church, spire.                                      | 33             | .....                  | .....           | 6       |
| Blue Mound.....                             | 22             | 46                     | 55              | 2       | Freeport, east spire.  | 33             | .....                  | .....           | 6       |
| Bluff.....                                  | 27             | 47                     | 56              | 4       | Frey.....  | 19             | 39                     | 55              | 2       |
| Bluff City elevator, north gable.           | 33             | .....                  | .....           | 6       | Fulton (Mo.)   | 18             | 35                     | .....           | 2       |
| Bluff City mill, iron stack.                | 33             | .....                  | .....           | 6       | Gardner Catholic Church, spire.                              | 22             | .....                  | .....           | 2       |
| Bluff City school-house, belfry.            | 33             | .....                  | .....           | 6       | Gardner Methodist Church, spire.                             | 22             | .....                  | 55              | 2       |
| Bossing.....                                | 29             | 50                     | 55              | 6       | Genesee schoolhouse, tower.                                  | 32             | .....                  | 56              | 6       |
| Boundary stone 180.                         | 33             | 54                     | .....           | .....   | German church, spire.  | 31             | .....                  | 58              | 6       |
| Boundary stonc 163.                         | 34             | 53                     | .....           | .....   | German Lutheran church, spire.                               | 24             | .....                  | .....           | 4       |
| Bowler (Mo.)                                | 18             | 35                     | 55              | 2       | Gilbert.....   | 28             | 48                     | .....           | 2       |
| Brown.....                                  | 29             | 49                     | 55              | 6       | Gilmore.....   | 30             | 51                     | 55              | 6       |
| Buffalo Mound, azimuth mark.                | 24             | 47                     | 56              | 2       | Golden Bolt.....   | 19             | 40                     | 55              | 8       |
| Bunker Hill.....                            | 19             | 41                     | 55              | 3       | Gopher.....  | 20             | 44                     | .....           | 4       |
| Bunker Hill flouring mill, iron chimney.    | 26             | .....                  | .....           | 3       | Gorham elevator.   | 27             | .....                  | 56              | 4       |
| Bunker Hill Methodist Church, spire.        | 26             | .....                  | 56              | 3       | Grand View school-house, belfry.                             | 24             | .....                  | 56              | 2       |
| Bunker Hill school-house, cupola.           | 26             | .....                  | 56              | 3       | Hardilee, U. S. G. S.  | 31             | 53                     | 56              | 5       |
| Bunker Hill water tower.                    | 26             | .....                  | 56              | 3       | Harper standpipe.  | 32             | .....                  | .....           | 6       |
| Burlingame school-house, cupola.            | 23             | .....                  | .....           | 2       | Harrisonville Cum-berland Presby-terian Church, spire (Mo.). | 21             | .....                  | .....           | 2       |
| Bushton elevator.....                       | 32             | .....                  | 56              | 6       | Haskin.....  | 18             | 36                     | 55              | 2       |
| Butte, highest point.                       | 32             | .....                  | 56              | 6       | Hays.....  | 20             | 42                     | 55              | 4       |
| Camchester school-house, belfry.            | 34             | .....                  | .....           | .....   | Heath.....   | 19             | 40                     | 55              | 3, 6    |
| Canyon.....                                 | 20             | 43                     | -56             | 4       | Heath's barn, cupola.  | 31             | .....                  | .....           | 6       |
| Carbondale school-house.                    | 23             | .....                  | 55              | 2       | Herrick (Nebr.)  | 29             | 50                     | 55              | 5       |
| Carson.....                                 | 22             | 46                     | 55              | 2       | Hertzog Catholic Church, tower.                              | 27             | .....                  | 56              | 4       |
| Castle Rock.....                            | 27             | 47                     | 55              | 4       | Hesper schoolhouse, belfry.                                  | 22             | 47                     | .....           | 2       |
| Central.....                                | 29             | 51                     | 55              | 6       | Hill.....  | 27             | 47                     | .....           | 4       |
| Chase.....                                  | 30             | 51                     | 55              | 6       | Hinton elevator, north gable.                                | 38             | .....                  | .....           | 6       |
| Chaney.....                                 | 30             | 51                     | 55              | 6       | Hollinger's house, cu-pola.                                  | 24             | .....                  | .....           | 2       |
| Clark.....                                  | 18             | 37                     | 55              | 2       | Humboldt.....  | 18             | 38                     | 55              | 2       |
| Colorado and Kansas boundary mark 68.       | 29             | .....                  | .....           | 4       | Hutchinson court-house.                                      | 32             | .....                  | .....           | 6       |
| Colorado and Kansas boundary mark 73.       | 28             | 48                     | .....           | 4       | Hutchinson salt works, largest stack.                        | 32             | .....                  | .....           | 6       |
| Colorado and Kansas boundary mark 78.       | 29             | .....                  | .....           | 4       |  |                |                        |                 |         |
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| Independence court-house, high cupola or tower (Mo.)      | 21             | 43                     | 56              | 2  | McAllaster school-house, spire                | 28             | .....                  | .....           | 4              |
