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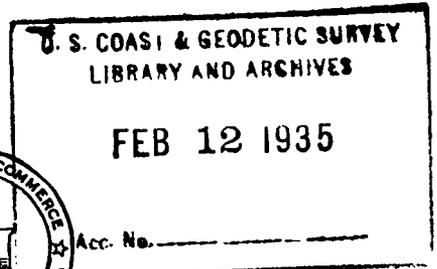
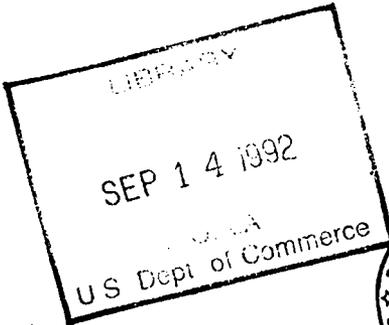
TRIANGULATION IN MISSOURI

[1927 DATUM]

BY

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TRIANGULATION IN MISSOURI (1927 DATUM)

GENERAL STATEMENT

This publication contains the results of all first-order triangulation in Missouri that has been executed by the Coast and Geodetic Survey, and also the results of all second-order triangulation along the Mississippi River in Missouri that has been executed by the United States Lake Survey and the Mississippi River Commission. The geographic positions contained herein are on a new datum and those along the thirty-ninth parallel supersede the positions in Missouri which appeared in Special Publication No. 30. The positions of the second-order stations along the Mississippi River supersede the second-order positions which appear in various publications of the Mississippi River Commission. The positions along the other arcs included in this volume have not previously been published.

This volume is one of a series of publications, each of which will contain the geographic positions on the new datum, and the descriptions and other data, for all first- and second-order triangulation of a State or occasionally of two States.

READJUSTMENT OF THE TRIANGULATION NET

The triangulation of the United States has been built up by continually adding new arcs to those already measured, and for many years in adjusting this triangulation the plan had to be followed of fitting the new arcs of triangulation to the old ones which had been previously adjusted. This method was the only one that could be followed until a comprehensive net had been built up and it led to no serious difficulty until the point was reached where the new arcs formed closed loops with the old arcs. It then developed that the last arc to close the loop received excessive corrections when adjusted to the previous triangulation because the entire error of closure of the loop had to be absorbed by it.

It was realized that the only way to overcome this difficulty was to adjust the entire network at one time. It was impracticable, however, to readjust the network each time a new arc was added or an additional loop was closed, as the time required to do so was too great, and if this were done, the geographic positions of the triangulation stations would be in a continual state of change, a condition very disturbing to those using the data.

In 1926 the triangulation net west of the ninety-eighth meridian had become so extended that it could serve as a framework for all future triangulation in that area and it was found desirable to adjust this portion of the United States net in one piece. In preparation for this adjustment a method was devised, in 1924, at the

office of the Coast and Geodetic Survey,¹ by means of which a large network of triangulation could be adjusted within a reasonable time and at a comparatively small cost. This method was applied first to the triangulation west of the ninety-eighth meridian involving 12,500 miles of arcs in 16 closed loops. Later it was applied to the eastern half of the net involving 13,000 miles of arcs forming 26 loops. The adjusted net of the country is now of such extent and strength that all new arcs hereafter can be fitted to it without having to disturb the old work and without causing excessive corrections to the new work.

ARCS INCLUDED IN THIS PUBLICATION

The triangulation included in this publication consists of 5 first-order and 1 second-order arcs. The first-order arcs are as follows: Thirty-ninth parallel, Mississippi River, ninety-third meridian, ninety-third meridian to Cairo along parallel approximately $36^{\circ}30'$, and thirty-seventh parallel to thirty-ninth parallel along meridian approximately $91^{\circ}30'$. The second-order arc is along the Mississippi River and is controlled by the first-order arc along the same river. A general idea of the location of the first-order arcs which were included in the general readjustment of the first-order triangulation in the eastern part of the United States may be obtained by referring to figure 4 near the back of this publication. Detailed sketches of both first- and second-order triangulation in Missouri are shown in figures 6 to 17, inclusive, and the location of the triangulation included in each sketch is shown on the index sketch, figure 5.

Triangulation just over the boundary in adjoining States has been included in this publication in order that all data required for surveys in Missouri, even near the boundaries, might be available in one volume.

STATEMENT OF ADJUSTMENTS

The first-order arcs along the thirty-ninth parallel, ninety-third meridian and approximately along the parallel of $36^{\circ}30'$ from the ninety-third meridian to Cairo, Ill., were adjusted as a part of the general readjustment of the first-order triangulation in the eastern part of the United States. That part of the Mississippi River first-order triangulation extending from Cairo, Ill., north to the thirty-ninth parallel in the vicinity of Belleville was also included in this general readjustment. The portion of the Mississippi River first-order triangulation extending northward from Fountain Bluff, Ill., was afterwards adjusted to those arcs to which it was connected and which were fixed by the eastern adjustment. The arc extending from the thirty-seventh parallel to the thirty-ninth parallel approximately along the meridian of $91^{\circ}30'$ was also fitted later to arcs which were fixed by the eastern adjustment. All the first-order adjustments were under the direction of Dr. O. S. Adams.

After the completion of the adjustment of the first-order triangulation along the Mississippi River, the stations of the Mississippi River Commission triangulation, which were tied directly to the main

¹ For a description of the method used see Special Publication No. 159.

scheme by triangulations of the second-order accuracy were adjusted separately. In those cases where the Mississippi River Commission stations were coincident with the first-order stations, their positions were fixed by the main-scheme adjustment. From Cairo, Ill., northward these adjustments provided a number of lines fixed in position, length, and azimuth to which the second-order triangulation of the Commission could be adjusted. From Cairo southward the first-order triangulation was connected directly to the third-order triangulation of the Mississippi River Commission or to its monuments which were connected to the third-order work by traverses. The third-order triangulation of the Mississippi River Commission was connected to its second-order triangulation either by points or lines. Since in this area the first-order triangulation was tied directly to the third-order triangulation, it was necessary to adjust the third-order work to the first order and then adjust the second order. Practically all the adjustments were made by the angle method, single chains of triangles being used. The second- and third-order triangulations were adjusted under the direction of Leslie E. Shmidl. The descriptions were compiled under the direction of H. C. Mitchell. The sketches were prepared under the direction of Lt. R. L. Pfau.

NORTH AMERICAN DATUM OF 1927

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

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

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

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

GENERAL DESCRIPTION OF TABLES AND SKETCHES

The tables of geographic positions, on pages 15 to 76, also contain the distances between contiguous triangulation stations in meters and feet, the logarithms of the distances in meters, and the azimuths of the lines joining these stations. The distances are corrected for elevation above mean sea level, and the azimuths are referred to the true south. Anyone who wishes to obtain the actual distances between the triangulation stations should use the formula given on page 13, by which the true distance at the mean elevation of the stations can be derived from the distance at sea level. The descriptions of the stations, given on pages 81 to 157, are designed to enable the engineer to recover and identify the station mark after he has visited the general locality of the station. There will be times when the description, so far as witness and other marks are concerned, will have become out of date from changes by nature or by the work of man. Any engineer who may visit a station and find that the description does not truly represent the present conditions, or who finds the mark destroyed or mutilated, should report the facts to the Director of the Coast and Geodetic Survey, at Washington, D.C., in order that the files of this office may be kept up to date. The engineer should realize that the triangulation extended over the country by the Coast and Geodetic Survey is a public survey, made for the use of the people. The stations really belong to the States in which they are located, and the engineer who is so fortunate as to find one of these stations located near his work should help to perpetuate the monuments in order that they may be of continuous service and value to his locality. The Coast and Geodetic Survey officials will, from time to time, visit the stations established and will re-mark and re-describe them if necessary.

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

Near the back of this publication will be found a number of sketches which show graphically the approximate locations of the stations, especially with reference to State and county boundaries, and the lines over which the main-scheme observations were made. It is suggested that if one should wish to learn whether there are triangulation stations in the vicinity of his work he should first consult the sketches. He can obtain from them the names of the stations that may be of help to him; then he should turn to the index on page 171 of this volume, from which he can find the pages upon which the descriptions and geographic positions of the stations appear.

OTHER PUBLICATIONS OF VALUE TO THE ENGINEER

If an engineer wishes to compute geographic positions for the stations of any triangulation that he may execute, he should procure a copy of Coast and Geodetic Survey Special Publication No. 8 from

the Superintendent of Documents, Washington, D.C. The cost of this publication is 25 cents. If he is interested in knowing the length in meters of the degrees, minutes, and seconds of latitude and longitude in the region in which he is working, he can obtain them from Special Publication No. 5, which can be purchased at a cost of 20 cents from the Superintendent of Documents.

There are occasions, especially in cities, when the engineer wishes to use plane coordinates for his triangulation stations rather than spherical coordinates. In such cases he should procure from the Superintendent of Documents Special Publication No. 71, entitled "Relation between Plane Rectangular Coordinates and Geographic Positions", which costs 15 cents. This publication also describes the methods of transforming plane coordinates to spherical ones.

In order to make geodetic control data of greater use to engineers and surveyors, one or more plane-coordinate systems have been established in each of the 48 States. It is planned to have the data for each triangulation station in a State include its x and y coordinates as well as its latitude and longitude. A brief explanation of plane-coordinate systems is contained in Serial No. 562 of this Bureau. A more detailed publication will be issued in the near future.

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

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

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

CLASSIFICATION OF TRIANGULATION

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

The ultimate criterion applied in classifying the different grades of triangulation is the actual error in the length of any line. This is indicated by the discrepancy between the measured length of a base line and its length as computed through the triangulation from

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

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

Under certain conditions the proportionate error in the length of a line as specified above may be found to be exceeded in any class of triangulation. Where two points are fairly close together as compared with the size of the triangulation scheme, the distance between those points may be in error in excess of that indicated by the class of triangulation of the scheme. The accuracy of the computed length of any line can be estimated by computing the ΣR_1 in accordance with the formula for the strength of figures as given in Coast and Geodetic Survey Special Publication No. 145. In any class of triangulation the subsidiary stations will be located with a less degree of accuracy than the main-scheme stations.

CHARACTERISTICS OF FIRST-ORDER TRIANGULATION

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

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

The probable error of a measured base is about 1 part in 1,000,000 of its length. This accuracy meets all the requirements of engineering and science.

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

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

SECONDARY STATIONS

In addition to the stations which form the main network of triangles in Missouri, a number of objects, such as mountain peaks, church spires, and schoolhouse cupolas, were observed upon from stations of the main scheme. The geographic positions of these secondary stations have been computed and the data are included in the tables on pages 15 to 76. These stations are shown on the sketches and in the index, but only a few of them are given in the descriptions of stations, as in most cases the name of the object is all the description that is available. Ordinarily the name of the secondary station is sufficient for its accurate identification by the engineer who may wish to use it.

USE OF HORIZONTAL CONTROL DATA

The plan or map for any extensive engineering project, whether or not map construction is the primary object, should have all of its parts properly correlated and should be on the same datum as adjacent surveys. Federal and State mapping organizations have long been aware of the necessity for having all surveys based upon a common datum, but local engineers and surveyors in this country have too often in the past been content, and in many cases compelled, to use a local datum for their surveys. The future economic disadvantage of such a system is now becoming recognized, with the result that city and county surveys are being more generally placed upon a permanent basis by connecting them to stations on the North American datum.

One other factor must be taken into consideration by the engineer of today. As the States develop industrially they will undoubtedly follow the lead of one of the Eastern States, Massachusetts, which with splendid foresight has extended its triangulation control over the entire State for the purpose of defining property boundaries in terms of latitude and longitude. The advantage of such a system is well stated in the following extracts from the report on the Maryland oyster survey:

The difficulties of accurately locating and permanently defining the boundaries of a farmer's plantation on land, even with the aid of monuments, public roads,

streams of water, and other points of reference, are often great, judging from the disputes frequently arising in connection with boundaries. * * *

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

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

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

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

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

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

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

While it may be noted in the preceding paragraphs that the azimuth and length of one line and the geographic position of one end of that line constitute the essential data for the complete utilization of old work as a basis for new work, there is always grave danger in depending upon this minimum of data. There may be failure to identify the true station mark, or the mark, though genuine, may have been tampered with or otherwise disturbed in position. This will, of course, introduce an error into the new work based on these stations. It is the present practice in this survey, unless unusual conditions render it unnecessary, to establish the integrity of the recovered points by using at least three old stations as a basis for new work, the third station serving as a check for the two stations on which the new work may actually depend.

In local surveys where the area is of limited extent it is usually desirable to use a system of plane coordinates, the origin being connected to some point of the first- or second-order triangulation or traverse scheme. Tables for computing plane coordinates from geographic positions are found in Coast and Geodetic Survey Special Publication No. 71. The Coast and Geodetic Survey will be glad to give advice on any problem arising out of the use of its control points or on any proposed extension of triangulation or traverse from them.

EXPLANATION OF TABLE FOR POLYCONIC MAP PROJECTION

The engineer or surveyor who makes use of the data in this publication may find it desirable to construct a map covering the territory he is surveying. He may wish to show on this map the meridians and parallels so as to be able to plot the positions of the triangulation stations included in the area and show the details of his survey in the correct geographic positions. To enable him to do this with the least possible difficulty, the following table, reprinted in an abbreviated form from Coast and Geodetic Survey Special Publication No. 5, has been inserted. This table may also be used to interpret in terms of degrees, minutes, and seconds of arc any relatively short distance measured along a meridian or parallel. The method of using the table is described below.

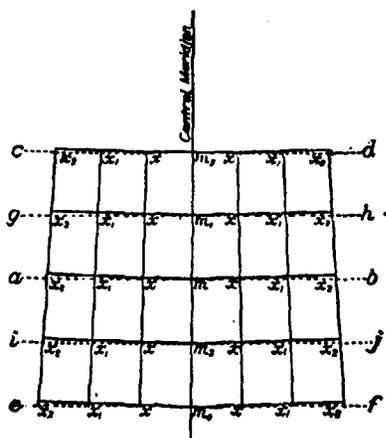


FIGURE 1.—Sketch showing construction of polyconic projection.

NOTE.—In this figure the angles made at the central meridian by the parallels are grossly exaggerated. In an actual projection the parallels appear practically as straight lines.

To make a projection for a large-scale map (1 to 20,000 and larger), first draw a straight line for a central meridian and a construction line *ab* perpendicular thereto, each to be as central to the sheet as the selected interval of latitude and longitude will permit. (See fig. 1 above.) On the central meridian lay off, on the desired scale, the distances $m m_2$, and $m m_4$, using the length of 1 minute along the

meridian for the latitude of m_1 , as given in the table in the column headed "Arc of the meridian, 1'", and multiplying this length by the number of minutes for the interval between the central parallel and the extreme parallels. Through m_2 and m_4 draw straight lines, cd and ef , parallel to the line ab . On the lines ef , ab , and cd lay off to the scale of the map the distances $m_4 x_2$, $m x_2$, and $m_2 x_2$ on both sides of the central meridian, taking the values from the column headed "Arc of the parallel, 1'", corresponding to the latitude of m_4 , m_2 , and m_2 , respectively. The value of 1 minute as taken from the table must be multiplied by the number of minutes out from the central meridian. Draw straight lines through the points thus determined for the extreme meridians—that is, through the x_2 points.

At the two points designated x_2 on the line ab lay off along the meridians the value of Y as given in the table under "Y coordinate of curvature", using as argument the interval in minutes between the central meridian and the extreme meridian. Draw straight lines from these points to the point m for the middle parallel, and from the points of intersection with the extreme meridians lay off distances along these meridians, above and below, equal to the distances $m m_2$ and $m m_4$ to locate points in the extreme parallels.

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

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

Polyconic map projection table

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 36°
	1"	1'	1"	1'		
° /	Meters	Meters	Meters	Meters	° /	Meters
36 00	25.046	1,502.8	30.821	1,849.27	0 01	0.1
05	25.020	1,501.2	30.822	1,849.30	03	1.2
10	24.993	1,499.6	30.822	1,849.32	06	3.2
15	24.967	1,498.0	30.822	1,849.35	07	6.3
20	24.940	1,496.4	30.823	1,849.37	10	12.8
25	24.914	1,494.8	30.823	1,849.40	15	28.0
30	24.887	1,493.2	30.824	1,849.43	20	51.4
35	24.860	1,491.6	30.824	1,849.45	25	80.3
40	24.834	1,490.0	30.825	1,849.48	30	115.6
45	24.807	1,488.4	30.825	1,849.51	40	205.6
50	24.780	1,486.8	30.826	1,849.53	50	321.2
55	24.753	1,485.2	30.826	1,849.56	1 00	462.5

Polyconic map projection table—Continued

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 37°
	1"	1'	1"	1'		
° /	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	° /	<i>Meters</i>
37 00	24.726	1,483.6	30.826	1,849.58	0 01	0.1
05	24.699	1,481.9	30.827	1,849.01	03	1.2
10	24.672	1,480.3	30.827	1,849.64	05	3.3
15	24.645	1,478.7	30.828	1,849.66	07	6.4
20	24.618	1,477.1	30.828	1,849.69	10	13.0
25	24.590	1,475.4	30.829	1,849.72	15	29.2
30	24.563	1,473.8	30.829	1,849.74	20	51.9
35	24.536	1,472.2	30.829	1,849.77	25	81.2
40	24.509	1,470.5	30.830	1,849.80	30	116.9
45	24.481	1,468.9	30.830	1,849.82	40	207.8
50	24.454	1,467.2	30.831	1,849.85	50	324.6
55	24.426	1,465.6	30.831	1,849.88	1 00	467.5

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

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

Polygonic map projection table—Continued

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature	
	1"	1'	1"	1'		Lat. 40°	Lat. 41°
° ' /	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	° ' /	<i>Meters</i>	<i>Meters</i>
40 00	23.721	1,423.3	30.842	1,850.64	0 01	0.1	0.1
05	23.692	1,421.5	30.843	1,850.57	03	1.2	1.2
10	23.663	1,419.8	30.843	1,850.60	05	3.3	3.3
15	23.634	1,418.1	30.844	1,850.63	07	5.5	6.6
20	23.605	1,416.3	30.844	1,850.65	10	13.3	13.4
25	23.576	1,414.6	30.845	1,850.68	15	20.9	30.1
30	23.547	1,412.8	30.845	1,850.71	20	53.2	53.5
35	23.518	1,411.1	30.846	1,850.73	25	83.2	83.6
40	23.489	1,409.3	30.846	1,850.76	30	119.8	120.4
45	23.460	1,407.6	30.846	1,850.79	40	212.9	214.1
50	23.430	1,405.8	30.847	1,850.81	50	332.6	334.5
55	23.401	1,404.1	30.847	1,850.84	1 00	479.0	481.7

CONVERSION TABLE

In a number of triangulation publications of this Bureau complete tables have been printed for the conversion of feet to meters and meters to feet. As these tables require eight pages, it seemed advisable in the interests of economy to substitute for them the condensed table shown below. This table can be used readily for converting a rather large number of one unit to the corresponding number in the other unit by simply taking the conversion value for each digit of the first number, moving the decimal point if necessary, and adding the values together. For example, to convert 24.6 feet to meters we take from the table the value in meters corresponding to 2 feet and move the decimal point one number to the right. We then take the value for 4 feet as given in the table, and next the value for 6 feet, and move the decimal point one number to the left. This gives, by rounding off the third decimal place, $6.096 + 1.219 + 0.183 = 7.498$ meters.

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

EXPLANATION OF TABLES OF POSITIONS

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

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

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

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

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

EXPLANATION OF LENGTHS

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

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

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

AZIMUTH AND BACK AZIMUTH

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

Because of the convergence of the meridians, the azimuth and the back azimuth of a line do not differ by exactly 180° , the amount of the divergence varying with the latitude and the difference of longitude of the two ends of the line. To illustrate from the tables

on page 27, the azimuth from Barnes to Chalk is $255^{\circ}54'28''.88$, while the back azimuth, or the azimuth from Chalk to Barnes is $76^{\circ}04'46''.15$.