| Indian Creek  | 20             | 43                     | 56              | 4  | McLane  | 20             | 45                     | .....           | 4              |
| Iron Mound  | 19             | 39                     | 55              | 2, 3, 6                                  | Mabon   | 18             | 37                     | 55              | 2              |
| Kanapolis salt works, center hoist                        | 32             | .....                  | 56              | 6  | Marquette church, spire                       | 32             | .....                  | .....           | 6              |
| Kansas and Colorado boundary mark 08                      | 29             | .....                  | .....           | 4  | Martins Hill                                  | 23             | .....                  | 56              | 2              |
| Kansas and Colorado boundary mark 73                      | 28             | 48                     | .....           | 4  | Marty   | 18             | 36                     | 55              | 2              |
| Kansas and Colorado boundary mark 78                      | 29             | .....                  | .....           | 4  | Marty's house, lightning rod                  | 21             | .....                  | .....           | 2              |
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| Kansas and Missouri State line 1, stone                   | 21             | .....                  | .....           | 2  | Medicine Peak                                 | 31             | .....                  | 56              | 2              |
| Kansas and Missouri State line 2, stone                   | 21             | .....                  | .....           | 2  | Meyer   | 18             | 37                     | 55              | 2              |
| Kansas and Missouri State line 3, stone                   | 21             | .....                  | .....           | 2  | Miller  | 30             | 52                     | 55              | 6              |
| Kansas and Nebraska State line 1                          | 31             | 53                     | 56              | .....                                    | Missouri and Kansas State line 1, stone (Mo.) | 21             | .....                  | .....           | 2              |
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| Kansas and Nebraska State line A                          | 31             | 53                     | .....           | 5  | Missouri and Kansas State line 3, stone       | 21             | .....                  | .....           | 2              |
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| Kansas City astronomical station (Mo.)                    | 21             | 46                     | .....           | .....                                    | Moss Springs, Morgan's barn, ventilator       | 24             | .....                  | .....           | 2              |
| Kansas City Catholic Cathedral (Mo.)                      | 21             | .....                  | .....           | 2  | Nebraska and Kansas State line 1              | 31             | 53                     | 56              | .....          |
| Kansas City Second Presbyterian Church, spire (Mo.)       | 21             | .....                  | .....           | 2  | Nebraska and Kansas State line 2              | 31             | 53                     | 56              | .....          |
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| Katherinentadt Catholic Church, spire                     | 27             | .....                  | 56              | 4  | Nebraska and Kansas State line B              | 31             | 53                     | 56              | 5              |
| Kellam's house, chimney                                   | 23             | .....                  | 55              | 2  | Nebraska and Kansas State line C              | 31             | 53                     | 56              | 5              |
| Kill Creek  | 29             | 48                     | 55              | 5  | New Cambria church, white spire               | 26             | .....                  | .....           | 3              |
| Kingman   | 30             | 51                     | 55              | 6  | Newbury Catholic Church, spire                | 24             | .....                  | 56              | 2              |
| Knox Knob, top  | 23             | .....                  | 55              | 2  | North Pole Mound                              | 19             | 40                     | 55              | 3              |
| La Crosse   | 20             | 42                     | 55              | 4  | North Sherman, cairn                          | 32             | .....                  | 56              | 6              |
| Langley church, spire                                     | 32             | .....                  | .....           | Ochiltree church, cupola                 | 22  | .....          | 55                     | 2               |                |
| Lawrence 2  | 29             | 49                     | 55              | 5  | Olathe Deaf and Dumb Asylum, new chimney      | 22             | .....                  | 55              | 2              |
| Lawrence, Kansas State University, north dome, anerometer | 22             | .....                  | 55              | Olathe high school                       | 22  | .....          | 55                     | 2               |                |
| Lawrence water tower, pole                                | 22             | .....                  | 55              | Olathe Methodist Episcopal Church, spire | 22  | .....          | 55                     | 2               |                |
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| Lebanon   | 29             | 49                     | 55              | 5  | Oxide   | 31             | .....                  | 56              | 6              |
| Lebanon schoolhouse, cupola                               | 31             | .....                  | .....           | Partridge                                | 30  | 51             | 55                     | 6               |                |
| Lebanon Methodist Church, spire                           | 31             | .....                  | .....           | Pond                                     | 28  | 47             | .....                  | 4               |                |
| Lenexa Methodist Episcopal Church, spire                  | 22             | 49                     | 55              | Powell                                   | 18  | 37             | 55                     | 2               |                |
| Lincoln   | 19             | 40                     | 55              | 3  | Prairie                                       | 30             | 51                     | 55              | 6              |
| Lincoln College, cupola                                   | 25             | 49                     | 56              | 3  | Pretty Prairie                                | 30             | 51                     | 55              | 6              |
| Lipps   | 29             | 49                     | 55              | 5  | Prominent windmill                            | 23             | .....                  | 55              | 2              |
| Little River  | 29             | 51                     | 55              | 6  | Quarry  | 30             | 52                     | 55              | 6              |
| Livingood's house, chimney                                | 34             | .....                  | .....           | Ransom gristmill, smoke stack            | 27  | .....          | .....                  | 4               |                |
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| Loder's house, chimney                                    | 32             | .....                  | 56              | Red barn, near section 13, south gable   | 34  | .....          | .....                  | 2               |                |
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| Lyons salt works, tower                                   | 32             | .....                  | .....           | Robbins                                  | 18  | 38             | 55                     | 2               |                |
|   |                |                        |                 | Robert's windmill                        | 23  | .....          | 55                     | 2               |                |
|   |                |                        |                 | Round Top Mound                          | 27  | .....          | .....                  | 4               |                |
|   |                |                        |                 | Russell high school, cupola, pole        | 26  | .....          | 56                     | 3               |                |
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| Russell Springs church, spire.....                      | 27        | .....        | .....  | 4       | State Forestry station, large windmill.....         | 27        | .....        | .....  | 4       |
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| Russell Springs schoolhouse, cupola.....                | 27        | .....        | .....  | 4       | State line 2.....                                   | 21        | 46           | 55     | 2       |
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| Rutherford.....   | 30        | 52           | 55     | 6       | Stenger.....  | 23        | 47           | 55     | 2       |
| St. Mary's Catholic Church, spire.....                  | 24        | 40           | 58     | 2       | Sterling College, tower.....                        | 32        | .....        | 56     | 6       |
| Salina east base.....                                   | 19        | 40           | 55     | 3       | Stone house, center.....                            | 23        | .....        | 55     | 2       |
| Salina paper mill, tall brick chimney.....              | 25        | .....        | .....  | 3       | Sugar Loaf Mound, rock pile.....                    | 25        | .....        | 56     | 3       |
| Salina, Phillip's house, dome.....                      | 25        | .....        | 50     | 3       | Sumner.....   | 30        | 52           | 55     | 6       |
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| Scranton schoolhouse south end, cupola.....             | 23        | .....        | 55     | 2       | Thompson.....                                       | 19        | 40           | 55     | 3       |
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| Section 36, T. 34, R. 8 W., southwest corner.....       | 33        | .....        | .....  | .....   | Victoria, stable cupola west of.....                | 27        | .....        | 55     | 2,3     |
| Section line 1.....                                     | 21        | 46           | .....  | .....   | Vine Creek.....                                     | 19        | 39           | 55     | 2,3     |
| Section line 2.....                                     | 21        | 46           | .....  | .....   | Wakoneey courthouse, cupola.....                    | 27        | .....        | .....  | 4       |
| Sharon Springs church, spire.....                       | 28        | .....        | .....  | .....   | Waldo.....  | 19        | 41           | 56     | 3,4,5   |
| Sharon Springs schoolhouse, cupola.....                 | 28        | .....        | .....  | .....   | Walker schoolhouse, cupola.....                     | 27        | .....        | 56     | 4       |
| Sheridan.....   | 20        | 44           | .....  | 4       | Wallace Bluffs.....                                 | 20        | 45           | .....  | 4       |
| Sheridan Butte.....                                     | 28        | .....        | .....  | 4       | Wallace church, spire.....                          | 28        | .....        | .....  | 4       |
| Sherman.....  | 29        | 50           | 55     | 6       | Wallace latitude station.....                       | 28        | 48           | .....  | 4       |
| Simmons.....  | 18        | 30           | 55     | 2       | Wallace railway office, chimney.....                | 28        | .....        | .....  | 4       |
| Skaggs.....   | 20        | 42           | 55     | 4       | Wallace schoolhouse, cupola.....                    | 28        | .....        | .....  | 4       |
| Small house.....  | 24        | .....        | .....  | .....   | Weskan schoolhouse, cupola.....                     | 23        | .....        | .....  | 4       |
| Small Peak.....   | 25        | .....        | 50     | 3       | Westport, College of Redemptorist Fathers (Mo)..... | 21        | .....        | .....  | 2       |
| Smith Center courthouse, cupola.....                    | 31        | .....        | .....  | .....   | White City.....                                     | 18        | 38           | 55     | 2       |
| Smith Center stand-pipe.....                            | 31        | .....        | .....  | .....   | White City Baptist Church, spire.....               | 24        | .....        | .....  | 2       |
| Smoky Hill.....   | 20        | 42           | 55     | 4       | White City schoolhouse, cupola.....                 | 24        | .....        | 56     | 2       |
| Soldier Cap Mound.....                                  | 25        | .....        | 50     | 3       | White Cliffs, cairn.....                            | 32        | .....        | 56     | 6       |
|   |           |              |        |         | White house on hill, center chimney.....            | 23        | .....        | 55     | 2       |
|   |           |              |        |         | Wilmar.....   | 19        | 39           | 55     | 2       |
|   |           |              |        |         | Wilson.....   | 19        | 41           | 55     | 3,6     |
|   |           |              |        |         | Windom water tower.....                             | 32        | .....        | 56     | 6       |
|   |           |              |        |         | Winona new schoolhouse, tower.....                  | 28        | .....        | .....  | 4       |
|   |           |              |        |         | Winona old schoolhouse, cupola.....                 | 28        | .....        | .....  | 4       |
|   |           |              |        |         | Zean Dale.....                                      | 18        | 38           | 55     | 2       |