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

GEOGRAPHIC POSITIONS

Thirty-ninth parallel arc

Station	Latitude and longitude	Azimuth	Back Azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
<i>Principal points</i>							
Marty (Kans.), 1884.....	° ' " 38 59 22.923 94 40 15.047						
Haskin (Kans.), 1885.....	38 44 23.753 94 41 06.668	182 33 55.94	2 34 28.33	Marty.....	4.4433413	27,755.01	91,059.6
Berry, 1884.....	38 49 14.136 94 33 33.696	50 43 24.78 152 46 47.65	230 38 41.07 332 42 35.59	Haskin..... Marty.....	4.1502151 4.3246406	14,132.37 21,117.41	46,366.0 69,282.7
Bowler, 1884.....	38 53 16.213 94 23 39.574	62 31 45.52 115 20 17.51	242 25 32.80 295 09 51.86	Berry..... Marty.....	4.2082831 4.4233795	16,154.11 28,508.15	52,998.9 86,968.8
Fulton, 1883.....	38 38 43.731 94 18 34.362	107 54 15.75 131 54 10.92 164 42 34.73	287 40 10.36 311 44 48.21 344 39 23.62	Haskin..... Berry..... Bowler.....	4.5355741 4.4646392 4.4455186	34,322.12 29,150.04 27,894.50	112,605.2 96,636.4 91,517.2
Thornton, 1883.....	38 50 05.496 94 14 47.129	14 39 01.03 114 39 34.20	194 36 38.83 294 34 00.12	Fulton..... Bowler.....	4.3370035 4.1498479	21,727.18 14,120.43	71,283.3 46,326.8
Chapel Hill, 1883.....	38 54 47.365 94 03 28.600	62 04 24.24 84 36 13.36	241 57 18.39 264 23 32.90	Thornton..... Bowler.....	4.2677036 4.4671062	18,522.67 29,316.10	60,769.8 96,181.2
Baker, 1883.....	38 45 37.166 94 04 13.109	58 35 02.76 118 27 33.95 183 36 59.92	238 26 04.23 298 20 56.69 3 37 27.83	Fulton..... Thornton..... Chapel Hill.....	4.3874870 4.2404028 4.2504477	24,405.46 17,394.13 16,999.95	80,070.2 57,067.2 55,774.0
Hutton Mound, 1883.....	38 32 51.517 94 10 50.135	134 04 17.20 169 50 10.98 202 05 38.16	313 59 27.60 349 47 42.83 22 09 46.15	Fulton..... Thornton..... Baker.....	4.1938318 4.5104580 4.4063045	15,625.42 32,393.51 25,486.16	51,264.4 106,277.7 83,615.8
Caldwell, 1882.....	38 34 05.471 93 45 22.469	86 36 16.04 128 03 41.32	266 20 23.84 307 51 54.95	Hutton Mound..... Baker.....	4.5688918 4.5399742	37,058.84 34,671.62	121,583.9 113,751.8

Thirty-ninth parallel arc—Continued

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Normal, 1883.....	38	45	33.128	4	18	34.24	184	17	53.00	Caldwell.....	4.3276453	21,264.01	69,763.7
	93	44	16.466	90	21	03.53	270	08	34.36	Baker.....	4.4607892	28,892.77	94,792.4
				121	41	34.89	301	29	32.38	Chapel Hill.....	4.5135251	32,623.09	107,030.9
High Point Tebo, 1882.....	38	34	34.409	86	52	17.87	266	45	24.96	Caldwell.....	4.2056463	16,056.33	52,678.1
	93	34	20.221	144	41	22.52	324	35	09.99	Normal.....	4.3963178	24,906.79	81,715.0
Knob Noster, 1882.....	38	46	35.585	37	36	28.29	217	28	48.79	Caldwell.....	4.4649641	29,171.86	95,708.0
	93	33	07.116	83	15	41.94	263	08	42.82	Normal.....	4.2114880	16,273.76	53,391.5
Kendrick, 1882.....	38	39	39.076	310	33	09.21	130	42	12.84	Schnackenburg.....	4.4440919	27,803.01	91,217.0
	93	25	59.416	52	15	12.48	232	09	59.91	High Point Tebo.....	4.1855721	15,331.06	50,298.7
				141	13	11.94	321	08	44.42	Knob Noster.....	4.2170545	16,483.69	54,080.2
Heard, 1880.....	38	42	56.523	72	51	22.03	252	42	53.79	Kendrick.....	4.3132831	20,572.31	67,494.3
	93	12	26.350	102	48	43.38	282	35	46.82	Knob Noster.....	4.4873578	30,715.51	100,772.5
Schnackenburg, 1882.....	38	29	51.951	104	47	59.90	284	33	44.76	High Point Tebo.....	4.5361134	34,364.77	112,745.1
	93	11	27.659	130	42	12.84	310	33	09.21	Kendrick.....	4.4440919	27,803.01	91,217.0
				176	38	44.25	356	38	07.63	Heard.....	4.3844228	24,233.87	79,507.3
Syracuse, 1928.....	38	40	29.267	55	36	22.33	235	24	05.40	Schnackenburg.....	4.5403095	34,689.40	113,839.7
	92	51	46.103	98	43	20.13	278	30	24.75	Heard.....	4.4816470	30,314.26	99,456.0
Bowers, 1928.....	38	22	05.748	128	03	45.99	307	55	54.41	Schnackenburg.....	4.3682886	23,350.09	76,607.8
	92	58	48.999	152	54	05.74	332	45	36.46	Heard.....	4.6369914	43,350.23	142,224.9
Hubbard, 1880.....	38	40	28.255	55	37	56.70	235	25	40.22	Schnackenburg.....	4.5399088	34,666.40	113,734.7
	92	51	46.825	98	47	07.78	278	34	12.86	Heard.....	4.4814685	30,301.80	99,415.2
				107	49	20.67	287	39	38.73	Schnackenburg.....	4.3768186	23,813.25	78,127.3
Hughes, 1880.....	38	25	56.612	142	39	34.80	322	29	14.87	Heard.....	4.5977077	39,601.14	129,924.7
	92	55	52.128	192	26	26.92	12	28	59.80	Hubbard.....	4.4397323	27,525.32	90,306.0
				38	18	03.57	218	10	27.20	Hughes.....	4.4573960	28,667.91	94,054.6
Cole, 1880.....	92	43	39.559	110	20	50.93	290	15	46.57	Hubbard.....	4.0960848	12,562.75	41,216.3
Versailles north base, 1880.....	38	29	34.895	58	17	49.85	238	13	10.72	Hughes.....	4.1069915	12,793.56	41,973.5
	92	48	23.364	166	16	53.73	346	14	46.84	Hubbard.....	4.3167959	20,739.39	68,042.5
				203	29	46.07	23	32	42.99	Cole.....	4.2359618	17,217.17	56,486.7
Hunter (Versailles south base), 1880.....	38	25	45.313	91	29	54.18	271	24	01.31	Hughes.....	4.1390700	13,774.31	45,191.2
	92	46	24.416	157	50	41.40	337	49	27.42	Versailles north base.....	3.8833123	7,643.853	25,078.21
				189	53	28.94	9	55	11.64	Cole.....	4.3657068	23,211.69	76,153.7
Christian, 1879.....	38	37	38.496	41	56	52.98	221	48	25.98	Hunter (Versailles south base).....	4.4703304	29,534.55	96,897.9
	92	32	50.478	56	38	53.61	236	29	12.11	Versailles north base.....	4.4324098	27,065.11	88,796.1
				57	13	45.56	236	59	24.90	Hughes.....	4.6004756	39,854.34	130,755.4
				93	14	46.69	273	08	01.47	Cole.....	4.1965699	15,724.25	51,588.6
				100	53	02.53	280	41	12.80	Hubbard.....	4.4467304	27,972.45	91,772.9
Belshe, 1879.....	38	22	30.441	100	41	30.74	280	27	47.01	Hunter (Versailles south base).....	4.5149864	32,733.05	107,391.7
	92	24	18.337	110	36	05.31	290	21	07.06	Versailles north base.....	4.5730055	37,411.53	122,741.0
				156	08	24.64	336	03	05.81	Christian.....	4.4860938	30,626.25	100,479.6
High Point, 1880.....	38	29	29.488	309	39	17.82	129	45	56.54	Belshe.....	4.3058548	20,223.43	66,349.7
	92	34	59.774	67	27	05.26	247	19	59.43	Hunter (Versailles south base).....	4.2548130	17,980.97	58,992.6
				90	33	35.91	270	25	15.75	Versailles north base.....	4.2894849	19,475.33	63,835.3
				129	53	37.11	309	43	09.07	Hubbard.....	4.5014596	31,729.23	104,088.3
				141	46	40.57	321	41	16.55	Cole.....	4.3079108	20,319.40	66,664.6
				191	43	03.37	11	44	23.96	Christian.....	4.1875192	15,399.95	50,524.7
Medlock, 1879.....	38	38	13.335	11	33	18.37	191	30	45.92	Belshe.....	4.4723578	29,672.75	97,351.3
	92	20	13.473	86	42	28.56	266	34	35.94	Christian.....	4.2634370	18,341.59	60,176.7
Moreau, 1879.....	38	31	36.986	354	19	12.09	174	19	55.03	Belshe.....	4.2287903	16,935.20	55,561.6
	92	25	27.387	74	13	21.64	254	07	25.25	High Point.....	4.1586059	14,414.71	47,292.3
				136	08	33.23	316	03	56.93	Christian.....	4.1894653	15,469.11	50,761.6
				211	50	32.51	31	53	48.28	Medlock.....	4.1580817	14,390.69	47,213.5
Cedar, 1879.....	38	36	03.960	42	17	17.06	222	07	32.85	Belshe.....	4.5297446	33,864.49	111,103.7
	92	08	39.626	71	26	34.10	251	16	05.87	Moreau.....	4.4107719	25,749.68	84,480.4
				103	25	44.85	283	18	31.79	Medlock.....	4.2368067	17,253.08	56,604.5
Kennedy, 1879.....	38	20	59.578	96	00	34.63	275	49	03.18	Belshe.....	4.4344551	27,192.87	89,215.3
	92	05	44.231	124	30	38.29	304	18	22.75	Moreau.....	4.5413297	34,780.01	114,107.4
				171	20	46.87	351	18	57.74	Cedar.....	4.4503748	28,208.16	92,546.3
McDaniel, 1879.....	38	27	35.710	56	08	49.96	236	01	04.90	Kennedy.....	4.3402356	21,889.49	71,815.8
	91	53	15.590	125	04	46.25	304	55	10.64	Cedar.....	4.4365268	27,322.90	80,641.9
Pilot Knob, 1879.....	38	20	11.266	93	22	37.86	273	11	34.89	Kennedy.....	4.4148834	25,994.62	85,284.0
	91	47	55.664	150	29	17.31	330	25	58.53	McDaniel.....	4.1973165	15,751.30	51,677.4
Bradford, 1879.....	38	33	57.240	4	00	17.91	183	59	32.25	Pilot Knob.....	4.4070560	25,530.31	83,760.7
	91	46	42.144	39	03	03.22	218	58	58.22	McDaniel.....	4.1801655	15,141.38	49,676.3
				97	06	59.70	276	52	18.04	Cedar.....	4.5068663	32,126.71	105,402.4

Thirty-ninth parallel arc—Continued

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Geyer, 1878	38 26 57.031	54 42 29.76	234 34 58.46	Pilot Knob	4.3348984	21,622.12	70,938.6						
	91 35 48.890	129 21 37.71	309 14 50.99	Bradford	4.3107981	20,454.93	67,109.2						
Turnpike Bluff, 1878	38 35 29.086	5 51 38.60	185 50 56.97	Geyer	4.2006248	15,871.75	52,072.6						
	91 34 42.055	34 16 31.90	214 08 18.31	Pilot Knob	4.5342774	34,219.80	112,269.5						
		80 50 00.73	260 42 31.69	Bradford	4.2469592	17,658.72	57,935.3						
Gasconade, 1874	38 35 33.325	35 19 13.69	215 14 24.11	Geyer	4.2900644	19,501.34	63,980.6						
	91 28 03.934	83 50 59.96	263 39 22.65	Bradford	4.4350207	27,228.31	89,331.5						
		89 15 26.00	269 11 17.66	Turnpike Bluff	3.9838991	9,635.83	31,613.6						
Winter, 1874	38 27 41.358	84 33 19.37	264 27 14.97	Geyer	4.1545101	14,272.83	46,826.8						
	91 26 02.948	111 12 57.87	291 00 06.23	Bradford	4.5076111	32,181.86	105,583.3						
		138 57 37.64	318 52 14.31	Turnpike Bluff	4.2818070	19,134.05	62,775.6						
		168 37 28.82	348 36 13.47	Gasconade	4.1715803	14,845.00	48,704.0						
Berger, 1874	38 35 58.107	39 12 07.27	219 06 46.48	Winter	4.2956402	19,753.32	64,807.4						
	91 17 27.984	87 12 45.16	267 06 08.45	Gasconade	4.1877676	15,408.76	50,553.6						
Jacobs, 1874	38 26 18.154	100 10 10.64	280 04 01.98	Winter	4.1644457	14,603.12	47,910.4						
	91 16 10.091	134 46 09.11	314 38 44.59	Gasconade	4.3862060	24,333.58	79,834.4						
		173 58 59.10	353 58 10.59	Berger	4.2548334	17,981.81	58,995.3						
Enoch Knob, 1874	38 34 43.746	36 45 54.06	216 40 55.19	Jacobs	4.2889150	19,449.79	63,811.5						
	91 08 10.086	99 41 10.26	279 35 22.28	Berger	4.1365803	13,695.58	44,932.9						
Peters, 1874	38 27 46.527	81 28 26.00	261 20 43.42	Jacobs	4.2610894	18,242.71	59,851.3						
	91 03 46.206	127 21 38.66	307 13 06.74	Berger	4.3982693	25,018.96	82,083.0						
		153 36 00.34	333 33 16.00	Enoch Knob	4.1573172	14,365.38	47,130.4						
Dieckhaus, 1873	38 35 16.568	36 40 53.70	216 36 28.27	Peters	4.2379229	17,295.09	56,742.3						
	90 56 40.065	86 35 31.40	266 28 21.06	Enoch Knob	4.2235446	16,731.87	54,894.5						
		92 32 12.17	272 19 13.72	Berger	4.4804008	30,227.40	99,171.1						
Lynch, 1873	38 24 27.667	102 08 24.72	281 56 07.74	Peters	4.4683511	29,400.26	96,457.4						
	90 44 00.660	137 27 35.44	317 19 42.72	Dieckhaus	4.4343177	27,184.27	89,187.1						
Halleck, 1873	38 28 07.618	86 58 48.27	266 53 36.46	Peters	4.0852741	12,169.54	39,926.2						
	90 55 24.960	123 27 04.34	303 19 07.78	Enoch Knob	4.3463015	22,197.37	72,825.9						
		172 10 25.83	352 09 39.04	Dieckhaus	4.1256139	13,351.00	43,802.4						
		292 10 06.93	112 17 12.33	Lynch	4.2535338	17,928.08	58,819.0						
Clarks Mound (Ill.), 1871	38 34 45.652			Clarks Mound	4.1645294	14,605.94	47,919.7						
	90 04 12.660	21 53 57.62	201 51 37.08										
Sugar Loaf Mound (Ill.), 1871	38 42 05.211			Clarks Mound	4.1497216	14,116.32	46,313.3						
	90 00 27.599	232 20 43.69	52 25 31.37	Turkey Hill	4.4117885	25,810.03	84,678.4						
Dreyer (Ill.), 1871	38 30 06.230	245 16 08.45	65 26 18.33	Sugar Loaf Mound	4.4145958	25,977.41	85,227.6						
	90 11 54.377	278 26 41.17	98 34 29.85	Clarks Mound	4.2645005	18,386.56	60,323.2						
		328 13 50.36	148 16 50.89	Dreyer	4.1248607	13,330.94	43,736.6						
Insane asylum, 1871	38 36 13.891	269 20 28.30	89 30 39.21	Sugar Loaf Mound	4.3731283	23,611.76	77,466.2						
	90 16 44.033	306 08 49.95	126 16 39.51	Clarks Mound	4.3529897	22,541.86	73,956.1						
		359 54 59.94	179 55 00.33	Insane asylum	4.0251617	10,596.48	34,765.3						
Minoma, 1872	38 41 57.540	89 53 40.24	269 45 07.74	Insane Asylum	4.2683132	19,875.28	65,907.5						
	90 16 44.670	117 59 42.76	297 51 09.33	Minoma	4.3521188	22,496.70	73,807.9						
		199 10 36.46	19 12 13.30	Sugar Loaf Mound	4.0571138	11,405.49	37,419.5						
American Bottom lower base (Ill.), 1872	38 36 15.879	24 40 11.13	204 38 52.87	American Bottom lower base	3.8613482	7,266.883	23,841.43						
	90 03 02.643	26 44 34.85	206 42 32.90	Clarks Mound	4.0215630	10,509.04	34,478.4						
		73 51 09.71	253 41 18.62	Insane asylum	4.3774742	23,849.22	78,245.3						
		99 49 22.82	279 39 30.72	Minoma	4.3661240	23,234.00	76,228.9						
Kleinschmidt, 1871	38 30 19.750	200 09 30.40	20 11 13.66	Insane asylum	4.0657084	11,633.45	38,167.4						
	90 19 29.717	249 39 28.40	69 48 59.81	Clarks Mound	4.3742739	23,674.13	77,670.9						
		272 07 28.09	92 12 11.57	Dreyer	4.0430122	11,041.10	36,224.0						
Morgan, 1871	38 40 20.667	253 48 15.36	73 52 41.98	Minoma	4.0307393	10,733.45	35,214.7						
	90 23 51.215	306 20 05.64	126 24 32.37	Insane asylum	4.1082752	12,831.43	42,097.8						
		341 07 09.36	161 09 52.47	Kleinschmidt	4.2918171	19,580.20	64,239.4						
Patterson, 1873	38 27 52.592	70 10 17.70	250 02 50.08	Lynch	4.2688607	18,572.09	60,931.9						
	90 32 00.587	207 08 34.64	27 13 39.74	Morgan	4.4138228	26,931.21	85,076.0						
		235 04 17.15	55 13 48.15	Insane asylum	4.4321786	27,050.71	88,748.9						
		255 56 05.99	76 03 53.27	Kleinschmidt	4.2731388	18,755.94	61,535.1						
Kessler, 1871	38 36 33.931	244 45 38.90	64 52 02.76	Morgan	4.2156106	16,428.98	53,900.7						
	90 34 05.948	271 18 49.41	91 29 39.53	Insane asylum	4.4017095	25,217.94	82,735.9						
		349 17 36.52	169 18 54.62	Patterson	4.2137685	16,359.44	53,672.6						

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Tavern Rock, 1873.....	38	36	19.060	256	20	25.03	76	33	43.19	Morgan.....	4.5024302	31,800.23	104,331.3
	90	45	09.479	268	18	23.37	88	25	17.40	Kessler.....	4.2057803	16,061.29	52,694.4
				309	11	29.68	129	19	41.15	Patterson.....	4.3922954	24,677.17	80,961.7
				355	35	48.99	175	39	31.84	Lynch.....	4.3423963	21,998.66	72,173.9
				44	34	57.11	224	28	33.66	Halleck.....	4.3274855	21,256.20	69,738.0
			59	47	57.73	239	36	22.03	Peters.....	4.4959062	31,326.24	102,776.2	
			83	28	56.80	263	21	45.99	Dieckhaus.....	4.2258926	16,822.58	55,192.1	
Ganahl, 1931.....	38	36	35.336	244	57	09.52	65	03	34.35	Morgan.....	4.2160172	16,444.37	53,951.2
	90	34	07.492	319	15	14.88	139	15	15.85	Kessler.....	1.7575479	57.22	187.7
				349	11	35.49	169	12	54.56	Patterson.....	4.2150822	16,409.00	53,835.2
Kleinschmidt 2, 1931.....	38	30	19.847	337	54	21.38	157	57	40.92	Johanna.....	4.3167168	20,735.61	68,030.1
	90	19	29.616	25	19	20.47	205	15	23.37	Engle.....	4.3358355	21,668.83	71,091.8
				39	15		219	15		Kleinschmidt.....	0.586137	3.856	12.65
				49	14	45.13	229	08	45.73	Four Ridge.....	4.2675123	18,514.51	60,743.0
				76	03	27.93	255	55	40.59	Patterson.....	4.2732103	18,759.03	61,545.3
<i>Supplementary points</i>													
Base 1 (Kans.), 1885 ¹	38	59	27.62	345	31	14	165	33	21	Berry.....	4.290854	19,536.8	64,097
	94	36	56.18	88	17	01	268	14	56	Marty.....	3.680168	4,788.2	15,709
Base 2 (Kans.), 1885 ¹	38	59	18.82	196	43	06	18	43	08	Base 1.....	2.457094	286.5	940
	94	37	00.00										
State line 2 (Kans.), 1885 ¹	38	59	09.48	110	31	45	290	31	25	Base 2.....	2.914843	821.9	2,697
	94	36	28.02	129	32	32	309	32	14	Base 1.....	2.943949	878.9	2,884
State line 1 (Kans.), 1885 ¹	38	53	01.94	328	59	26	149	01	16	Berry.....	3.913528	8,194.6	26,885
	94	36	28.60	22	47	35	202	44	41	Haskin.....	4.238778	17,329.2	56,854
Belton, South Methodist Church, spire, 1885.....	38	48	32.894	116	55	47.2	296	54	42.1	Berry.....	3.448526	2,808.8	9,215
	94	31	49.890	233	29	49.4	53	34	56.9	Bowler.....	4.167357	14,701.3	48,233
				313	19	23.4	133	27	41.0	Fulton.....	4.422337	26,444.6	86,760
State line 3 (Kans.), stake, 1885.....	38	46	20.907	61	36	42.3	241	33	49.2	Haskin.....	3.880374	7,592.3	24,909
	94	36	30.107	167	20	53.0	347	18	31.7	Marty.....	4.392888	24,716.6	81,091
				218	32	19.3	38	34	09.8	Berry.....	3.834460	6,830.6	22,410

Harrisonville, Cumberland Presbyterian Church, spire, 1885.....	38	39	15.063	135	30	37.1	315	22	45.9	Berry.....	4.413701	25,923.9	85,052
	94	21	00.634	171	35	56.4	351	34	16.9	Bowler.....	4.418630	26,210.8	86,023
				285	15	52.1	105	17	23.5	Fulton.....	3.564271	3,666.7	12,030
Westport, College of Redemptorist Fathers, 1884.....	39	04	01.682	319	41	24.9	139	48	45.2	Bowler.....	4.416280	26,078.3	85,559
	94	35	19.556	354	40	08.8	174	41	15.4	Berry.....	4.439136	27,487.6	90,182
				39	36	40.8	219	33	34.8	Marty.....	4.047433	11,154.1	36,595
Independence, courthouse, high cupola or tower, 1884.....	39	05	32.874	355	15	59.1	175	16	48.2	Bowler.....	4.357819	22,793.9	74,783
	94	24	57.620	62	44	19.2	242	34	41.4	Marty.....	4.395127	24,838.6	81,491
Kansas City, Catholic Cathedral, Eleventh Street between Broadway and Washington, 1884.....	39	06	03.255	273	31	38.3	93	38	11.1	Independence, courthouse, high cupola or tower.....	4.175981	14,996.2	49,200
	94	35	20.444	324	26	48.4	144	34	09.4	Bowler.....	4.463162	29,051.1	95,312
				29	52	35.5	209	49	29.9	Marty.....	4.153314	14,233.6	46,698
Kansas City, Second Presbyterian Church, spire, 1885.....	39	05	55.948	272	41	55.2	92	48	23.5	Independence, courthouse, high cupola or tower.....	4.170736	14,816.2	48,609
	94	35	13.450	30	55	27.5	210	52	17.5	Marty.....	4.149965	14,124.2	46,339
				80	13	08.5	259	57	27.5	Eckman.....	4.561487	36,432.3	119,528
Kansas City, astronomical station, 1882.....	39	05	50.54										
94	35	22.16											
Missouri-Kansas State line 1, stone 1885. ¹	38	53	01.70	117	32	4	297	32	54	State line 1.....	1.19931	15.82	51.9
94	36	28.11											
Missouri-Kansas State line 2, stone, 1884 ¹	38	59	09.57	11	08	31	191	08	31	State line 2.....	0.4617	2.90	9.5
94	36	27.99											
Missouri-Kansas State line 3, stone, 1885 ¹	38	46	03.00	179	59	23	359	59	23	State line 3, stake.....	2.74207	552.16	1,811.5
94	36	30.10											
Raymore Hill, Butler's barn, 1883 ¹	38	46	46.67	195	51	14	15	52	42	Bowler.....	4.096482	12,487.7	40,970
	94	26	01.12	249	17	06	69	24	08	Thornton.....	4.240044	17,379.8	57,020
Lee's Summit, South Methodist Church, cupola, 1883. ¹	38	54	43.71	307	24	06	127	28	58	Thornton.....	4.149571	14,111.4	46,297
	94	22	31.90	31	09	09	21	08	26	Bowler.....	3.498682	3,152.7	10,343
Austin, Methodist Church, spire, 1883 ¹	38	30	09.14	176	26	42	356	26	17	Fulton.....	4.201342	15,898.0	52,159
	94	17	53.60	243	56	46	64	01	10	Hutton Mound.....	4.057458	11,414.5	37,449
Staley Mound, 1883.....	38	42	15.528	165	06	11.7	345	04	31.6	Thornton.....	4.175999	14,996.8	49,202
	94	12	07.285	241	27	44.7	61	32	41.4	Baker.....	4.115013	13,032.1	42,756
				353	52	06.8	173	52	54.9	Hutton Mound.....	4.242818	17,491.1	57,385
Gunn City Flour Mill, 1883 ¹	38	39	58.48	79	38	28	259	33	04	Fulton.....	4.105980	12,763.8	41,876
	94	09	55.17	218	19	33	38	23	07	Baker.....	4.124432	13,317.8	43,693
Hicks City Christian Union Church, spire, 1883. ¹	38	53	31.11	246	15	23	66	17	43	Chapel Hill.....	3.766764	5,844.7	19,175
	94	07	10.66	60	05	36	240	00	49	Thornton.....	4.103842	12,701.1	41,670

¹ No check on this position.

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Kingsville Public School, 1883.....	38 44 36.740	23 15 43.4	203 11 42.4	Hutton Mound.....	4.374086	23,663.9	77,637						
	94 04 24.202	62 09 31.6	242 00 40.1	Fulton.....	4.366440	23,250.9	76,282						
Holden Methodist Church, spire, 1883.....	38 42 56.239	164 55 11.4	344 52 37.7	Baker.....	3.274728	1,882.5	6,176						
	93 59 23.333	257 27 57.9	77 37 25.4	Chapel Hill.....	4.356268	22,712.7	74,517						
Centerview, Cumberland Presbyterian Church, cupola, 1883. ¹	38 44 32.77	95 51 17	275 42 49	Normal.....	4.350843	22,430.7	73,591						
	93 50 41.36	135 44 47	315 36 46	Caldwell.....	4.416700	26,103.6	85,642						
Hazel Hill, 1882. ¹	38 53 42.22	307 05 22	127 12 53	Knob Noster.....	4.294513	19,702.1	64,639						
	93 45 06.97	355 22 40	175 23 11	Normal.....	4.423070	26,489.3	86,907						
Warrensburg Presbyterian Church, spire, 1883.	38 45 52.811	4 10 08.7	184 09 27.6	Caldwell.....	4.338125	21,783.4	71,468						
	93 44 16.799	89 08 49.7	268 56 20.7	Baker.....	4.179859	15,130.7	49,641						
Cooks Knob ice house, 1882. ¹	38 51 57.28	13 02 52	193 01 53	Knob Noster.....	4.339823	21,868.7	71,748						
	93 31 31.88	57 21 36	237 13 37	Baker.....	4.460708	28,887.4	94,775						
Windsor Public School, flagstaff, 1882. ¹	38 31 44.26	102 16 22	282 07 43	Knob Noster.....	4.210064	16,220.5	53,217						
	93 31 30.90	142 00 26	321 58 40	Normal.....	4.007849	10,182.4	33,407						
Shoemaker's house, cupola, lightning rod, 1882. ¹	38 44 19.40	147 17 34	327 16 24	Normal.....	4.340897	21,922.8	71,925						
	93 31 15.39	318 31 03	138 34 20	Caldwell.....	4.313916	20,602.3	67,593						
Tomlin's house, southeast chimney, 1882. ¹	38 37 55.27	55 45 35	235 41 41	High Point Tebo.....	3.823366	6,658.3	21,845						
	93 28 04.62	223 23 45	43 25 04	Knob Noster.....	3.698194	4,991.1	16,375						
Lamonte, Campbellite Church, spire, 1882. ¹	38 46 39.48	3 44 05	183 43 43	Kendrick.....	4.061958	11,533.4	37,839						
	93 25 24.42	89 25 24	269 20 34	High Point Tebo.....	4.041320	10,998.2	36,083						
Green Ridge Congregational Church, chimney, 1882. ¹	38 37 04.26	72 03 04	251 56 57	Kendrick.....	3.644047	4,406.0	14,455						
	93 24 32.57	156 15 28	336 14 34	Kendrick.....	4.113645	12,991.1	42,622						
Sedalia, church, spire, 1880.....	38 42 22.015	238 13 06.9	58 13 51.4	Knob Noster.....	4.048040	11,169.7	36,646						
	93 13 37.451	276 12 20.2	96 25 59.5	High Point Tebo.....	4.174720	14,952.7	49,057						
Jefferson City Capitol, rod on dome, 1879. ¹	38 34 47.04	113 57 33	293 51 23	Kendrick.....	3.717294	5,215.5	17,111						
	92 10 20.41	225 47 25	45 48 28	Heard.....	3.305503	2,020.7	6,630						
Tipton, church spire, 1879.....	38 39 18.000	278 37 59.0	98 46 36.6	Hubbard.....	4.503367	31,868.9	104,557						
	92 46 39.577	359 09 32.8	179 09 42.1	Hughes.....	4.600473	39,864.1	130,755						
Hunter latitude, 1880. ¹	38 25 45.313	270 00 00	90 00 00	Medlock.....	4.195800	15,696.4	51,497						
	92 46 24.681			Cedar.....	3.531760	3,402.2	11,162						
California, church, spire, 1879.....	38 38 00.706	5 20 56.2	185 20 18.2	Christian.....	4.307177	20,285.1	66,552						
	92 33 58.874	38 35 50.1	116 46 23.1	Cole.....	3.688025	4,875.6	15,996						
Jefferson City astronomic, 1879. ¹	38 33 41.22	157 26 07	337 25 45	Hunter.....	4.399039	25,063.3	82,229						
	92 09 45.57	199 55 40	19 56 21	Hunter.....	0.808211	6.43	21.1						
Koeltztown, spire, 1879.....	38 19 31.495	119 53 01.5	299 51 00.7	High Point.....	4.199539	15,832.1	51,942						
	92 02 29.494	221 56 59.4	42 02 43.4	Hunter.....	4.462210	28,987.4	95,103						
L'Ours Creek, spire, 1879. ¹	38 30 35.15	35 53 44	215 48 16	Cole.....	4.147560	14,046.2	46,083						
	91 56 55.56	112 46 53	292 32 22	Jefferson City Capitol.....	3.341931	2,197.5	7,210						
Doermann Hill, 1878.....	38 30 19.369	61 20 00.9	241 24 06.6	Cedar.....	3.670400	4,681.7	15,360						
	91 27 55.970	124 11 48.5	314 07 35.4	Kennedy.....	3.736697	5,453.8	17,893						
St. Gertrude's Church, 1874.....	38 29 50.164	71 13 38.4	251 05 26.8	McDaniel.....	4.302975	20,089.8	65,911						
	91 02 59.845	118 25 46.9	298 16 45.9	Pilot Knob.....	4.327600	21,251.8	69,756						
Dutzow Catholic Church, east gable, 1874. ¹	38 35 33.04	278 19 13	98 20 42	Kennedy.....	4.340346	21,895.1	71,834						
	90 59 03.32	25 29 45	205 26 49	Medlock.....	4.564318	36,670.6	120,310						
Polemann's house, 1874. ¹	38 28 33.17	189 28 17	9 29 10	Geyer.....	4.115649	13,051.2	42,819						
	90 58 05.81	281 24 32	101 26 12	Turnpike Bluff.....	4.136967	13,707.8	44,973						
Corner fifth meridian, 1874. ¹	38 28 37.92	60 55 16	240 55 09	Gasconade.....	3.985993	9,682.6	31,757						
	90 57 54.95			Jacobs.....	4.306262	20,242.4	66,412						
Northwest corner 36, 1874. ¹	38 36 28.42	24 50 30	204 50 27	Berger.....	4.378192	23,888.7	78,375						
	90 45 03.96			Enoch Knob.....	4.070577	11,764.6	38,598						
St. Louis, tower, corner Grand Street and LaFayette Avenue, 1871.	38 36 58.723	285 35 20.1	105 41 38.2	Dieckhaus.....	3.544568	3,504.0	11,496						
	90 14 18.719	344 37 36.8	164 39 06.8	Peters.....	4.202305	15,933.3	52,275						
St. Louis, church, corner Smith Street and Ballas Road, 1871.	38 37 57.583	222 00 00.2	42 01 42.8	Dieckhaus.....	4.100741	12,610.8	41,374						
	90 26 35.608	258 20 20.4	78 29 08.5	Halleck.....	3.599682	3,978.2	13,052						
Jefferson City Capitol, rod on dome, 1879. ¹	38 34 47.04	113 57 33	293 51 23	Polemann's house.....	2.479014	301.31	988.5						
	92 10 20.41	225 47 25	45 48 28	Tavern Rock.....	2.502310	317.91	1,043.0						
Tipton, church spire, 1879.....	38 39 18.000	278 37 59.0	98 46 36.6	Clarks Mound.....	4.182704	15,230.1	49,967						
	92 46 39.577	359 09 32.8	179 09 42.1	Dreyer.....	4.120359	13,193.5	43,286						
Hunter latitude, 1880. ¹	38 25 45.313	270 00 00	90 00 00	Insane asylum.....	3.577374	3,779.0	12,398						
	92 46 24.681			Morgan.....	3.773723	5,939.1	19,485						
California, church, spire, 1879.....	38 38 00.706	5 20 56.2	185 20 18.2	Standpipe.....	4.319453	20,866.7	68,460						
	92 33 58.874	38 35 50.1	116 46 23.1	Insane asylum.....	4.166259	14,664.2	48,111						

¹ No check on this position.

Station	Latitude and longitude			Azimuth	Back Azimuth	To station	Distance		
							Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>									
St. Louis, church, corner Manchester and Ballas Roads, 1871.	38 36 13.242	207 42 42.1	27 44 25.6	Morgan.....	3.935457	8,619.0	28,278		
	90 26 37.015	250 02 22.9	70 11 11.7	Standpipe.....	4.338022	21,778.2	71,451		
St. Louis, Centenary Methodist Church, 1871.	38 38 11.613	183 53 28.0	3 53 34.7	Insane asylum.....	4.156806	14,348.5	47,075		
	90 12 40.838	355 41 53.5	175 42 22.4	Standpipe.....	3.575983	3,766.9	12,359		
		58 20 48.3	238 18 16.5	Dreyer.....	4.176348	15,008.9	49,242		
St. Louis, Holy Cross Church, 1871.....	38 35 22.802	274 42 53.1	94 48 47.3	Insane asylum.....	3.839665	6,913.0	22,680		
	90 13 40.545	345 14 05.4	165 15 11.6	Clarks Mound.....	4.139644	13,792.5	45,251		
		42 10 16.7	222 06 39.2	Dreyer.....	4.004075	10,094.3	33,118		
St. Louis, St. Francis Church, 1871.....	38 34 48.715	127 24 55.6	307 23 27.1	Kleinschmidt.....	4.100446	12,602.2	41,346		
	90 14 22.105	195 06 28.0	15 07 37.9	Insane asylum.....	3.635874	4,323.9	14,186		
		337 39 25.6	157 40 57.6	Standpipe.....	4.015927	10,373.5	34,034		
Centerville, church, spire (Ill.), 1871.....	38 27 35.445	116 56 37.1	296 52 42.0	Dreyer.....	3.973887	9,416.4	30,804		
	90 05 36.464	188 41 39.0	8 42 31.2	Clarks Mound.....	4.011671	10,272.4	33,702		
		263 48 39.7	83 55 43.0	Turkey Hill.....	4.127742	13,419.7	44,028		
St. Louis, First Presbyterian Church, 1871.....	38 37 53.080	170 25 53.5	350 25 34.6	Insane asylum.....	4.219840	16,589.8	54,428		
	90 12 00.074	297 01 35.6	117 06 27.2	Standpipe.....	3.642542	4,390.8	14,405		
		66 01 31.3	245 58 34.0	Clarks Mound.....	4.103834	12,700.9	41,670		
St. Louis, Bohemian Church, 1871.....	38 36 44.527	177 31 45.5	357 31 38.3	Insane asylum.....	3.876204	7,519.8	24,671		
	90 12 18.763	287 15 52.6	107 20 55.8	Standpipe.....	3.809527	6,449.5	21,160		
		81 39 02.2	261 36 16.6	Clarks Mound.....	4.090662	12,321.5	40,425		
St. Louis, Marine Hospital, 1871.....	38 35 12.933	273 38 38.2	93 44 14.2	Insane asylum.....	3.812078	6,487.5	21,284		
	90 13 11.455	348 49 41.1	168 50 29.1	Clarks Mound.....	4.116213	13,068.1	42,874		
		110 05 23.4	290 03 10.8	Dreyer.....	3.984054	9,639.5	31,626		
St. Louis, Sacred Heart Convent, 1871.....	38 34 43.811	193 30 55.2	13 31 58.3	Insane asylum.....	3.738546	5,477.0	17,969		
	90 14 11.342	338 48 15.3	158 49 40.6	Standpipe.....	4.019351	10,455.6	34,303		
		126 56 37.9	306 55 02.6	Dreyer.....	3.962814	9,179.4	30,116		
				Insane asylum.....	3.664905	4,622.8	15,167		
St. Louis, standpipe, 1871.....	38 40 13.493	309 58 51.8	130 04 02.4	Clarks Mound.....	4.196421	15,718.9	51,571		
	90 12 30.264	357 20 27.8	177 20 50.1	Dreyer.....	4.272885	18,745.0	61,499		
		39 44 23.3	219 41 44.8	Insane asylum.....	3.982495	9,604.9	31,512		
		90 49 44.6	270 42 39.0	Morgan.....	4.216511	16,463.1	54,013		
St. Louis, St. John's Church, 1871.....	38 38 08.386	295 35 17.5	115 40 53.5	Clarks Mound.....	4.159846	14,449.3	47,406		
	90 13 11.059	352 52 33.5	172 53 21.3	Dreyer.....	4.175587	14,982.6	49,155		
		55 35 55.0	235 33 42.1	Insane asylum.....	3.795584	6,245.7	20,491		
St. Louis, Second Presbyterian Church, spire, 1871.	38 37 56.114	174 53 14.5	354 53 04.7	Standpipe.....	3.628698	4,253.0	13,953		
	90 12 14.586	296 41 23.2	116 46 23.9	Clarks Mound.....	4.115821	13,056.3	42,836		
		64 13 02.1	244 10 13.9	Insane asylum.....	3.859775	7,240.6	23,755		
St. Louis, courthouse, 1871.....	38 37 32.318	161 24 03.8	341 23 20.6	Standpipe.....	3.719655	5,243.9	17,204		
	90 11 21.079	296 19 54.9	116 24 22.2	Clarks Mound.....	4.063357	11,570.6	37,961		
		72 49 49.4	252 46 27.8	Insane asylum.....	3.912700	8,179.0	26,834		
St. Louis, U.S. Veterans' Hospital, water tank, 1931.	38 29 39.623	81 35 05.4	261 25 38.1	Patterson.....	4.349150	22,343.4	73,305		
	90 16 48.892	107 37 40.7	287 36 00.7	Kleinschmidt.....	3.611590	4,088.7	13,414		
		152 41 30.0	332 37 06.6	Morgan.....	4.347390	22,253.1	73,009		
St. Louis, International Shoe Co., smoke-stack, 1931.	38 35 26.320	45 02 46.0	224 58 42.6	Kleinschmidt.....	4.126176	13,371.4	43,869		
	90 12 59.186	63 15 29.7	243 03 38.7	Patterson.....	4.491165	30,986.0	101,660		
		119 58 36.2	299 51 49.1	Morgan.....	4.250984	18,196.3	59,699		
St. Louis, Continental Life Ins. Co., beacon, 1931	38 38 18.537	28 37 27.2	208 33 59.9	Kleinschmidt.....	4.225677	16,814.2	55,165		
	90 13 57.276	83 54 04.8	263 41 29.3	Ganahl.....	4.469054	29,447.9	96,614		
		104 44 42.4	284 38 31.4	Morgan.....	4.171634	14,846.8	48,710		
Creve Coeur Lake, lookout tower, 1931 ¹	38 42 56.506	34 40 57.2	214 37 27.2	Ganahl.....	4.154973	14,288.1	46,877		
	90 28 31.460	105 44 08.0	285 34 00.4	Orf.....	4.386468	24,348.3	79,883		
		211 42 18.2	31 43 31.8	Yosti.....	3.732528	5,401.7	17,722		
Florissant, tall black water tank, 1931 ¹	38 48 08.155	52 49 41.8	232 46 50.4	Yosti.....	3.918840	8,295.5	27,216		
	90 22 00.130	155 14 54.2	335 10 28.6	Sancamper.....	4.385779	24,308.7	79,756		
		211 12 31.9	31 14 19.6	Commerce (Mo.R.C.).....	3.902668	7,992.2	26,221		
St. Charles, Catholic Church, spire, 1931 ¹	38 46 59.809	168 12 50.9	348 10 52.8	Thompson (M.R.C.).....	4.345490	22,155.9	72,690		
	90 29 19.052	306 05 02.3	126 06 45.7	Yosti.....	3.693257	4,934.7	16,190		
		17 34 31.0	197 32 53.5	Howard (Mo.R.C.).....	4.096195	12,479.4	40,943		
Aviation beacon, 1931 ¹	38 46 20.243	284 06 31.0	104 09 24.8	Yosti.....	3.839502	6,910.4	22,672		
	90 31 11.452	13 17 17.6	193 15 27.6	Ganahl.....	4.267895	18,530.8	60,796		
		90 54 31.0	270 46 03.1	Orf.....	4.291724	19,576.0	64,226		
St. Peters, All Saints Catholic Church, spire, 1931 ¹	38 47 51.69	346 03 37	166 05 51	Ganahl.....	4.332173	21,486.9	70,493		
	90 37 41.43	76 01 55	255 57 31	Orf.....	4.019923	10,469.4	34,348		