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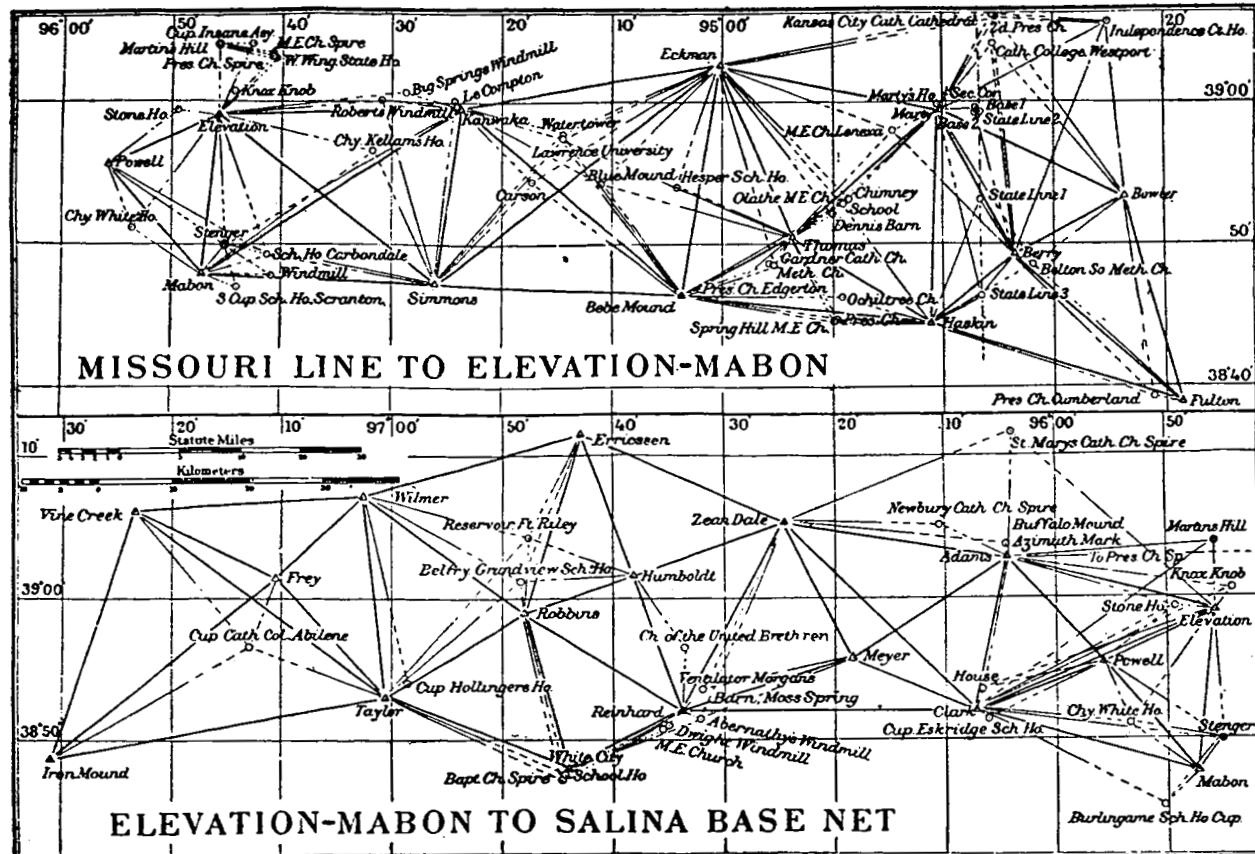