¹ No check on this position.
² This position was added in proof and is out of place. It belongs on p. 36.

Mississippi River arc, first-order triangulation

Station	Latitude and longitude	Azimuth	Back Azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
<i>Principal points</i>							
Prairie (southwest base), 1929	38 46 47.896 89 23 03.322						
Chalk (Ky.), 1929	36 43 51.480 89 07 03.367	102 56 38.87	282 47 04.43	Prairie (southwest base)	4.3878303	24,424.76	80,133.6
Williams (northeast base), 1929	36 53 08.546 89 15 09.555	324 53 50.08 45 03 16.88	144 58 41.37 224 58 32.86	Chalk Prairie (southwest base)	4.3217812 4.2200667	20,975.83 16,598.418	68,828.0 54,456.64
Mathis (Ky.), 1929	36 51 35.074 89 05 58.407	0 26 07.27 70 52 19.68 101 57 53.96	186 25 28.36 250 42 05.44 281 52 23.25	Chalk Prairie (southwest base) Williams (northeast base)	4.1577858 4.4297535 4.1446112	14,380.89 26,900.07 13,951.19	47,181.3 88,254.6 45,771.5
Big Lake, 1929	36 59 01.276 89 15 25.093	314 23 32.77 357 58 24.15	134 29 13.19 177 58 33.49	Mathis Williams (northeast base)	4.2932515 4.0366316	19,044.98 10,880.07	64,451.9 35,695.7
Wickliffe (Ky.), 1929	36 58 12.179 89 05 16.939	4 47 48.59 57 30 18.69 95 47 47.24	184 47 23.68 237 24 22.64 275 41 41.44	Mathis Williams (northeast base) Big Lake	4.0893430 4.2405231 4.1794876	12,284.09 17,398.95 15,117.77	40,302.1 57,083.1 49,596.9
Cairo (Ill.), 1929	37 03 18.608 89 11 14.243	316 53 25.24 38 02 08.60	136 57 00.34 217 59 37.57	Wickliffe Big Lake	4.1116909 4.0029733	12,932.75 10,068.70	42,430.2 33,033.7
Barlow (Ky.), 1929	37 03 09.566 89 02 52.190	21 20 08.12 67 42 31.30 91 19 45.19	201 18 40.99 247 34 58.00 271 14 42.67	Wickliffe Big Lake Cairo	3.9930430 4.3037196 4.0937078	9,841.09 20,124.25 12,408.17	32,287.0 66,024.3 40,709.1
Larrison (Ill.), 1930	37 07 30.710 89 15 27.592	293 16 37.05 321 08 27.15 359 46 28.19	113 24 12.60 141 10 59.94 179 46 29.70	Barlow Cairo Big Lake	4.3079045 3.9990104 4.1960178	20,319.10 9,977.24 15,704.27	66,663.6 32,733.7 51,523.1
Allen (Ill.), 1930	37 18 31.934 89 18 30.182	320 47 05.13 347 31 50.07	140 56 32.00 167 33 40.51	Barlow Larrison	4.5641767 4.3196289	36,658.67 20,875.12	120,271.0 68,487.8
Levings (Ill.), 1930	37 13 03.140 89 03 47.773	355 42 27.20 59 21 59.74 115 04 03.72	175 43 00.76 239 14 56.91 294 55 09.44	Barlow Larrison Allen	4.2639250 4.3027040 4.3800222	18,349.53 20,077.24 23,989.56	60,201.7 65,870.1 78,705.7
Adams (Ill.), 1930	37 24 25.544 89 02 33.678	4 57 46.61 65 13 53.08	184 57 01.70 245 04 12.68	Levings Allen	4.3246145 4.4139646	21,116.14 25,940.87	69,278.5 85,107.7
Atwood (Ill.), 1930	37 25 32.346 89 19 52.796	274 31 12.38 314 06 25.35 351 04 43.80	94 41 43.75 134 16 10.43 171 05 33.94	Adams Levings Allen	4.4068390 4.5203023 4.1179028	25,635.34 33,136.17 13,119.06	84,105.3 108,714.2 43,041.4
Bald Knob (Ill.), 1930	37 33 06.518 89 20 45.959	300 48 23.46 354 39 58.90	120 59 28.09 174 40 31.26	Adams Atwood	4.4952131 4.1480612	31,276.14 14,062.46	102,611.8 46,136.6
Hines (Ill.), 1930	37 34 06.967 89 04 32.933	350 42 25.61 55 00 13.13 85 37 13.27	170 43 36.19 234 50 53.24 265 27 20.12	Adams Atwood Bald Knob	4.2691762 4.4410540 4.3793790	18,162.52 27,609.21 23,954.06	59,588.2 90,581.2 78,589.3
Farmer (Ill.), 1930	37 46 10.584 89 10 09.971	339 39 14.76 32 52 15.63	159 42 40.72 212 45 47.05	Hines Bald Knob	4.3763787 4.4588354	23,789.14 28,763.08	78,048.2 94,366.9
Levan (Ill.), 1930	37 49 20.722 89 27 03.266	283 13 02.50 310 18 05.51 342 51 34.39	103 23 23.50 130 31 51.19 162 55 25.05	Farmer Hines Bald Knob	4.4061115 4.6380029 4.4972794	25,474.84 43,451.31 31,425.30	83,678.7 142,556.5 103,101.2
Barnes, 1929	36 40 24.021 89 24 16.178	188 40 49.87 255 54 28.88	8 41 33.44 76 04 46.15	Prairie Chalk	4.0781027 4.4219680	11,970.23 26,422.14	39,272.3 86,686.6
Hickman (Ky.), 1929	36 34 16.809 89 11 05.279	120 00 22.64 142 27 33.91 198 43 02.27	299 52 30.84 322 20 25.04 18 45 26.68	Barnes Prairie Chalk	4.3556197 4.4637053 4.2719660	22,078.78 29,221.69 18,705.36	74,405.3 95,871.5 61,369.2
Madrid, 1929	36 34 53.963 89 33 06.350	232 22 47.55 271 53 04.11	52 28 05.05 92 06 12.52	Barnes Hickman	4.2222875 4.5173911	16,883.51 32,914.79	54,735.8 107,967.9
Fishgap (Tenn.), 1929	36 29 05.196 89 17 12.659	114 24 39.36 153 19 21.99 223 32 49.88	294 15 10.45 333 15 09.60 43 36 28.55	Madrid Barnes Hickman	4.4165036 4.3696644 4.1225005	26,091.77 23,424.18 13,258.69	85,602.7 76,850.8 43,499.6
Pleasant, 1929	36 27 15.909 89 34 23.050	187 29 35.23 262 26 02.77	7 30 19.68 82 36 15.23	Madrid Fishgap	4.1535352 4.4128569	14,240.83 25,873.60	46,721.8 84,867.0
Chigger (Tenn.), 1929	36 23 12.178 89 20 05.513	109 26 43.20 138 03 03.81 201 34 22.79	289 18 14.07 317 55 18.33 21 36 05.45	Pleasant Madrid Fishgap	4.3549868 4.4641075 4.0682600	22,645.76 29,114.38 11,702.00	74,297.0 95,519.4 38,392.3
Stewart, 1929	36 19 38.924 89 38 24.107	203 04 42.39 256 24 54.44	23 07 05.41 76 35 45.71	Pleasant Chigger	4.1850711 4.4497643	15,313.38 28,168.54	50,240.6 92,416.3
Gratio (Tenn.), 1929	36 16 09.160 89 24 56.712	107 51 34.96 145 33 21.91 209 05 44.62	287 43 36.99 325 27 46.14 29 08 37.13	Stewart Pleasant Chigger	4.3254685 4.3967946 4.1739171	21,157.70 24,934.15 14,925.10	69,414.9 81,804.8 48,966.8
Caruthers, 1929	36 11 46.597 89 39 50.218	188 23 31.71 249 59 27.90	8 24 22.64 70 08 16.02	Stewart Gratio	4.1677938 4.3753918	14,716.14 23,735.14	48,281.2 77,871.0

Mississippi River arc, first-order triangulation—Continued

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Obion (Tenn.), 1929	36	06	45.761	121	03	20.29	300	57	16.15	Caruthers	4.2552868	18,000.59	59,056.9
	89	29	32.999	150	56	29.26	330	51	15.43	Stewart	4.4357465	27,273.86	89,481.0
				201	39	23.82	21	42	06.96	Gratio	4.2715392	18,686.98	61,308.9
Cotton, 1929	36	03	35.044	189	46	17.52	9	47	19.10	Caruthers	4.1867869	15,374.00	50,439.5
	89	41	34.656	251	54	25.71	72	01	30.77	Obion	4.2784740	18,987.77	62,295.7
Head (Tenn.), 1929	36	03	33.706	90	11	33.72	270	04	44.91	Cotton	4.2400923	17,381.70	57,026.5
	89	30	00.146	135	53	01.61	315	47	13.71	Caruthers	4.3258828	21,177.60	69,481.2
				186	32	35.72	6	32	51.71	Obion	3.7751211	5,958.28	19,548.1
School (Ark.), 1929	35	56	39.824	195	39	27.64	15	40	51.89	Cotton	4.1235752	13,291.54	43,607.3
	89	43	57.900	238	38	10.05	58	46	22.54	Head	4.3901802	24,557.28	80,568.3
Miles (Ill.), 1931	37	47	24.801	234	25	23.68	54	27	28.97	Levan	3.7885606	6,145.55	20,162.5
	89	30	27.639	331	38	16.11	151	44	11.59	Bald Knob	4.4779370	30,056.40	98,610.0
Fountain Bluff (M.R.C.) (Ill.), 1880	37	41	36.692	176	14	31.76	356	14	14.12	Miles	4.0316293	10,755.47	35,286.9
	89	29	58.830	196	42	18.37	16	44	05.88	Levan	4.1742858	14,937.77	49,008.3
				319	11	29.79	139	17	07.29	Bald Knob	4.3173424	20,765.50	68,128.1
Frohna, 1931	37	38	21.052	210	21	48.17	30	25	53.79	Miles	4.2885970	19,435.56	63,764.8
	89	37	09.159	240	11	55.89	60	16	18.85	Fountain Bluff (M.R.C.)	4.0845643	12,149.66	39,861.0
				291	49	06.23	111	59	06.06	Bald Knob	4.4149071	25,996.04	85,288.7
U.S.G.S. 15, 1931	37	42	55.643	247	12	36.82	67	20	52.45	Miles	4.3321250	21,484.49	70,487.0
	89	43	57.161	310	13	14.53	130	17	23.90	Frohna	4.1172951	13,100.72	42,981.3
Degonia (Ill.), 1931	37	51	02.145	301	24	55.78	121	29	30.43	Miles	4.1086202	12,841.63	42,131.2
	89	37	55.540	357	13	31.67	177	14	00.06	Frohna	4.3709238	23,492.21	77,074.0
				30	34	11.47	210	30	29.92	U.S.G.S. 15	4.2409200	17,414.86	57,135.3
Dowl, 1931	37	48	35.037	259	10	15.55	79	20	14.92	Degonia	4.3860535	24,325.04	79,806.4
	89	54	12.797	304	43	23.98	124	49	40.99	U.S.G.S. 15	4.2635309	18,345.56	60,188.7
Chester (Ill.), 1931	37	54	08.868	289	58	31.32	110	05	08.01	Degonia	4.2255002	16,807.39	55,142.2
	89	48	41.659	341	26	23.86	161	29	18.27	U.S.G.S. 15	4.3402777	21,891.61	71,822.7
				38	12	49.42	218	09	26.21	Dowl	4.1170831	13,094.33	42,960.3

U.S. COAST AND GEODETIC SURVEY

08207°-14-11

Scheltgen (Ill.), 1931	37	58	20.126	320	07	17.76	140	10	00.58	Chester	4.0039436	10,091.22	33,107.6
	89	53	06.492	5	08	15.99	185	07	35.27	Dowl	4.2579556	18,111.55	59,421.0
Geiler, 1931	37	55	08.131	248	19	53.16	68	26	09.37	Scheltgen	4.2059748	16,068.48	52,718.0
	90	03	18.307	274	48	07.13	94	57	05.77	Chester	4.3322898	21,492.64	70,513.8
				312	13	16.94	132	18	51.77	Dowl	4.2557283	18,018.90	59,117.0
Moore (Ill.), 1931	38	03	40.906	311	37	57.02	131	42	37.57	Scheltgen	4.1724769	14,875.68	48,804.6
	90	00	42.020	13	34	31.52	193	32	55.32	Geiler	4.2112050	16,263.16	53,356.7
Wilder, 1931	38	00	15.005	241	34	34.71	61	39	31.54	Moore	4.1256404	13,354.89	43,815.2
	90	08	43.803	278	43	20.60	98	52	57.51	Scheltgen	4.3644622	23,145.27	75,935.8
				319	56	53.86	140	00	14.08	Geiler	4.0918520	12,355.26	40,535.5
Renault (Ill.), 1931	38	09	38.362	315	59	52.60	136	04	21.90	Moore	4.1850356	15,312.13	50,236.5
	90	07	58.357	3	39	08.85	183	38	40.82	Wilder	4.2406686	17,404.78	57,102.2
Holst, 1931	38	04	59.086	234	48	40.45	54	53	50.44	Renault	4.1748754	14,958.07	49,074.0
	90	16	20.493	275	56	06.01	96	05	44.72	Moore	4.3617564	23,001.51	75,464.1
				308	08	49.44	128	13	30.88	Wilder	4.1513012	14,167.76	46,482.1
Schilling (Ill.), 1931	38	13	58.851	323	26	05.35	143	28	36.62	Renault	3.9998700	9,997.01	32,798.5
	90	12	02.988	20	39	49.44	200	37	10.34	Holst	4.2500288	17,783.98	58,346.3
Crystal, 1931	38	12	41.519	260	02	58.61	80	08	46.03	Schilling	4.1419281	13,865.26	45,489.6
	90	21	24.504	285	59	20.22	106	07	38.60	Renault	4.3099616	20,415.57	66,980.1
				332	32	09.98	152	35	17.76	Holst	4.2058832	16,065.09	52,706.9
Rehling (Ill.), 1931	38	18	40.805	320	31	05.91	140	34	08.23	Schilling	4.0515178	11,259.47	36,940.4
	90	16	57.346	30	24	23.09	210	21	37.65	Crystal	4.1086172	12,841.54	42,131.0
Engle, 1931	38	19	44.439	205	15	14.53	25	19	11.56	Kleinschmidt	4.3357605	21,665.09	71,079.5
	90	25	51.185	278	33	27.01	98	38	58.02	Rehling	4.1177889	13,115.62	43,030.2
				297	49	24.03	117	57	57.11	Schilling	4.3574726	22,775.74	74,723.4
				333	32	35.82	153	35	20.99	Crystal	4.1632338	14,562.43	47,776.9
Johanna (Ill.), 1931	38	19	56.614	344	31	50.98	164	33	08.74	Schilling	4.0586162	11,445.01	37,549.2
	90	14	08.501	60	20	08.83	240	18	24.14	Rehling	3.6740167	4,720.81	15,488.2
				88	48	01.63	268	40	45.83	Engle	4.2322667	17,071.30	56,008.1
				119	31	17.69	299	20	11.78	Patterson	4.4752256	29,869.34	97,996.3
				157	57	07.26	337	53	47.65	Kleinschmidt	4.3166781	20,733.76	68,024.0
Four Ridge, 1931	38	23	47.464	150	58	31.32	330	56	43.77	Patterson	3.9367694	8,645.09	28,363.1
	90	29	07.575	229	08	53.19	49	14	52.52	Kleinschmidt	4.2674233	18,510.72	60,730.6
				327	30	54.20	147	32	56.09	Engle	3.9484932	8,881.64	29,139.2
Yosti, 1931	38	45	25.523	337	17	48.46	157	19	30.20	Morgan	4.0061269	10,188.89	33,428.0
	90	26	33.889	33	53	10.60	213	48	27.09	Ganahl	4.2941230	19,684.44	64,581.4
Orf, 1931	38	46	29.528	274	12	02.43	94	23	23.93	Yosti	4.4208002	26,351.19	86,453.9
	90	44	42.306	290	30	53.27	110	43	55.90	Morgan	4.5090920	32,291.78	105,943.9
				320	00	15.20	140	06	32.04	Ganahl	4.3783448	23,897.08	78,402.3