Fig. 2.—TRIANGULATION ALONG THIRTY-NINTH PARALLEL, MISSOURI LINE TO SALINA BASE NET.

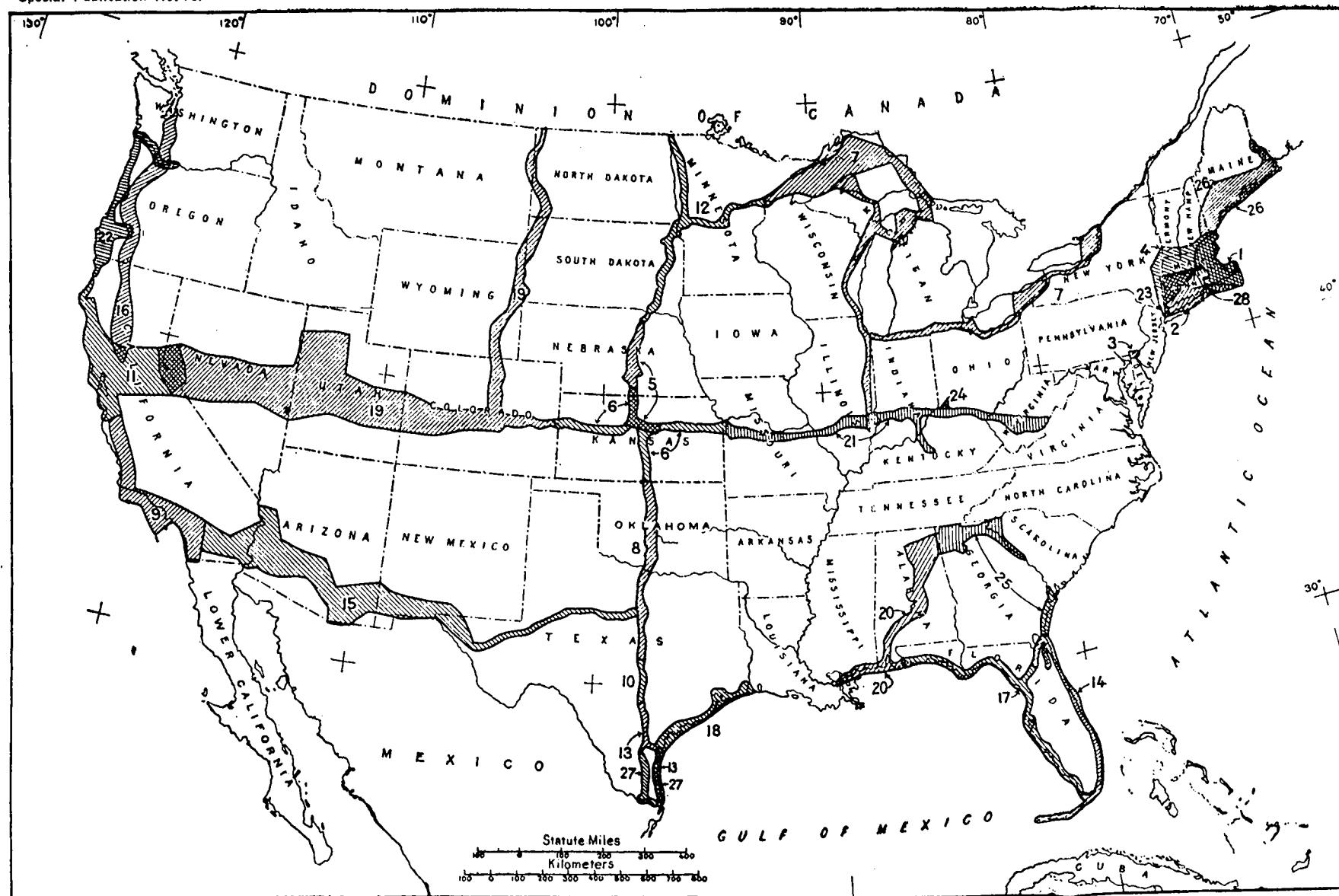


FIG. 1.—INDEX MAP SHOWING AREAS IN THE UNITED STATES COVERED BY PUBLISHED TRIANGULATION WHICH HAS BEEN RIGIDLY COMPUTED ON THE NORTH AMERICAN DATUM.

1, Appendix 8 Report for 1885; 2, Appendix 8 Report for 1888; 3, Appendix 8 Report for 1893; 4, Appendix 10 Report for 1894; 5, Appendix 6 Report for 1901; 6, Special Publication No. 70; 7, Appendix EEE Annual Report of the Chief of Engineers, 1902; 8, Appendix 4 Report for 1903; 9, Appendix 9 Report for 1904; 10, Appendix 5 Report for 1905; 11, Appendix 5 Report for 1910; 12, Appendix 4 Report for 1911; 13, Appendix 5 Report for 1911; 14, Appendix 6 Report for 1911; 15, Special Publication No. 11; 16, Special Publication No. 13; 17, Special Publication No. 16; 18, Special Publication No. 17; 19, Special Publication No. 19; 20, Special Publication No. 24; 21, Special Publication No. 30; 22, Special Publication No. 31; 23, Report on the triangulation of Greater New York; 24, Report on a plan of sewerage for the city of Cincinnati; 25, Special Publication No. 43; 26, Special Publication No. 46; 27, Special publication No. 54; 28, Special Publication No. 62.

38373°—21. (To follow page 60.)

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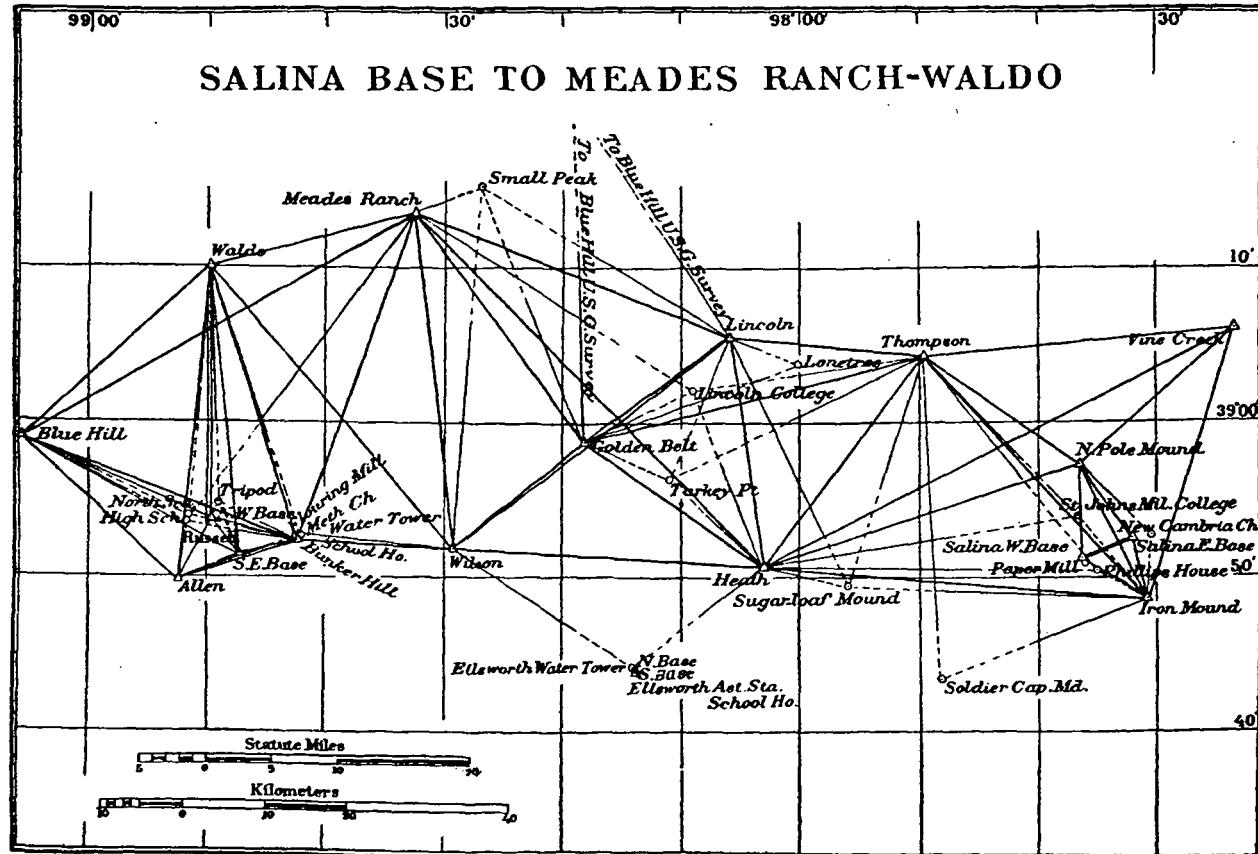


Fig. 3.—TRIANGULATION ALONG THIRTY-NINTH PARALLEL, SALINA BASE TO STATIONS MEADES RANCH-WALDO.