TRIANGULATION IN MISSOURI

Mississippi River arc, first-order triangulation—Continued

Station	Latitude and longitude	Azimuth	Back Azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>							
Sancamper (Ill.), 1931.....	39 00 03.859 90 29 03.104	352 25 21.29 42 06 52.91	172 26 54.95 221 57 03.28	Yosti..... Orf.....	4.4365199 4.5290146	27,322.47 33,807.62	89,640.5 110,917.2
Palmer, 1931.....	38 57 21.623 90 48 22.562	259 44 09.86 304 52 11.98 345 11 16.52	79 56 19.19 125 05 53.01 165 13 34.73	Sancamper..... Yosti..... Orf.....	4.4526123 4.5856152 4.3180118	28,353.87 39,513.70 20,797.53	93,024.3 126,357.0 68,233.2
Snider (Ill.), 1931.....	39 08 04.382 90 38 51.030	316 18 07.19 34 47 18.04	136 24 17.72 214 41 18.01	Sancamper..... Palmer.....	4.3112865 4.3823775	20,477.95 24,120.01	67,184.7 79,133.7
Sealock, 1931.....	39 05 58.126 90 49 16.298	255 24 51.12 290 25 24.85 355 21 20.55	75 31 25.61 110 38 09.20 175 21 54.39	Snider..... Sancamper..... Palmer.....	4.1908274 4.4934778 4.2035727	15,517.70 31,151.42 15,979.85	50,911.0 102,202.6 52,427.2
Gress (Ill.), 1931.....	39 12 20.417 90 39 27.559	353 39 33.36 50 13 32.60	173 39 56.44 230 07 20.88	Snider..... Sealock.....	3.9000466 4.2649882	7,944.13 18,407.22	26,063.4 60,391.0
Annada, 1931.....	39 15 15.594 90 49 38.232	290 11 28.38 310 30 47.14 358 14 37.94	110 17 54.58 130 37 36.14 178 14 51.79	Gress..... Snider..... Sealock.....	4.1934499 4.3106137 4.2355099	15,611.69 20,446.25 17,199.27	51,219.4 67,080.7 56,427.9
Freemeyer (Ill.), 1931.....	39 19 57.723 90 42 03.892	345 06 16.07 348 06 29.78 51 24 40.81	165 07 55.01 168 08 31.76 231 19 53.08	Gress..... Snider..... Annada.....	4.1641168 4.3517821 4.1441693	14,592.07 22,479.26 13,937.00	47,874.1 73,750.7 45,725.0
La Rue, 1931.....	39 22 27.425 90 55 08.281	283 44 28.75 329 16 18.11	103 52 46.13 149 19 47.22	Freemeyer..... Annada.....	4.2864550 4.1899824	19,339.97 15,487.54	63,451.2 50,812.0
Long (Ill.), 1931.....	39 27 59.689 90 51 23.651	317 55 41.14 353 52 38.24 27 41 29.83	138 01 36.43 173 53 45.10 207 39 07.19	Freemeyer..... Annada..... La Rue.....	4.3011991 4.3747236 4.0633387	20,007.79 23,698.65 11,570.14	65,642.2 77,751.3 37,959.7
Louisiana, 1931.....	39 27 47.786 91 04 17.869	268 47 43.49 306 52 34.41	88 55 55.59 126 58 23.39	Long..... La Rue.....	4.2674416 4.2160388	18,511.50 16,445.19	60,733.1 53,953.9
Shinn (Ill.), 1931.....	39 33 48.646 90 55 13.557	332 56 35.57 359 39 20.02 49 29 19.42	152 59 01.86 179 39 23.38 229 23 33.10	Long..... La Rue..... Louisiana.....	4.0821431 4.3224035 4.2333786	12,062.12 21,008.91 17,115.07	39,639.4 68,926.7 56,151.7

Ashburn, 1931.....	39 31 56.004 91 10 32.899	260 55 33.25 310 28 21.80	81 05 18.62 130 32 20.34	Shinn..... Louisiana.....	4.3468249 4.0713468	22,224.14 11,785.47	72,913.7 38,666.2
El Dara (Ill.), 1931.....	39 37 27.816 91 01 25.125	307 17 17.94 13 00 00.74 51 59 47.92	127 21 14.75 192 58 10.76 231 53 58.91	Shinn..... Louisiana..... Ashburn.....	4.0472235 4.2638136 4.2201635	11,148.68 18,357.50 16,602.12	36,577.0 60,227.9 54,468.8
Gibbs, 1931.....	39 35 21.889 91 14 26.873	258 10 03.66 318 38 31.09	78 18 22.04 138 41 00.11	El Dara..... Ashburn.....	4.2798926 3.9271955	19,049.89 8,466.59	62,499.5 27,744.7
Kuhlman (Ill.), 1931.....	39 44 05.445 91 06 51.943	327 33 01.57 13 12 07.84 33 55 34.80	147 36 30.25 193 09 46.90 213 50 44.44	El Dara..... Ashburn..... Gibbs.....	4.1621894 4.3637082 4.2889294	14,527.45 23,105.12 19,450.44	47,662.1 75,804.0 63,813.7
Hannibal, 1931.....	39 43 17.612 91 22 41.707	266 11 02.64 321 09 17.11	86 21 09.68 141 14 32.90	Kuhlman..... Gibbs.....	4.3553862 4.2747583	22,666.59 18,826.01	74,365.3 61,765.0
Payson (Ill.), 1931.....	39 49 37.830 91 15 04.622	311 07 17.36 358 02 44.32 42 53 30.35	131 12 32.60 178 03 08.44 222 48 37.92	Kuhlman..... Gibbs..... Hannibal.....	4.1923929 4.4218215 4.2039866	15,573.74 26,413.23 15,995.09	51,094.8 86,657.4 52,477.2
Heather, 1931.....	39 47 20.329 91 26 19.042	255 07 59.74 325 19 48.41	75 15 11.52 145 22 07.40	Payson..... Hannibal.....	4.2199441 3.9590238	16,593.73 9,099.63	54,441.3 29,854.4
St. Michael (Ill.), 1931.....	39 57 08.804 91 19 45.452	334 20 50.09 9 18 01.53 27 18 03.34	154 23 50.19 189 16 08.62 207 13 51.02	Payson..... Hannibal..... Heather.....	4.1882666 4.4145648 4.3100180	15,426.47 25,975.55 20,418.23	50,611.7 85,221.4 66,988.8
Schroeder, 1931.....	39 55 08.960 91 32 46.364	258 39 22.65 291 56 26.99 327 28 01.58	78 47 43.94 112 07 47.66 147 32 09.78	St. Michael..... Payson..... Heather.....	4.2766061 4.4348983 4.2339311	18,906.28 27,220.64 17,136.85	62,028.4 89,306.4 56,223.1
Miller (Ill.), 1931.....	40 05 24.072 91 18 48.446	5 03 44.88 46 24 25.93	185 03 08.22 226 15 27.27	St. Michael..... Schroeder.....	4.1856842 4.4389550	15,335.01 27,476.09	50,311.6 90,144.5
La Grange, 1931.....	40 02 53.777 91 30 42.060	254 36 25.04 304 16 44.18 11 38 10.57	74 44 04.40 124 23 46.24 191 36 50.69	Miller..... St. Michael..... Schroeder.....	4.2438929 4.2756020 4.1654304	17,534.48 18,862.62 14,636.27	57,527.7 61,885.1 48,019.2
Hufendick (Ill.), 1931.....	40 14 24.643 91 21 02.112	349 14 45.46 32 50 37.22	169 16 11.67 212 44 23.32	Miller..... La Grange.....	4.2296914 4.4039401	16,970.38 25,347.79	55,677.0 83,161.9
Finway, 1931.....	40 12 39.825 91 32 49.691	258 59 55.66 303 56 37.04 350 29 52.02	79 07 32.61 124 05 39.47 170 31 14.28	Hufendick..... Miller..... La Grange.....	4.2314371 4.3806246 4.2630768	17,038.73 24,022.86 18,326.38	55,901.2 78,815.0 60,125.8
Wilcox (Ill.), 1931.....	40 20 00.005 91 23 32.180	341 04 11.96 44 10 59.82	161 05 48.99 224 04 59.43	Hufendick..... Finway.....	4.0387959 4.2768419	10,934.42 18,916.55	35,874.0 62,062.0
Dukes, 1931.....	40 20 25.474 91 37 19.089	272 13 49.62 295 39 34.07 336 04 31.60	92 22 44.86 115 50 05.83 156 07 25.75	Wilcox..... Hufendick..... Finway.....	4.2907981 4.4085817 4.1961621	19,534.31 25,620.15 15,709.49	64,068.8 84,055.4 51,540.2

Mississippi River arc, first-order triangulation—Continued

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Hamilton (Ill.), 1931.....	40 23 52.739	36 28 19.11	216 25 53.56	Wilcox.....	3.9505861	8,924.54	29,279.9						
	91 19 47.443	75 38 45.56	255 27 24.40	Dukes.....	4.4086090	25,621.76	84,060.7						
Montrose (Iowa), 1931.....	40 30 51.879	323 01 30.70	143 05 58.37	Hamilton.....	4.2088379	16,174.76	53,066.7						
	91 26 39.968	347 33 59.35	167 36 01.12	Wilcox.....	4.3136230	20,588.42	67,547.2						
		38 00 10.38	217 53 15.92	Dukes.....	4.3891798	24,500.77	80,382.9						
Hosford (Ill.), 1931.....	40 27 42.127	33 21 06.29	213 18 58.25	Hamilton.....	3.9278155	8,468.68	27,784.3						
	91 16 30.016	34 58 15.65	214 53 42.05	Wilcox.....	4.2402154	17,386.63	57,042.6						
		112 13 21.84	292 06 45.80	Montrose.....	4.1906625	15,511.81	50,891.7						
<i>Supplementary points</i>													
Mounds City, water tank (Ill.), 1929.....	37 05 05.960	289 38 14.5	109 42 19.4	Barlow.....	4.027711	10,658.9	34,970						
	89 09 38.476	333 06 08.1	153 08 45.6	Wickliffe.....	4.155336	14,300.0	46,916						
		35 34 07.0	215 33 09.3	Cairo.....	3.609378	4,068.0	13,346						
Transmission tower, east bank of Ohio River (Ky.), 1929.....	37 04 09.231	290 55 55.2	100 59 46.8	Barlow.....	3.985445	9,670.4	31,727						
	89 09 16.458	331 42 09.1	151 44 33.4	Wickliffe.....	4.096845	12,498.1	41,004						
		61 48 23.4	241 47 12.5	Cairo.....	3.518776	3,302.0	10,833						
Transmission tower, west bank of Ohio River (Ill.), 1929.....	37 04 32.723	283 28 33.7	103 32 53.9	Barlow.....	4.040256	10,971.2	35,995						
	89 10 03.983	328 48 30.8	148 51 23.6	Wickliffe.....	4.137029	13,709.7	44,979						
		37 13 52.2	217 13 09.8	Cairo.....	3.457775	2,869.3	9,414						
Cairo, Catholic Church, spire (Ill.), 1929 ¹	37 00 14.26	244 51 10	64 55 51	Barlow.....	4.105020	12,735.6	41,783						
	89 10 38.76	27 04 15	207 01 33	Williams (northeast base).....	4.168342	14,734.7	48,342						
Wickliffe, water tank (Ky.), 1929.....	36 58 12.542	44 29 15.1	224 29 14.9	Wickliffe.....	1.195900	15.70	51.5						
	89 05 16.494	136 52 50.3	316 49 15.0	Cairo.....	4.111669	12,932.1	42,428						
		201 16 31.5	21 17 58.4	Barlow.....	3.992406	9,826.7	32,240						
Cairo, Bruce Lumber Co., water tank (Ill.), 1929.....	37 02 46.891	266 41 08.1	86 46 06.1	Barlow.....	4.087895	12,243.2	40,168						
	89 11 06.857	314 21 32.4	134 25 03.0	Wickliffe.....	4.083002	12,106.0	39,718						
		42 34 13.9	222 31 38.4	Big Lake.....	3.975000	9,440.6	30,973						
Cairo, water supply, water tank, (Ill.), 1929.....	37 00 25.012	70 11 28.0	250 08 33.9	Big Lake.....	3.881278	7,608.1	24,961						
	89 10 35.665	169 54 01.5	349 53 38.3	Cairo.....	3.738251	5,435.6	17,833						
		297 25 31.7	117 28 43.5	Wickliffe.....	3.948521	8,882.2	29,141						
Cairo, Singer Sewing Machine Co., stack, (Ill.), 1929.....	37 01 03.000	60 26 44.9	240 24 04.0	Big Lake.....	3.890036	7,602.1	24,941						
	89 10 57.698	174 24 53.6	354 24 43.6	Cairo.....	3.623279	4,200.3	13,780						
		301 58 25.1	122 01 50.1	Wickliffe.....	3.997228	9,936.4	32,600						
Barlow, water tank (Ky.), 1929.....	37 03 09.962	21 21 18.6	201 19 51.3	Wickliffe.....	3.993678	9,855.5	32,334						
	89 02 51.851	34 27 41.4	214 27 41.2	Barlow.....	1.170262	14.80	48.6						
		91 16 19.5	271 11 16.8	Cairo.....	4.093991	12,416.3	40,736						
Wickliffe, courthouse dome (Ky.), 1929 ¹	36 57 54.76	58 57 26	238 51 31	Williams (northeast base).....	4.232601	17,084.4	56,051						
	89 05 18.44	183 58 08	3 58 08	Wickliffe.....	2.731117	538.4	1,766						
Charleston, water tank, higher, 1929.....	36 55 31.545	231 42 56.1	51 46 15.3	Big Lake.....	4.018790	10,441.4	34,256						
	89 20 56.492	297 08 20.6	117 11 48.9	Williams (northeast base).....	3.984712	9,654.1	31,673						
		11 01 32.0	191 00 16.0	Prairie (southwest base).....	4.216028	16,444.8	53,953						
Charleston, church spire, 1929 ¹	36 55 26.63	230 40 08	50 43 24	Big Lake.....	4.018940	10,445.8	34,271						
	89 20 51.79	296 38 44	116 42 10	Williams (northeast base).....	3.976893	9,481.8	31,108						
Columbus, water tank (Ky.), 1929.....	36 45 31.314	23 02 45.3	203 02 13.7	Chalk.....	3.524287	3,344.2	10,972						
	89 06 10.607	136 35 00.4	316 29 37.4	Williams (northeast base).....	4.288206	19,418.1	63,708						
		181 32 37.7	1 32 45.0	Mathis.....	4.049882	11,217.1	36,801						
New Madrid, water tank, 1929.....	36 35 21.840	15 33 23.5	195 31 43.8	Pleasant.....	4.191642	15,546.8	51,006						
	89 31 35.612	69 33 57.6	249 33 02.3	Madrid.....	3.391003	2,460.4	8,072						
		229 29 38.8	49 34 01.0	Barnes.....	4.156888	14,351.2	47,084						
Hickman, standpipe (Ky.), 1929.....	36 34 16.768	198 44 35.4	18 47 00.0	Chalk.....	4.272064	18,709.6	61,383						
	89 11 05.656	262 18 21.7	82 18 21.9	Hickman.....	0.975432	9.45	31.0						
Portageville, water tank, 1929 ¹	36 25 27.99	253 27 22	73 31 50	Pleasant.....	4.068475	11,707.8	38,411						
	89 41 53.75	334 04 38	154 06 43	Stewart.....	4.07773	11,961.2	39,243						
Tiptonville, stack, silver (Tenn.), 1929 ¹	36 22 34.00	70 40 24	250 34 20	Stewart.....	4.211247	16,264.7	53,362						
	89 28 08.76	133 00 33	312 56 51	Pleasant.....	4.105379	12,746.1	41,818						
Ridgely, water tank (Tenn.), 1929 ¹	36 15 43.14	263 15 51	83 18 33	Gratio.....	3.836441	6,861.8	22,512						
	89 29 29.72	0 17 01	180 16 59	Obion.....	4.219145	16,563.2	54,341						
Hayti, water tank, higher, 1929.....	36 13 58.980	296 50 29.5	116 53 40.0	Caruthers.....	3.955618	9,028.6	29,621						
	89 45 12.658	299 32 44.3	119 41 59.0	Obion.....	4.431589	27,014.0	88,628						
		344 09 34.4	164 11 43.0	Cotton.....	4.300775	19,968.3	65,578						
Hayti, water tank, lower, 1929.....	36 14 13.940	300 27 32.1	120 30 34.6	Caruthers.....	3.951929	8,952.2	29,371						
	89 44 59.086	300 45 21.7	120 54 28.4	Obion.....	4.430600	26,952.6	88,427						
		345 26 04.5	165 28 05.1	Cotton.....	4.308444	20,344.4	66,747						
Caruthersville, standpipe, 1929 ¹	36 11 39.80	11 51 08	191 49 54	Cotton.....	4.183721	15,265.8	50,085						
	89 39 29.38	111 55 46	291 55 34	Caruthers.....	2.749231	561.3	1,842						
Caruthersville, water tank, 1929.....	36 10 53.092	14 42 39.9	194 41 16.4	Cotton.....	4.144832	13,958.3	45,795						
	89 39 13.025	150 36 04.5	330 35 42.5	Caruthers.....	3.277143	1,893.0	6,211						
		314 21 39.0	134 27 04.9	Head.....	4.286767	19,353.8	63,497						

¹ No check on this position.