Special Publication No. 70,

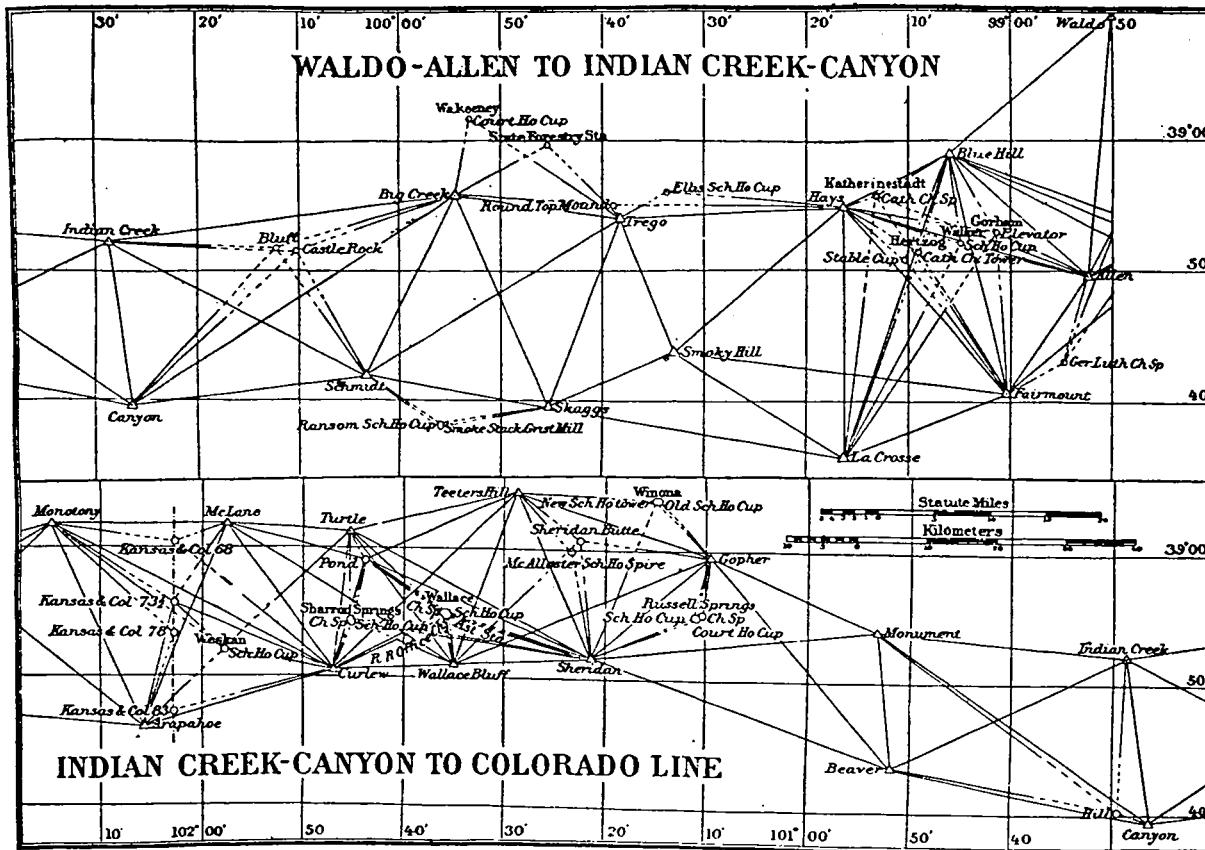
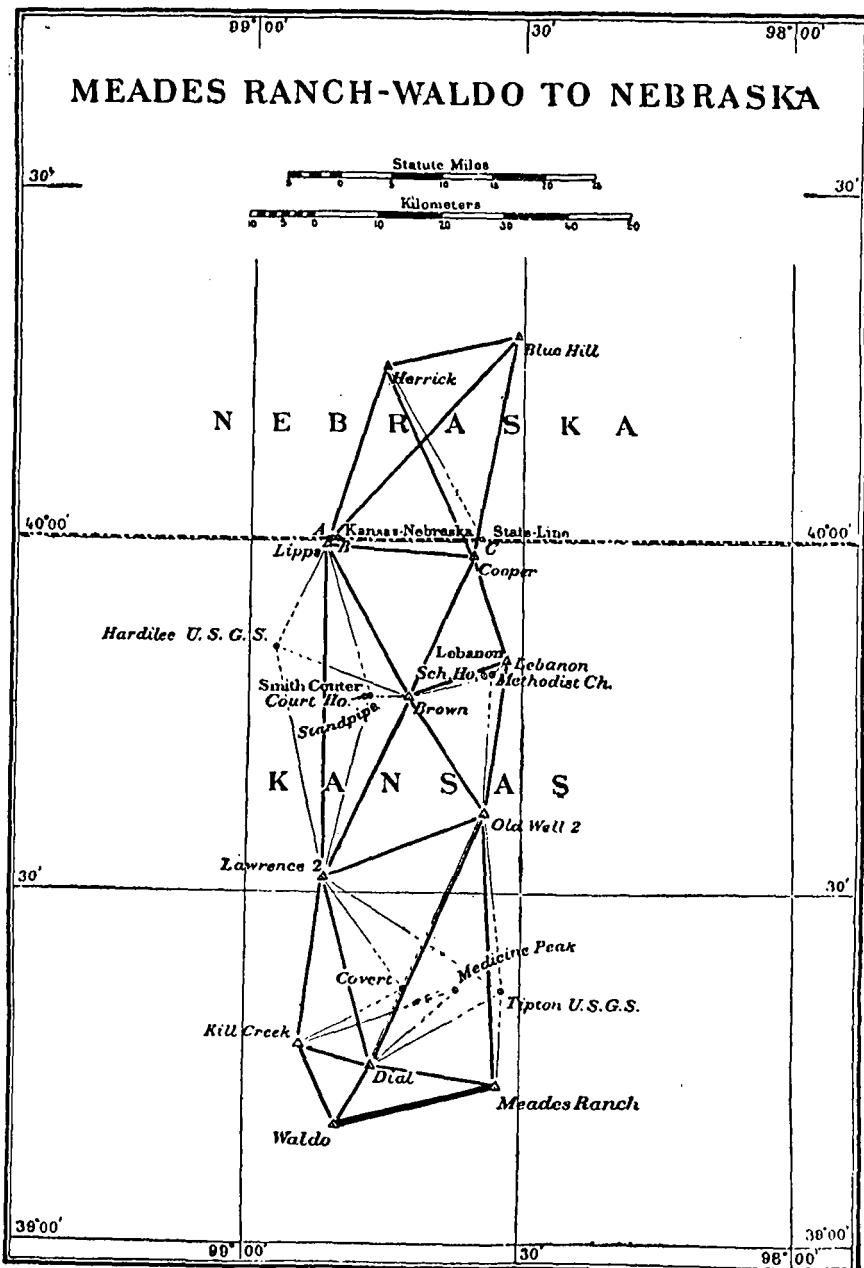