Mississippi River arc, first-order triangulation—Continued

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Longtown, Lutheran church, spire, 1931.....	37	40	21.727	143	33	58.5	323	29	17.4	Dowl.....	4.276767	18,913.3	62,051
	89	46	33.606	174	53	41.7	354	53	09.4	Killian (M.R.C.).....	4.161791	14,514.1	47,618
				218	54	55.3	218	54	55.3	U.S.G.S. 15.....	3.785317	6,099.8	20,012
Perryville, International Shoe Co., water tower, 1931.	37	43	50.216	160	41	05.8	340	39	48.7	Dowl.....	3.968740	9,305.5	30,530
	89	52	06.970	220	31	02.3	40	33	54.1	Killian (M.R.C.).....	4.023866	10,564.9	34,662
				277	56	34.3	98	01	33.9	U.S.G.S. 15.....	4.083245	12,112.8	39,740
Perryville, St. Mary's Seminary, water tower, 1931.	37	43	34.782	199	59	21.1	20	02	19.6	Chester.....	4.318185	20,805.8	68,260
	89	53	32.780	226	29	13.6	46	32	58.0	Killian (M.R.C.).....	4.091985	12,359.0	40,548
				274	50	36.4	94	56	28.6	U.S.G.S. 15.....	4.150721	14,148.8	46,420
Perryville, courthouse spire, 1931.....	37	43	30.939	159	06	53.1	339	05	23.5	Dowl.....	4.001545	10,035.6	32,925
	89	51	46.539	216	25	13.4	36	27	52.7	Killian (M.R.C.).....	4.030158	10,719.1	35,168
				275	22	04.5	95	26	51.6	U.S.G.S. 15.....	4.062464	11,546.9	37,883
Perryville, municipal water tower, 1931.....	37	43	23.248	160	56	21.9	340	54	58.7	Dowl.....	4.007359	10,170.9	33,369
	89	51	57.013	216	45	30.6	36	48	16.3	Killian (M.R.C.).....	4.043848	11,062.4	36,294
				274	06	05.2	94	10	58.7	U.S.G.S. 15.....	4.071253	11,782.9	38,658
Chester, municipal water tower (Ill.), 1931.....	37	54	40.134	339	23	40.7	159	27	05.1	U.S.G.S. 15.....	4.365491	23,200.2	76,116
	89	49	30.520	345	48	33.5	165	49	49.7	Killian (M.R.C.).....	4.092937	12,386.2	40,637
				31	31	56.8	211	29	03.6	Dowl.....	4.120669	13,202.9	43,317
Chester, St. Johns Lutheran Church (Ill.), 1931.	37	54	55.233	326	51	06.5	146	51	29.8	Chester.....	3.232306	1,707.3	5,601
	89	49	19.871	347	27	13.5	167	28	23.0	Killian (M.R.C.).....	4.106496	12,779.0	41,926
				31	26	37.3	211	23	37.4	Dowl.....	4.137852	13,735.7	45,065
Chester, International Shoe Co., water tower (Ill.), 1931.	37	54	47.339	321	26	16.0	141	26	39.7	Chester.....	3.180930	1,516.8	4,976
	89	49	20.361	347	09	31.7	167	10	41.6	Killian (M.R.C.).....	4.098442	12,544.2	41,155
				31	56	18.0	211	53	18.5	Dowl.....	4.131052	13,522.3	44,364
Bremen, spire (Ill.), 1931 ¹	37	58	29.10	37	51	16	217	48	39	Chester.....	4.006825	10,158.4	33,328
	89	44	26.50	88	47	47	208	42	27	Scheltgen.....	4.103621	12,694.7	41,649
Chester, Catholic Church, spire (Ill.), 1931.....	37	54	42.905	312	32	56.3	132	33	25.0	Chester.....	3.190779	1,551.6	5,091
	89	49	28.447	339	35	08.7	159	38	31.8	U.S.G.S. 15.....	4.366654	23,282.4	76,320
				346	07	54.3	166	09	09.2	Killian (M. R. C.).....	4.095402	12,456.7	40,868
Ste. Genevieve, Catholic Church, spire, 1931.....	37	58	44.969	135	34	40.2	315	33	23.2	Correll (M.R.C.).....	3.639327	4,358.4	14,299
	90	02	48.464	273	02	13.3	93	08	11.4	Scheltgen.....	4.153039	14,224.6	46,669
				6	13	21.8	186	13	03.4	Gelley.....	3.827694	6,725.0	22,064
Ste. Genevieve, municipal water tower, 1931.....	37	58	56.830	135	29	10.8	315	28	02.7	Correll (M.R.C.).....	3.585712	3,852.2	12,638
	90	03	02.807	274	23	42.9	94	29	49.9	Scheltgen.....	4.164282	14,597.6	47,892
				3	04	25.1	183	04	15.6	Gelley.....	3.848883	7,061.3	23,167
Sparta, water tower (Ill.), 1931 ¹	38	07	14.80	21	05	01	201	01	06	Chester.....	4.414379	25,964.4	85,185
	89	42	19.35	43	48	10	223	41	31	Scheltgen.....	4.358312	22,819.8	74,868
Red Bud, municipal water tower (Ill.), 1931.....	38	12	39.651	340	20	06.6	160	24	05.9	Scheltgen.....	4.449270	28,136.5	92,311
	89	59	34.419	5	39	57.5	185	39	15.7	Moore.....	4.222513	16,692.2	54,764
				65	32	29.4	245	27	17.8	Renault.....	4.129624	13,478.0	44,219
Ruma, Catholic Church, spire (Ill.), 1931 ¹	38	07	06.78	0	58	23	180	58	20	Moore.....	3.802658	6,348.3	20,828
	90	00	37.60	113	34	05	293	29	33	Renault.....	4.068442	11,706.9	38,408
Red Bud, Catholic Church, spire (Ill.), 1931.....	38	12	28.111	339	37	27.7	159	41	33.1	Scheltgen.....	4.445357	27,884.1	91,483
	89	59	44.256	4	57	04.8	184	56	29.1	Moore.....	4.212607	16,315.7	53,529
				66	31	18.9	246	26	13.4	Renault.....	4.117760	13,114.7	43,027
Red Bud, Lutheran Church, spire (Ill.), 1931.....	38	12	27.665	340	05	04.7	160	09	04.0	Scheltgen.....	4.443854	27,787.8	91,167
	89	59	34.294	5	48	16.7	185	47	34.9	Moore.....	4.212847	16,324.8	53,559
				66	59	34.0	246	54	22.4	Renault.....	4.124895	13,332.0	43,740
Wartburg, church spire (Ill.), 1931.....	38	17	19.875	108	25	28.7	288	22	17.4	Rehling.....	3.897968	7,906.2	25,939
	90	11	48.603	144	53	37.2	324	52	10.5	Johanna.....	3.771462	5,908.3	19,384
				155	00	35.8	334	57	00.4	Twin Hollow.....	4.299175	19,914.8	65,337
Waterloo, municipal water tower (Ill.), 1931.....	38	20	00.527	21	38	26.2	201	36	33.5	Schilling.....	4.079035	11,996.0	39,357
	90	09	01.092	78	02	43.5	257	57	48.2	Rehling.....	4.072878	11,827.1	38,803
				89	06	02.4	269	02	51.8	Johanna.....	3.873161	7,467.3	24,499
Waterloo, Catholic Church, spire (Ill.), 1931.....	38	20	14.807	21	14	35.6	201	12	40.8	Schilling.....	4.094669	12,435.7	40,799
	90	08	57.726	76	04	14.5	255	59	17.1	Rehling.....	4.079377	12,005.4	39,388
				85	46	35.0	265	43	22.3	Johanna.....	3.879019	7,568.7	24,832
Waterloo, Lutheran Church, spire (Ill.), 1931.....	38	20	08.605	20	34	00.2	200	32	11.2	Schilling.....	4.085491	12,175.6	39,946
	90	09	07.122	76	42	24.7	256	37	33.1	Rehling.....	4.069617	11,738.6	38,512
				87	08	03.6	267	04	56.7	Johanna.....	3.865048	7,329.1	24,046
Crystal City, municipal water tower, 1931.....	38	13	11.954	158	29	46.8	338	27	45.1	Engle.....	4.114224	13,008.4	42,678
	90	22	34.867	213	24	21.7	33	27	09.3	Salt Bluff.....	4.077109	11,942.9	39,183
				218	57	07.0	39	00	36.0	Rehling.....	4.115397	13,043.6	42,794
Herculaneum, tall stack, 1931.....	38	15	37.395	220	00	21.1	50	03	07.8	Salt Bluff.....	3.931194	8,534.8	28,001
	90	22	33.353	281	09	27.6	101	15	57.8	Schilling.....	4.193864	15,626.6	51,268
				342	50	03.2	162	50	45.8	Crystal.....	3.753996	5,675.4	18,620

¹ No check on this position.

Mississippi River arc, first-order triangulation—Continued

Station	Latitude and longitude			Azimuth	Back Azimuth	To station	Distance			
							Logarithm (meters)	Meters	Feet	
<i>Supplementary points—Continued</i>										
Herculaneum, water tower, 1931.....	38	16	22.856	240	47	00.4	Salt Bluff.....	3.922604	8,367.7	27,453
	90	23	04.822	285	22	05.5	Schilling.....	4.222546	16,693.4	54,768
				340	19	15.2	Crystal.....	3.860182	7,247.4	23,778
White house water tower, 1931.....	38	25	23.092	326	21	14.6	Johanna.....	4.082388	12,088.9	39,662
	90	18	44.274	79	01	15.3	Four Ridge.....	4.187729	15,407.4	50,549
				103	29	39.8	Patterson.....	4.297842	19,853.7	65,137
Morgan, silver water tower, 1931.....	38	40	23.263	27	32	39.3	Patterson.....	4.416564	26,095.4	85,615
	90	23	42.835	65	06	18.7	Ganahl.....	4.221722	16,661.8	54,665
				91	37	53.1	Howard (Mo.R.C.).....	4.075561	11,900.4	39,043
Barry, silver standpipe (Ill.), 1931.....	39	41	36.222	56	16	55.9	Gibbs.....	4.317277	20,762.4	68,118
	91	02	23.158	96	15	22.7	Hannibal.....	4.465328	29,196.3	95,788
				107	22	20.1	Heather.....	4.553862	35,798.3	117,448
Hannibal, Hayden and Pleasant Streets, water tank, 1931.	39	42	50.953	147	59	58.7	Heather.....	3.991162	9,798.6	32,148
	91	22	40.815	178	31	08.1	Hannibal.....	2.915116	8,222.5	27,000
				319	34	53.6	Gibbs.....	4.259574	18,179.2	59,643
Hannibal, International Shoe Co., red water tank, 1931.	39	41	54.397	323	28	56.8	Gibbs.....	4.177702	15,055.7	49,395
	91	20	42.323	132	04	29.7	Hannibal.....	3.583275	3,830.7	12,568
				141	27	19.8	Heather.....	4.109161	12,857.6	42,184
Payson, church spire (Ill.), 1931.....	39	49	01.711	79	36	32.6	Heather.....	4.236337	17,232.1	56,536
	91	14	26.701	113	31	43.9	Schroeder.....	4.454604	28,484.2	93,452
				153	16	23.6	St. Michael.....	4.225930	16,824.0	55,197
Palmyra, municipal water tank, 1931.....	39	47	32.735	172	27	49.5	Schroeder.....	4.152091	14,193.5	46,567
	91	31	27.980	272	57	08.2	Heather.....	3.866915	7,360.6	24,149
				302	05	04.5	Hannibal.....	4.170082	14,793.9	48,536
Palmyra, Catholic Church spire, 1931.....	39	47	48.137	171	10	33.1	Schroeder.....	4.138582	13,758.8	45,140
	91	31	17.491	276	51	37.1	Heather.....	3.854458	7,152.5	23,466
				304	09	07.0	Hannibal.....	4.171563	14,844.4	48,702
Quincy, municipal water tank (Ill.), 1931.....	39	56	35.687	359	52	25.7	Hannibal.....	4.391180	24,613.9	80,754
	91	22	43.984	16	38	07.1	Heather.....	4.252236	17,874.6	58,644
				79	27	40.9	Schroeder.....	4.162906	14,551.4	47,741
Quincy, St. Peters Catholic Church spire (Ill.), 1931.	39	55	54.095	354	42	54.1	Hannibal.....	4.369779	23,430.4	76,871
	91	24	12.320	10	46	27.7	Heather.....	4.207611	16,129.1	52,917
				83	32	24.2	Schroeder.....	4.069412	12,286.0	40,308
Quincy, W.C.U. Building, penthouse (Ill.), 1931.	39	55	54.024	353	50	09.7	Hannibal.....	4.370404	23,464.1	76,982
	91	24	27.489	9	30	39.5	Heather.....	4.205841	16,063.5	52,702
				83	21	11.3	Schroeder.....	4.076566	11,928.0	39,134
La Grange, municipal water tank, 1931.....	40	02	43.897	13	42	05.1	Schroeder.....	4.159612	14,441.5	47,380
	91	30	22.332	123	05	11.8	La Grange.....	2.746766	568.2	1,831
				253	12	56.9	Miller.....	4.234759	17,169.6	56,331
Canton, Culver-Stockton College, water tank, 1931.	40	07	43.154	171	11	26.1	Finway.....	3.966596	9,259.7	30,380
	91	31	49.724	282	58	57.7	Miller.....	4.278616	18,994.0	62,316
				349	48	43.4	La Grange.....	3.957513	9,068.0	29,751
Tioga, church spire (Ill.), 1931.....	40	12	34.586	38	22	14.5	La Grange.....	4.358547	22,832.2	74,909
	91	20	44.155	90	36	17.1	Finway.....	4.234476	17,158.4	56,294
				121	48	02.1	Dukes.....	4.441398	27,631.1	90,653
Warsaw, municipal water tank (Ill.), 1931.....	40	21	27.493	83	21	29.8	Dukes.....	4.214489	16,386.6	53,762
	91	25	49.486	242	17	15.8	Hamilton.....	3.984269	9,644.3	31,641
				309	46	20.1	Wilcox.....	3.625005	4,217.0	13,835
Hamilton, municipal water tank (Ill.), 1931.....	40	23	48.336	36	05	52.2	Wilcox.....	3.940216	8,714.0	28,589
	91	19	54.689	75	50	44.2	Dukes.....	4.405222	25,422.7	83,408
				143	52	14.6	Montrose.....	4.209038	16,182.2	53,091
Keokuk, St. Peters Catholic Church spire (Iowa), 1931.	40	23	49.025	160	29	50.6	Montrose.....	4.141081	13,838.2	45,401
	91	23	23.729	233	33	43.8	Hosford.....	4.083359	12,116.0	39,751
				1	37	03.2	Wilcox.....	3.849224	7,066.8	23,185
Keokuk, post office, clock tower (Iowa), 1931.	40	24	04.72	233	50	37	Hosford.....	4.055969	11,375.5	37,321
	91	22	59.85	5	46	25	Wilcox.....	3.880047	7,586.6	24,890
Keokuk, Home of Standard 4 Tire, water tank (Iowa), 1931.	40	24	56.142	163	47	49.3	Montrose.....	4.057942	11,427.3	37,491
	91	24	24.523	286	38	20.0	Hamilton.....	3.833779	6,819.9	22,375
				352	17	46.4	Wilcox.....	3.964602	9,217.3	30,240
Lee County Poor Farm, water tank (Iowa), 1931.	40	27	40.467	183	53	42.7	Montrose.....	3.772161	5,917.8	19,415
	91	26	57.044	341	11	41.6	Wilcox.....	4.176148	15,002.0	49,219
				47	36	29.0	Dukes.....	4.298408	19,870.6	65,222
Carthage, municipal water tank (Ill.), 1931.....	40	24	52.926	114	00	41.8	Hosford.....	4.108837	12,848.0	42,152
	91	08	11.888	145	40	07.7	Scott.....	4.229388	16,958.5	55,638
				170	21	00.8	Ferris (north base).....	4.181512	15,188.4	49,831
Carthage, courthouse dome (Ill.), 1931.....	40	24	46.595	114	35	21.2	Hosford.....	4.115080	13,034.1	42,763
	91	08	06.970	145	43	03.6	Scott.....	4.235153	17,185.1	56,381
				170	02	51.6	Ferris (north base).....	4.187536	15,400.5	50,526

1 No check on this position.

Mississippi River arc, second-order triangulation

Station	Latitude and longitude			Azimuth	Back Azimuth	To station	Distance		
	°	'	"				Logarithm (meters)	Meters	Feet
<i>Principal points</i>									
P.B.M. Wickliffe (M.R.C.) (Ky.), 1906.....	36 58 04.156	89 05 32.212	236 47 14.2	56 47 23.4	Wickliffe.....	2.054708	451.55	1,481.5	
Bird Point, 1929.....	36 57 56.089	89 09 25.101	102 44 50.5	282 41 14.0	Big Lake.....	3.960379	9,128.1	29,948	
			265 21 36.0	85 24 05.2	Wickliffe.....	3.789487	6,158.7	20,206	
			336 26 35.7	156 28 39.8	Mathis.....	4.107591	12,811.2	42,031	
Birds Point School (M.R.C.) 1906.....	36 57 56.276	89 09 25.247	327 54	147 54	Bird Point.....	0.831998	6.79	22.3	
Chalk A (Ky.), 1929.....	36 43 43.516	89 07 20.895	240 33 22.9	60 33 33.4	Chalk.....	2.698467	499.42	1,638.5	
Chalk B (Ky.), 1929.....	36 43 35.077	89 07 26.912	209 51 19.4	29 51 23.0	Chalk A.....	2.477014	299.93	984.0	
P.B.M. 10-4/2 (M.R.C.) (Ky.), 1906.....	36 43 35.759	89 07 28.854	293 33 57.6	113 33 58.8	Chalk B.....	1.720821	52.58	172.5	
P.B.M. 17/4 (M.R.C.), 1906.....	36 35 23.186	89 32 37.350	40 33 03.7	220 32 45.2	Madrid.....	3.073879	1,185.44	3,889.2	
P.B.M. 21/1 (M.R.C.) (Tenn.), 1906.....	36 23 02.853	89 28 29.753	268 38 53.6	88 43 52.7	Chigger.....	4.099362	12,570.8	41,243	
			337 21 35.2	157 23 41.4	Gratio.....	4.140322	13,814.1	45,322	
			131 34 35.7	311 31 06.0	Pleasant.....	4.070426	11,760.5	38,584	
B. M. Caruthersville (M.R.C.), 1906.....	36 11 42.223	89 39 42.303	124 16 58.8	304 16 54.1	Caruthers.....	2.378995	239.33	785.2	
Cottonwood south base (P.B.M. south base (M.R.C.)), 1879.....	36 03 37.303	89 41 38.389	306 41 16.1	126 41 18.3	Cotton.....	2.066378	116.51	382.2	
Hofner = B. M. 9/4 (M.R.C.), 1881.....	37 10 05.409	89 27 04.884	285 25 53.1	105 32 54.2	Larrison.....	4.251801	17,856.7	58,585	
			298 02 08.0	118 11 41.5	Cairo.....	4.425065	26,611.2	87,307	
			319 45 58.8	139 53 00.6	Big Lake.....	4.428046	26,794.5	87,908	
Bee Bluff (M.R.C.), 1881.....	37 26 43.303	89 27 07.267	171 19 24.3	351 17 39.7	Fountain Bluff (M.R.C.).....	4.445021	27,862.6	91,413	
			218 22 31.4	38 26 23.5	Bald Knob.....	4.178301	15,076.5	49,463	
			281 32 15.4	101 36 39.5	Atwood.....	4.037442	10,900.4	35,762	

U. S. COAST AND GEODETIC SURVEY

O'Harrish (M.R.C.) (Ill.), 1880.....	37 49 21.324	89 38 40.239	199 22 09.6	19 22 37.0	Degonia.....	3.517853	3,295.0	10,810
			286 33 31.1	106 38 33.0	Miles.....	4.099485	12,574.3	41,254
			353 44 22.8	173 45 18.5	Frohna.....	4.311291	20,478.2	67,185
			33 08 39.9	213 05 25.7	U.S.G.S 15.....	4.152196	14,197.0	46,678
Killion (M.R.C.), 1880.....	37 48 10.630	89 47 26.399	170 32 55.0	350 32 08.8	Chester.....	4.049101	11,197.0	36,735
			249 12 22.4	69 18 12.5	Degonia.....	4.174022	14,925.7	48,979
			332 10 29.6	152 12 37.7	U.S.G.S. 15.....	4.040565	10,979.1	36,021
			94 21 46.9	274 17 37.8	Dowl.....	3.998694	9,970.0	32,710
Kaskaskia (U.S.E.) (Ill.), 1931.....	37 57 49.373	89 54 24.982	359 00 02.9	179 00 10.4	Dowl.....	4.232828	17,093.4	56,061
			69 09 05.6	249 03 37.6	Geller.....	4.144242	13,939.3	45,733
			102 09 55.3	282 01 06.8	Wilder.....	4.331105	21,434.1	70,322
Kaskaskia (M.R.C.) (Ill.), 1880.....	37 57 49.336	89 54 25.465	264 32 08.9	84 32 09.2	Kaskaskia (U.S.E.).....	1.073242	11.837	38.84
Crystal (M.R.C.), 1880.....	38 12 42.149	90 21 24.804	339 23 14.5	159 23 14.7	Crystal.....	1.3170809	20.753	68.09
Correll (M.R.C.), 1880.....	38 00 25.912	90 04 53.509	225 32 58.1	45 35 33.0	Moore.....	3.933909	8,588.3	28,177
			282 36 30.1	102 43 45.3	Scheltgen.....	4.247558	17,683.1	58,015
			86 35 40.8	266 33 19.0	Wilder.....	3.750389	5,628.5	18,466
Kidd (Ill.), 1931.....	38 10 22.117	90 12 56.912	280 29 24.5	100 32 29.0	Renault.....	3.868757	7,391.9	24,252
			341 44 25.7	161 47 01.9	Wilder.....	4.294656	19,708.6	64,661
			26 29 01.0	206 26 55.3	Holst.....	4.046331	11,125.8	36,502
			109 13 47.7	289 08 33.9	Crystal.....	4.116560	13,078.6	42,909
Kidd (M.R.C.) (Ill.), 1880.....	38 10 22.388	90 12 56.809	16 38 25.7	196 38 25.6	Kidd.....	0.9406659	8.723	28.62
Brickey (M.R.C.), 1880.....	38 05 12.711	90 12 47.646	178 37 51.9	358 37 46.1	Kidd.....	3.979659	9,542.4	31,307
			220 40 14.2	40 43 12.7	Renault.....	4.033542	10,802.9	35,443
			279 01 54.0	99 09 21.4	Moore.....	4.253072	17,909.0	58,756
Twin Hollow, 1931.....	38 27 05.144	90 17 35.565	339 09 36.1	159 11 44.7	Johanna.....	4.150341	14,136.5	46,360
			356 34 58.5	176 35 22.3	Rehling.....	4.192520	15,578.3	51,110
Twin Hollow (M.R.C.), 1880.....	38 27 05.253	90 17 35.746	307 30 15.0	127 30 15.1	Twin Hollow.....	0.7426466	5.529	18.14
Twin Hollow (U.S.E.), 1931.....	38 27 05.14	90 17 35.52	96 06	276 06	Twin Hollow.....	0.01284	1.030	3.38
			122 42	302 42	Twin Hollow (M.R.C.).....	0.80845	6.434	21.11
Salt Bluff (Ill.), 1931.....	38 18 35.215	90 18 04.226	263 56 18.9	83 57 00.3	Rehling.....	3.213254	1,634.0	5,361
			314 06 29.4	134 10 13.1	Schilling.....	4.087637	12,235.9	40,144
			24 04 37.8	204 02 33.8	Crystal.....	4.077119	11,943.2	39,184
			100 41 47.4	280 36 57.8	Engle.....	4.062302	11,542.6	37,369
			182 31 51.7	2 32 09.4	Twin Hollow.....	4.196961	15,738.4	51,635
Salt Bluff (M.R.C.) (Ill.), 1880.....	38 18 35.558	90 18 04.313	348 45 08.9	168 45 09.0	Salt Bluff.....	1.032619	10.780	35.37

TRIANGULATION IN MISSOURI

Mississippi River arc, second-order triangulation—Continued

Station	Latitude and longitude			Azimuth	Back Azimuth	To station	Distance		
	°	'	"				Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>									
Howard (Mo.R.C.), 1887.....	38 40 33.963	220 45 27.5	40 48 48.3	Yosti.....	4.074592	11873.9	38,956		
	90 31 54.940	271 57 57.7	92 03 00.0	Morgan.....	4.068204	11,700.5	38,387		
		23 33 08.3	203 31 45.5	Ganahl.....	3.904501	8,026.0	26,332		
Commerce (Mo.R.C.), 1887.....	38 51 49.796	42 15 07.8	222 10 28.6	Yosti.....	4.204087	15,968.8	52,489		
	90 19 08.359	136 48 55.1	316 42 41.4	Sancamper.....	4.320401	20,912.3	68,610		
Thompson (M.R.C.) (Ill.), 1881.....	38 58 43.119	303 27 05.8	123 35 27.6	Commerce (Mo.R.C.).....	4.363222	23,079.3	75,719		
	90 32 27.059	340 52 27.6	160 56 09.2	Yosti.....	4.415424	26,027.0	85,390		
		38 08 31.3	218 00 49.8	Orf.....	4.458447	28,737.4	94,283		
		83 50 55.3	263 40 54.4	Palmer.....	4.364367	23,140.2	75,919		
Knox (M.R.C.), 1881.....	39 05 44.552	161 53 25.7	341 50 53.9	Annada.....	4.267870	18,529.8	60,793		
	90 45 38.016	216 02 52.8	36 06 46.7	Gress.....	4.179116	15,104.8	49,556		
		246 09 59.6	66 14 16.3	Snider.....	4.028824	10,686.2	35,060		
Salt peter (M.R.C.), 1881.....	39 15 15.489	94 39 55.1	274 39 54.1	Annada.....	1.596157	39.46	129.5		
	90 49 36.588								
Clarksville (M.R.C.), 1881.....	39 22 24.160	125 41 08.2	305 34 58.7	Louisiana.....	4.233769	17,130.5	56,202		
	90 54 35.640	177 53 27.6	357 33 03.7	Shinn.....	4.324868	21,128.5	69,319		
		203 56 17.4	23 58 19.5	Long.....	4.053953	11,322.8	37,148		
Rockport (M.R.C.) (Ill.), 1881.....	39 32 48.306	27 23 48.4	207 21 40.6	Louisiana.....	4.018582	10,437.2	34,243		
	91 00 56.971	83 21 41.0	263 15 34.4	Ashburn.....	4.141364	13,847.3	45,431		
		103 50 16.9	283 41 41.1	Gibbs.....	4.298941	19,904.0	65,302		
Gard (M.R.C.) (Ill.), 1881.....	39 39 03.678	350 00 31.8	170 02 09.6	Louisiana.....	4.325610	21,164.6	69,438		
	91 06 51.473	21 51 01.6	201 48 40.5	Ashburn.....	4.152548	14,208.5	46,616		
		57 50 29.1	237 45 38.7	Gibbs.....	4.108445	12,836.4	42,114		
Heather (M.R.C.), 1881.....	39 47 20.149	94 07 05.0	274 07 02.0	Heather.....	2.0470857	111.454	365.66		
	91 26 14.370								
Marblehead 2 (Ill.), 1931.....	39 50 41.166	2 03 46.1	182 03 32.9	Hannibal.....	4.136359	13,688.6	44,910		
	91 22 21.020	42 26 51.4	222 24 19.0	Heather.....	3.923835	8,391.4	27,531		
		119 07 20.0	299 00 39.0	Schroeder.....	4.230461	17,000.5	55,776		
Quincy Courthouse (M.R.C.) (Ill.), 1881.....	39 56 06.222	204 57 57.1	25 01 34.7	Miller.....	4.278377	18,983.5	62,282		
	91 24 26.671	253 50 59.8	73 54 00.4	St. Michael.....	3.841967	6,949.7	22,801		
		9 21 40.7	189 20 28.7	Heather.....	4.215845	16,437.8	53,930		
		81 34 44.5	261 29 23.8	Schroeder.....	4.079058	11,966.6	39,359		
La Grange College, 1931.....	40 02 53.855	253 35 19.3	73 42 28.3	Müller.....	4.216341	16,456.6	53,991		
	91 29 54.812	306 18 28.5	126 25 00.3	St. Michael.....	4.254058	17,049.7	56,890		
		89 52 48.9	269 52 18.5	La Grange.....	3.049214	1,120.0	3,675		
Lima Lake (M.R.C.) (Ill.), 1881.....	40 10 12.775	31 49 33.7	211 45 45.4	La Grange.....	4.202228	15,930.4	52,265		
	91 24 47.663	111 44 03.7	291 38 52.6	Finway.....	4.088892	12,271.3	40,260		
Gillham (M.R.C.) (Ill.), 1881.....	40 18 40.803	40 53 32.6	220 49 09.2	Finway.....	4.167921	14,720.4	48,295		
	91 26 02.189	101 28 57.2	281 21 39.1	Dukes.....	4.212271	16,303.1	53,488		
Swallow Rock (M.R.C.) (Ill.), 1880.....	37 41 31.150	91 12 08.1	271 08 39.9	Fountain Bluff (M.R.C.).....	3.921344	8,343.4	27,373		
	89 24 18.353	145 29 56.4	325 27 26.7	Worthen (M.R.C.).....	4.023671	10,560.2	34,646		
Big Muddy (M.R.C.) (Ill.), 1880.....	37 34 32.899	156 32 16.4	336 29 55.0	Fountain Bluff (M.R.C.).....	4.153665	14,245.1	46,736		
	89 26 07.334	191 41 54.6	11 43 01.1	Swallow Rock (M.R.C.).....	4.119537	13,168.5	43,204		
Silica (M.R.C.), 1880.....	37 36 41.636	190 49 02.2	10 49 45.5	Fountain Bluff (M.R.C.).....	3.966669	9,261.2	30,384		
	89 31 09.775	298 07 03.4	118 10 07.9	Big Muddy (M.R.C.).....	3.925026	8,414.5	27,607		
Indian Creek (M.R.C.), 1880.....	37 30 59.535	173 45 17.0	353 44 48.3	Silica (M.R.C.).....	4.025707	10,609.8	34,809		
	89 30 22.716	223 36 06.9	43 38 42.5	Big Muddy (M.R.C.).....	3.958412	9,086.8	29,812		
Rich (M.R.C.) (Ill.), 1880.....	37 30 37.365	13 27 45.8	193 27 03.1	Bee Bluff (M.R.C.).....	3.870379	7,419.6	24,342		
	89 25 56.995	96 00 05.3	275 57 23.5	Indian Creek (M.R.C.).....	3.817002	6,561.5	21,527		
		145 40 16.3	325 37 05.6	Silica (M.R.C.).....	4.133643	13,603.3	44,630		
Moccasin Springs (M.R.C.), 1880.....	37 26 28.456	150 45 42.3	330 43 46.4	Indian Creek (M.R.C.).....	3.981258	9,577.6	31,423		
	89 27 12.222	193 32 19.4	13 33 05.2	Rich (M.R.C.).....	3.897194	7,892.1	25,893		
Bluff Lake (M.R.C.) (Ill.), 1880.....	37 25 17.894	102 46 40.1	282 42 42.2	Moccasin Springs (M.R.C.).....	3.994099	9,865.0	32,365		
	89 20 40.857	141 45 36.3	321 42 24.0	Rich (M.R.C.).....	4.098443	12,544.2	41,155		
Vancill (M.R.C.), 1897.....	37 28 18.751	224 24 01.7	44 25 45.4	Rich (M.R.C.).....	3.776892	5,982.6	19,628		
	89 28 47.430	294 57 09.4	115 02 05.2	Bluff Lake (M.R.C.).....	4.120444	13,196.1	43,294		
		320 04 34.6	140 05 35.5	Bee Bluff (M.R.C.).....	3.583031	3,836.5	12,587		
Clear Creek (M.R.C.) (Ill.), 1880.....	37 19 56.708	151 19 40.5	331 16 57.3	Moccasin Springs (M.R.C.).....	4.138899	13,768.9	45,173		
	89 22 43.484	196 56 08.7	16 57 23.1	Bluff Lake (M.R.C.).....	4.014986	10,351.1	33,960		
Floral (M.R.C.), 1880.....	37 20 50.328	234 18 01.1	54 22 44.8	Bluff Lake (M.R.C.).....	4.150730	14,149.1	46,421		
	89 28 28.164	280 59 45.2	101 03 14.3	Clear Creek (M.R.C.).....	3.936704	8,643.8	28,359		
Sextons (M.R.C.) (Ill.), 1880.....	37 15 05.040	166 09 43.6	346 08 39.0	Floral (M.R.C.).....	4.039934	10,963.1	35,968		
	89 26 41.621	213 05 54.0	33 08 18.3	Clear Creek (M.R.C.).....	4.030826	10,735.6	35,222		
Cape Lacroix=B. M. 11/3 (M.R.C.), 1880.....	37 14 53.474	176 57 21.3	356 57 06.9	Floral (M.R.C.).....	4.042049	11,016.6	36,144		
	89 28 04.385	260 04 40.4	80 05 30.5	Sextons (M.R.C.).....	3.316105	2,070.6	6,793		

Mississippi River arc, second-order triangulation—Continued

Station	Latitude and longitude			Azimuth	Back Azimuth	To station	Distance				
	°	'	"				Logarithm (meters)	Meters	Feet		
<i>Principal points—Continued</i>											
Day (M.R.C.) (Ill.), 1880.....	37 14 00.008	89 27 13.557		142 45 59.7	201 26 02.6	322 45 28.9	21 26 21.9	Cape Lacroix (M.R.C.).....	3.316035	2,070.3	6,792
								Sextons (M.R.C.).....	3.333201	2,153.8	7,066
Thebes north base (M.R.C.), 1880.....	37 14 26.657	89 27 47.722		234 00 11.7	314 17 12.1	54 00 51.7	134 17 32.8	Sextons (M.R.C.).....	3.303956	2,013.5	6,606
								Day (M.R.C.).....	3.070583	1,176.5	3,860
Thebes south base (M.R.C.), 1880.....	37 13 49.135	89 28 05.872		201 08 37.5	255 25 31.9	21 08 48.5	75 26 03.6	Thebes north base (M.R.C.).....	3.093499	1,240.2	4,069
								Day (M.R.C.).....	3.124656	1,332.5	4,372
Grand Chain = B. M. 10/4 (M.R.C.), 1880.....	37 13 02.561	89 28 26.232		188 56 57.2	225 19 36.7	8 57 10.4	45 20 20.7	Cape Lacroix (M.R.C.).....	3.539244	3,461.3	11,356
								Day (M.R.C.).....	3.401259	2,519.2	8,265
Thebes (M.R.C.) (Ill.), 1880.....	37 12 30.876	89 27 14.175		118 48 22.9	152 09 21.0	298 47 39.3	332 06 49.7	Grand Chain (M.R.C.).....	3.306960	2,027.5	6,652
								Thebes south base (M.R.C.).....	3.435926	2,728.5	8,952
								Day (M.R.C.).....	3.438978	2,747.8	9,015
Uncle Joe (M.R.C.), 1880.....	37 11 51.332	89 28 05.809		167 05 04.2	226 14 33.2	347 04 51.8	46 15 04.4	Grand Chain (M.R.C.).....	3.352727	2,252.8	7,391
								Thebes (M.R.C.).....	3.246197	1,762.8	5,783
								Hofner (M.R.C.).....	3.555644	3,594.5	11,793
Lassar (M.R.C.) (Ill.), 1880.....	37 11 05.793	89 26 14.927		33 30 37.9	117 10 56.0	213 30 07.7	297 09 49.0	Hofner (M.R.C.).....	3.348780	2,232.4	7,324
								Uncle Joe (M.R.C.).....	3.487712	3,074.1	10,086
								Thebes (M.R.C.).....	3.477475	3,002.4	9,850
Santa Fe (M.R.C.) (Ill.), 1880.....	37 10 05.132	89 25 27.228		90 12 40.6	147 49 27.6	270 11 41.6	327 48 58.8	Hofner (M.R.C.).....	3.381897	2,403.3	7,905
								Lassar (M.R.C.).....	3.344276	2,209.4	7,249
Commerce (M.R.C.), 1880.....	37 08 27.489	89 26 11.824		156 33 21.2	200 04 41.3	336 32 49.1	20 05 08.2	Hofner (M.R.C.).....	3.517238	3,290.3	10,795
								Santa Fe (M.R.C.).....	3.505816	3,204.9	10,515
Burnham (M.R.C.) (Ill.), 1880.....	37 08 31.398	89 24 31.061		87 14 03.5	154 22 48.9	267 13 02.7	334 22 15.0	Commerce (M.R.C.).....	3.396158	2,489.8	8,169
								Santa Fe (M.R.C.).....	3.505795	3,204.8	10,514
Powers Island (M.R.C.), 1880.....	37 07 26.423	89 24 38.347		129 13 05.8	185 07 48.7	309 12 09.4	5 07 53.1	Commerce (M.R.C.).....	3.473897	2,977.8	9,770
								Burnham (M.R.C.).....	3.303421	2,011.0	6,598
Atherton (M.R.C.) (Ill.), 1880.....	37 07 23.780	89 22 41.684		91 37 50.0	127 40 50.8	271 36 39.6	307 39 44.8	Powers Island (M.R.C.).....	3.459558	2,881.1	9,452
								Burnham (M.R.C.).....	3.532859	3,410.8	11,190
Goose Island (M.R.C.) (Ill.) 1880.....	37 05 35.923	89 22 57.418		143 49 12.7	186 39 47.3	323 48 11.8	6 39 56.8	Powers Island (M.R.C.).....	3.625376	4,220.6	13,847
								Atherton (M.R.C.).....	3.524722	3,347.5	10,983
Promised Land (M.R.C.) (Ill.), 1880.....	37 05 10.363	89 20 52.688		104 21 29.7	146 48 33.7	284 20 14.5	326 47 28.0	Goose Island (M.R.C.).....	3.502376	3,179.6	10,432
								Atherton (M.R.C.).....	3.691536	4,915.1	16,126
Speise's Mill (M.R.C.) (Ill.), 1880.....	37 05 29.843	89 17 58.212		82 04 52.3	116 40 18.8	262 03 07.1	296 37 27.9	Promised Land (M.R.C.).....	3.638561	4,350.7	14,274
								Atherton (M.R.C.).....	3.893823	7,831.1	25,693
Scudder (M.R.C.) (Ill.), 1880.....	37 04 25.034	89 18 33.868		112 11 02.2	203 47 09.9	292 09 38.5	23 47 31.4	Promised Land (M.R.C.).....	3.568513	3,702.7	12,148
								Speise's Mill (M.R.C.).....	3.339125	2,183.4	7,163
Missouri Sister (M.R.C.), 1880.....	37 04 41.932	89 16 50.193		77 27 01.1	135 22 52.8	257 26 04.0	315 22 17.2	Scudder (M.R.C.).....	3.379472	2,395.9	7,861
								Speise's Mill (M.R.C.).....	3.317040	2,075.1	6,808
Murray (M.R.C.) (Ill.), 1880.....	37 04 59.259	89 15 53.629		71 45 04.1	107 02 45.6	251 44 24.6	287 01 30.5	Missouri Sister (M.R.C.).....	3.231785	1,705.2	5,594
								Speise's Mill (M.R.C.).....	3.507597	3,218.1	10,558
Rouse (M.R.C.), 1880.....	37 03 34.597	89 15 26.501		132 12 00.1	165 36 05.6	312 11 04.2	345 35 49.2	Missouri Sister (M.R.C.).....	3.490046	3,090.6	10,140
								Murray (M.R.C.).....	3.430483	2,694.5	8,840
Dickey (M.R.C.) (Ill.), 1880.....	37 04 08.104	89 14 41.842		46 53 26.0	131 39 10.8	226 52 59.1	311 38 27.5	Rouse (M.R.C.).....	3.179367	1,511.4	4,959
								Murray (M.R.C.).....	3.375295	2,373.0	7,785
Taylor (M.R.C.), 1880.....	37 02 51.855	89 14 13.913		126 18 29.4	163 38 29.8	306 17 45.7	343 38 13.0	Rouse (M.R.C.).....	3.347425	2,225.5	7,301
								Dickey (M.R.C.).....	3.389113	2,449.7	8,037
Nimbus (M.R.C.) (Ill.), 1880.....	37 03 08.969	89 13 01.318		73 37 01.1	126 17 12.1	253 36 17.4	306 16 11.6	Taylor (M.R.C.).....	3.271793	1,869.8	6,135
								Dickey (M.R.C.).....	3.488662	3,068.8	10,108
Bowles (M.R.C.), 1880.....	37 01 02.538	89 12 29.807		142 38 43.2	168 42 09.8	322 37 40.5	348 41 50.8	Taylor (M.R.C.).....	3.627351	4,239.9	13,910
								Nimbus (M.R.C.).....	3.599279	3,974.5	13,040
Cairo north base (U.S.L.S.) (Ill.), 1876.....	37 02 21.864	89 11 30.477		30 57 21.2	102 54 24.5	210 56 45.5	282 52 46.1	Bowles (M.R.C.).....	3.455051	2,851.4	9,355
								Taylor (M.R.C.).....	3.617345	3,143.3	13,593
Cairo south base (U.S.L.S.) (Ill.), 1876.....	37 01 28.896	89 11 21.818		64 12 14.3	172 32 03.7	244 11 33.4	352 31 58.5	Bowles (M.R.C.).....	3.271081	1,866.7	6,124
								Cairo north base (U.S.L.S.).....	3.216641	1,646.8	5,403
Missouri (U.S.L.S.) (Ill.), 1876.....	37 01 09.549	89 11 09.549		214 11 15.9	250 57 36.5	34 11 52.8	70 58 18.6	Cairo north base (U.S.L.S.).....	3.430573	2,695.1	8,842
								Cairo south base (U.S.L.S.).....	3.262151	1,828.7	6,000
Ohio (U.S.L.S.) (Ky.), 1876.....	37 01 35.239	89 09 55.963		84 44 33.4	121 36 43.2	264 43 41.7	301 35 46.3	Cairo south base (U.S.L.S.).....	3.328609	2,131.1	6,992
								Cairo north base (U.S.L.S.).....	3.438176	2,742.7	8,998
Defiance (Cairo) (U.S.L.S.) (Ill.), 1876.....	36 59 47.927	89 09 30.253		138 28 15.9	169 08 17.7	318 27 08.8	349 08 52.3	Cairo south base (U.S.L.S.).....	3.618012	4,158.3	13,643
								Ohio (U.S.L.S.).....	3.527427	3,368.4	11,051
Greenfield (U.S.L.S.) (Ill.), 1876.....	36 59 01.607	89 11 49.869		188 40 57.8	247 30 56.6	8 41 14.7	07 32 20.6	Cairo south base (U.S.L.S.).....	3.662101	4,593.0	15,069
								Defiance (Cairo) (U.S.L.S.).....	3.572351	3,735.5	12,256
Birds Ferry (U.S.L.S.), 1876.....	36 58 20.745	89 09 57.355		114 21 54.1	193 59 30.6	294 20 46.4	13 59 46.9	Greenfield (U.S.L.S.).....	3.484926	3,054.4	10,021
								Defiance (Cairo) (U.S.L.S.).....	3.442434	2,789.7	9,087