Fig. 4.—TRIANGULATION ALONG THIRTY-NINTH PARALLEL, STATIONS WALDO-ALLEN TO COLORADO LINE.

Special Publication No. 70.



Special Publication No. 70.

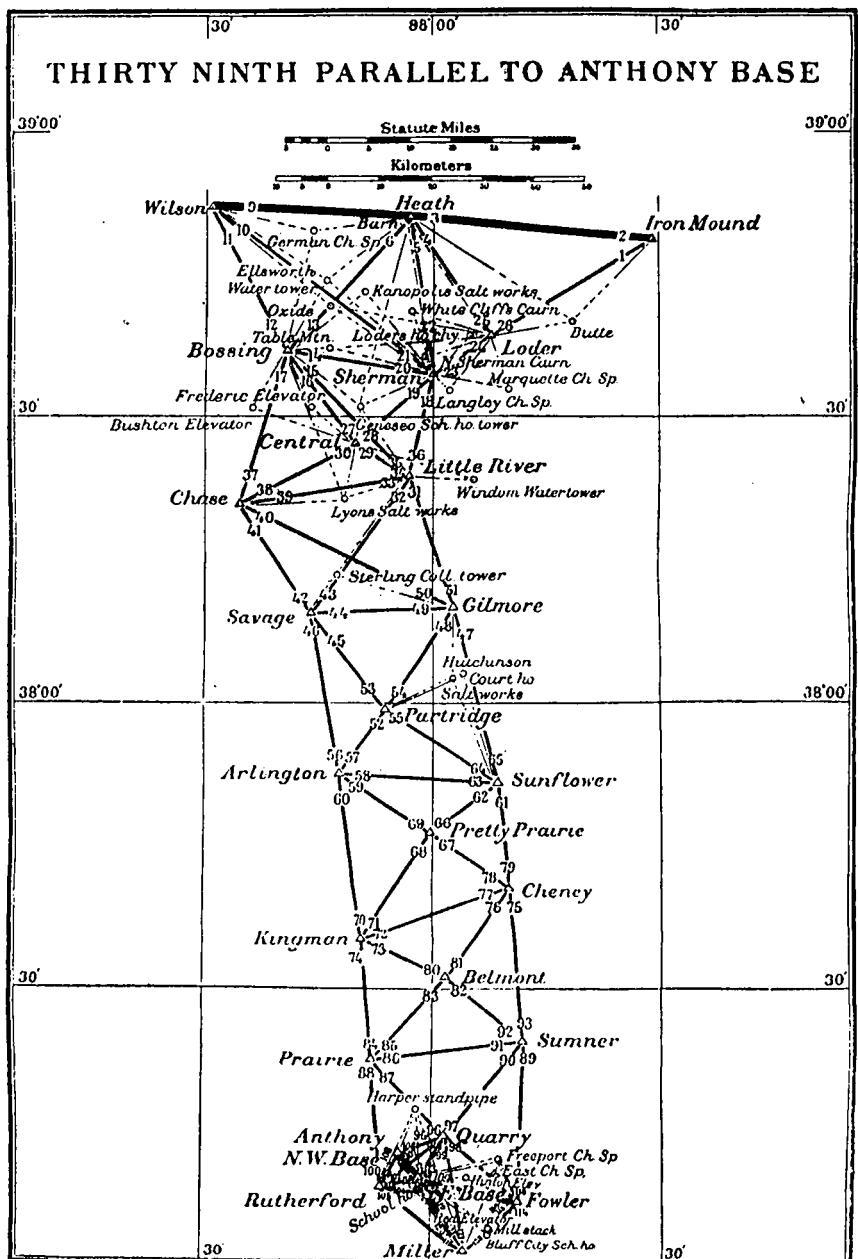


Fig. 6.—TRIANGULATION ALONG NINETY-EIGHTH MERIDIAN, THIRTY-NINTH PARALLEL TO ANTHONY BASE.