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Birds Point (U.S.L.S.) (Ky.), 1876.....	36	59	06.096	64	19	09.8	244	17	59.1	Birds Ferry (U.S.L.S.).....	3.508512	3,224.9	10,580
	89	07	52.866	119	58	49.9	299	57	55.5	Defiance (Cairo) (U.S.L.S.).....	3.411805	2,581.1	8,468
Ferguson (U.S.L.S.) (Ky.), 1876.....	36	59	55.076	308	49	53.6	128	51	36.9	P.B.M. Wickliffe (M.R.C.).....	3.736507	5,451.4	17,885
	89	08	23.886	338	31	23.1	158	31	37.6	Birds Point (U.S.L.S.).....	3.210185	1,622.5	5,323
				22	30	50.8	202	30	13.9	Birds Point School (M.R.C.).....	3.598152	3,964.2	13,006
				82	21	38.2	262	20	58.3	Defiance (Cairo) (U.S.L.S.).....	3.219189	1,656.5	5,435
Fillmore (U.S.L.S.) (Ky.), 1876.....	36	59	17.168	320	20	53.6	140	21	39.0	P.B.M. Wickliffe (M.R.C.).....	3.465823	2,923.0	9,590
	89	06	47.615	57	24	39.3	237	23	04.5	Birds Point School (M.R.C.).....	3.665398	4,625.0	15,184
				79	11	31.4	259	10	47.9	Birds Point (U.S.L.S.).....	3.259853	1,819.1	5,968
				116	09	11.2	296	08	13.3	Ferguson (U.S.L.S.).....	3.423564	2,651.9	8,700
Price (U.S.L.S.), 1876.....	36	58	12.036	139	18	53.4	319	18	18.5	Birds Point (U.S.L.S.).....	3.341985	2,197.8	7,211
	89	07	01.933	190	00	03.7	10	00	12.3	Fillmore (U.S.L.S.).....	3.308364	2,038.8	6,689
				276	14	22.0	96	15	16.0	P.B.M. Wickliffe (M.R.C.).....	3.348807	2,232.6	7,325
Willow Creek (U.S.L.S.) (Ky.), 1876.....	36	57	53.872	110	20	00.5	290	19	23.8	Price (U.S.L.S.).....	3.207306	1,611.8	5,288
	89	06	00.833	155	44	44.7	335	44	16.6	Fillmore (U.S.L.S.).....	3.449690	2,816.4	9,240
Maybee (U.S.L.S.), 1876.....	36	56	59.698	175	04	34.3	355	04	20.7	Price (U.S.L.S.).....	3.340893	2,238.2	7,343
	89	06	54.167	218	18	29.0	38	19	01.1	Willow Creek (U.S.L.S.).....	3.328038	2,128.3	6,993
Island No. 1 (U.S.L.S.) (Ky.), 1876.....	36	56	19.781	132	01	25.5	312	00	52.3	Maybee (U.S.L.S.).....	3.264408	1,838.3	6,031
	89	05	58.975	179	05	29.6	359	05	28.5	Willow Creek (U.S.L.S.).....	3.462522	2,900.8	9,517
Norfolk (M.R.C.), 1880.....	36	55	23.553	175	04	56.1	355	04	49.9	Maybee (U.S.L.S.).....	3.473448	2,974.7	9,759
	89	06	43.861	212	39	06.7	32	39	33.7	Island No. 1 (U.S.L.S.).....	3.313593	2,058.7	6,754
Chute (M.R.C.) (Ky.), 1880.....	36	54	48.773	126	27	13.1	306	26	37.8	Norfolk (M.R.C.).....	3.256384	1,804.6	5,921
	89	05	45.216	173	04	48.0	353	04	39.7	Island No. 1 (U.S.L.S.).....	3.451172	2,826.0	9,272
Beckwith (M.R.C.), 1880.....	36	54	08.574	184	32	33.2	4	32	37.6	Norfolk (M.R.C.).....	3.365221	2,318.6	7,607
	89	06	51.280	232	50	38.6	52	51	18.3	Chute (M.R.C.).....	3.312157	2,051.9	6,732
Davidson (M.R.C.) (Ky.), 1880.....	36	53	33.625	135	09	38.5	315	09	12.5	Beckwith (M.R.C.).....	3.181683	1,519.4	4,985
	89	06	08.005	193	41	10.9	13	41	24.6	Chute (M.R.C.).....	3.377348	2,384.2	7,822
Cypress (M.R.C.), 1880.....	36	52	59.302	209	20	23.3	29	20	52.4	Beckwith (M.R.C.).....	3.389110	2,449.7	8,037
	89	07	39.763	245	01	23.0	65	02	18.1	Davidson (M.R.C.).....	3.399650	2,506.4	8,223
Putney (M.R.C.) (Ky.), 1880.....	36	52	43.717	108	55	21.8	288	54	47.8	Cypress (M.R.C.).....	3.170804	1,481.8	4,862
	89	06	43.158	209	29	55.4	29	30	16.5	Davidson (M.R.C.).....	3.247399	1,767.7	5,800
Campbell (M.R.C.) (Ky.), 1880.....	36	51	51.047	185	22	55.5	5	23	00.3	Cypress (M.R.C.).....	3.324867	2,113.3	6,933
	89	07	47.768	224	34	47.4	44	35	26.2	Putney (M.R.C.).....	3.357865	2,279.6	7,479
Irene (M.R.C.), 1880.....	36	52	23.078	219	12	46.0	39	13	08.1	Cypress (M.R.C.).....	3.158738	1,441.2	4,728
	89	08	16.557	324	09	40.5	144	09	57.8	Campbell (M.R.C.).....	3.085626	1,217.9	3,996
Island No. 2 (M.R.C.) (Ky.), 1880.....	36	51	16.928	190	48	27.2	10	48	36.6	Irene (M.R.C.).....	3.317215	2,075.9	6,811
	89	08	32.274	226	20	45.0	46	21	11.7	Campbell (M.R.C.).....	3.182896	1,523.7	4,999
Willow (M.R.C.), 1880.....	36	51	46.406	224	41	20.5	44	41	47.6	Irene (M.R.C.).....	3.201439	1,590.2	5,217
	89	09	01.709	321	15	09.7	141	15	27.4	Island No. 2 (M.R.C.).....	3.066353	1,165.1	3,822
Obrien (M.R.C.), 1880.....	36	51	15.711	227	52	49.1	47	53	14.4	Willow (M.R.C.).....	3.149499	1,410.9	4,629
	89	09	43.959	268	47	01.3	58	47	44.3	Island No. 2 (M.R.C.).....	3.249504	1,776.2	5,827
Island No. 3 (M.R.C.) (Ky.), 1880.....	36	50	30.099	144	33	31.2	324	33	07.0	Obrien (M.R.C.).....	3.237001	1,725.8	5,662
	89	09	03.562	208	13	57.8	28	14	16.6	Island No. 2 (M.R.C.).....	3.214442	1,638.5	5,376
Fan (M.R.C.), 1880.....	36	49	46.188	206	07	47.3	26	08	20.1	Obrien (M.R.C.).....	3.487681	3,073.8	10,085
	89	10	38.604	240	06	14.3	60	07	11.3	Island No. 3 (M.R.C.).....	3.433986	2,716.4	8,912
Parsons (M.R.C.) (Ky.), 1880.....	36	48	52.995	126	16	19.8	306	15	25.7	Fan (M.R.C.).....	3.442795	2,772.0	9,094
	89	09	08.421	182	18	12.7	2	18	15.6	Island No. 3 (M.R.C.).....	3.476497	2,995.7	9,828
Lucas (M.R.C.), 1880.....	36	48	32.464	156	05	04.7	336	04	40.3	Fan (M.R.C.).....	3.395513	2,486.1	8,156
	89	09	57.935	242	43	01.6	62	43	31.3	Parsons (M.R.C.).....	3.140153	1,380.9	4,531
Cannon (M.R.C.), 1880.....	36	47	52.830	122	01	13.1	302	00	25.8	Lucas (M.R.C.).....	3.382599	2,304.6	7,561
	89	08	39.106	158	36	22.3	338	36	04.7	Parsons (M.R.C.).....	3.299206	1,991.9	6,535
William (M.R.C.) (Ky.), 1880.....	36	48	19.243	45	37	56.8	225	37	36.7	Cannon (M.R.C.).....	3.066065	1,164.3	3,820
	89	08	05.533	123	43	33.1	303	42	55.4	Parsons (M.R.C.).....	3.272804	1,874.1	6,149
Tyler (M.R.C.), 1880.....	36	47	20.568	121	42	01.0	301	41	22.1	Cannon (M.R.C.).....	3.277108	1,892.8	6,210
	89	07	34.147	156	43	29.0	336	43	10.2	William (M.R.C.).....	3.294232	1,968.9	6,460
Iron Bank (M.R.C.) (Ky.), 1880.....	36	47	12.660	96	44	18.7	276	43	28.8	Tyler (M.R.C.).....	3.318023	2,079.8	6,823
	89	06	10.844	125	49	58.0	305	48	49.3	William (M.R.C.).....	3.544905	3,506.8	11,505
Fort Halleck (M.R.C.) (Ky.), 1880.....	36	46	06.477	151	43	23.4	331	42	53.7	Tyler (M.R.C.).....	3.413876	2,593.4	8,509
	89	06	44.595	202	18	13.4	22	18	33.6	Iron Bank (M.R.C.).....	3.343427	2,205.1	7,235
Belmont (M.R.C.), 1880.....	36	45	52.365	182	27	38.0	2	27	40.8	Tyler (M.R.C.).....	3.434791	2,721.4	8,928
	89	07	38.859	252	04	59.1	72	05	31.6	Fort Halleck (M.R.C.).....	3.150567	1,414.4	4,640
Thorn (M.R.C.) (Ky.), 1880.....	36	44	46.882	159	54	58.2	339	54	40.4	Belmont (M.R.C.).....	3.332281	2,149.2	7,051
	89	07	09.102	193	54	48.3	13	55	03.0	Fort Halleck (M.R.C.).....	3.402724	2,527.7	8,293

08207°-34-4

Station	Latitude and longitude			Azimuth	Back Azimuth	To station	Distance						
	°	'	"				Logarithm (meters)	Meters	Feet				
<i>Principal points—Continued</i>													
Wolf Island (M.R.C.) (Ky.), 1880.....	36	43	47.605	199	27	04.8	19	27	37.5	Belmont (M.R.C.).....	3.610509	4,078.6	13,381
	89	08	33.620	228	55	31.4	48	56	21.9	Thorn (M.R.C.).....	3.444253	2,781.3	9,125
Muscavalley (M.R.C.) (Ky.), 1880.....	36	42	46.506	155	46	35.4	335	46	15.0	Wolf Island (M.R.C.).....	3.314971	2,065.2	6,776
	89	07	59.470	198	36	38.3	18	37	08.4	Thorn (M.R.C.).....	3.592775	3,915.4	12,846
Gale (M.R.C.) (Ky.), 1880.....	36	42	28.261	192	28	05.1	12	28	18.1	Wolf Island (M.R.C.).....	3.398779	2,504.8	8,218
	89	08	55.415	247	56	44.9	67	57	18.3	Muscavalley (M.R.C.).....	3.175531	1,498.1	4,915
Auxiliary (M.R.C.) (Ky.), 1880.....	36	42	01.926	132	18	39.5	312	18	18.0	Gale (M.R.C.).....	3.081339	1,206.0	3,957
	89	08	19.484	199	52	20.2	19	52	32.1	Muscavalley (M.R.C.).....	3.164701	1,461.2	4,794
Short Stop (M.R.C.) (Ky.), 1880.....	36	41	41.434	223	22	19.8	43	22	52.6	Gale (M.R.C.).....	3.297947	1,985.9	6,515
	89	09	50.360	254	20	59.3	74	21	53.6	Auxiliary (M.R.C.).....	3.369705	2,342.6	7,686
Wiggins (M.R.C.) (Ky.), 1880.....	36	40	48.580	139	19	12.8	319	18	39.1	Short Stop (M.R.C.).....	3.332134	2,148.5	7,049
	89	08	53.946	179	19	12.2	359	19	11.3	Gale (M.R.C.).....	3.487544	3,072.9	10,082
Ferris Landing (M.R.C.), 1880.....	36	40	14.628	209	31	22.9	29	32	19.0	Gale (M.R.C.).....	3.675246	4,734.2	15,532
	89	10	29.406	246	10	12.9	66	11	09.9	Wiggins (M.R.C.).....	3.413482	2,591.1	8,501
Davis (M.R.C.) (Ky.), 1880.....	36	38	54.719	154	28	59.3	334	28	31.0	Ferris Landing (M.R.C.).....	3.436078	2,729.5	8,955
	89	09	42.067	198	47	45.8	18	48	14.5	Wiggins (M.R.C.).....	3.569078	3,707.5	12,164
Parker (M.R.C.), 1880.....	36	37	28.825	191	06	00.9	11	06	25.0	Ferris Landing (M.R.C.).....	3.716694	5,208.3	17,088
	89	11	09.786	219	27	12.1	39	28	04.5	Davis (M.R.C.).....	3.535205	3,429.3	11,251
Little Obion=P.B.M. ½ (M.R.C.) (Ky.), 1880.....	36	37	24.926	94	47	52.0	274	47	08.7	Parker (M.R.C.).....	3.257181	1,807.9	5,931
	89	09	57.279	187	41	39.4	7	41	48.5	Davis (M.R.C.).....	3.450878	2,824.1	9,265
Salmon Landing (M.R.C.) (Ky.), 1880.....	36	36	12.831	138	51	16.6	318	50	27.5	Parker (M.R.C.).....	3.492901	3,111.0	10,207
	89	09	47.403	173	36	41.5	353	36	35.7	Little Obion=P.B.M. ½ (M.R.C.).....	3.343437	2,205.1	7,235
Island No. 6 (M.R.C.), 1880.....	36	35	41.776	180	03	38.8	0	03	38.9	Parker (M.R.C.).....	3.518479	3,299.7	10,826
	89	11	09.926	244	58	29.2	64	59	18.4	Salmon Landing (M.R.C.).....	3.354782	2,263.5	7,426

Bayou du Chien (M.R.C.) (Ky.), 1880.....	36	34	41.899	159	51	21.1	349	51	13.2	Island No. 6 (M.R.C.).....	3.272991	1,875.0	6,152
	89	10	56.640	211	32	45.7	31	33	27.0	Salmon Landing (M.R.C.).....	3.517082	3,289.1	10,791
Hickman (M.R.C.) (Ky.), 1880.....	36	34	24.058	202	23	14.4	22	23	38.1	Island No. 6 (M.R.C.).....	3.413457	2,590.9	8,500
	89	11	49.625	247	20	10.1	67	20	41.7	Bayou du Chien (M.R.C.).....	3.154589	1,427.5	4,683
Wasp (M.R.C.), 1880.....	36	34	52.515	278	43	09.4	98	44	00.5	Bayou du Chien (M.R.C.).....	3.333794	2,156.7	7,076
	89	12	22.386	317	07	09.1	137	07	28.6	Hickman (M.R.C.).....	3.078098	1,197.0	3,927
Bushart (M.R.C.) (Ky.), 1880.....	36	34	00.801	221	58	28.1	41	59	02.5	Wasp (M.R.C.).....	3.331287	2,144.3	7,035
	89	13	20.071	252	18	42.4	72	19	36.3	Hickman (M.R.C.).....	3.372983	2,360.4	7,744
Ballard (M.R.C.), 1880.....	36	34	41.238	283	05	16.5	103	06	11.1	Hickman (M.R.C.).....	3.368690	2,337.2	7,668
	89	13	21.184	358	43	42.4	178	43	43.1	Bushart (M.R.C.).....	3.095773	1,246.7	4,090
Keiser (M.R.C.) (Ky.), 1880.....	36	33	55.209	234	47	23.0	54	48	11.2	Ballard (M.R.C.).....	3.391133	2,461.1	8,074
	89	14	42.064	285	09	38.3	85	10	27.2	Bushart (M.R.C.).....	3.310925	2,046.1	6,713
Porter (M.R.C.), 1880.....	36	34	36.953	301	04	30.1	121	05	14.5	Porter (M.R.C.).....	3.334159	2,158.5	7,082
	89	14	34.422	8	24	04.7	188	23	00.2	Keiser (M.R.C.).....	3.114169	1,300.7	4,267
Warren (M.R.C.) (Ky.), 1880.....	36	34	18.843	257	26	39.8	77	27	39.8	Porter (M.R.C.).....	3.409852	2,569.5	8,430
	89	16	15.300	287	26	13.5	107	27	09.0	Keiser (M.R.C.).....	3.385620	2,430.1	7,973
Brown (M.R.C.), 1880.....	36	35	50.823	321	34	52.4	141	36	00.1	Keiser (M.R.C.).....	3.657812	4,547.9	14,921
	89	16	35.717	349	50	55.3	169	51	07.5	Warren (M.R.C.).....	3.459434	2,890.3	9,450
French's Point (M.R.C.) (Ky.), 1880.....	36	35	27.455	235	32	01.0	55	32	26.1	Brown (M.R.C.).....	3.104790	1,272.9	4,176
	89	17	17.938	323	37	48.2	143	38	25.5	Warren (M.R.C.).....	3.419357	2,626.4	8,617
Island No. 8 (M.R.C.) (Ky.), 1880.....	36	36	19.008	287	20	09.2	107	21	15.9	Brown (M.R.C.).....	3.464507	2,914.1	9,561
	89	18	27.632	312	31	30.9	132	32	12.5	French's Point (M.R.C.).....	3.371203	2,350.7	7,712
Ray (M.R.C.), 1880.....	36	37	05.186	317	18	45.8	137	19	36.5	Brown (M.R.C.).....	3.493875	3,118.0	10,230
	89	18	00.767	25	07	50.0	205	07	34.0	Island No. 8 (M.R.C.).....	3.196509	1,672.2	5,158
St. James (M.R.C.), 1880.....	36	37	46.076	304	52	23.3	124	53	06.7	Ray (M.R.C.).....	3.343234	2,204.1	7,231
	89	19	13.538	336	58	07.6	156	58	35.0	Island No. 8 (M.R.C.).....	3.464817	2,916.2	9,568
Woodcock (M.R.C.) (Ky.), 1880.....	36	37	06.162	211	59	40.5	31	59	58.9	St. James (M.R.C.).....	3.161591	1,450.7	4,760
	89	19	44.476	270	39	36.3	90	40	38.1	Ray (M.R.C.).....	3.411156	2,577.2	8,455
Hubbard (M.R.C.), 1880.....	36	37	42.759	267	36	09.9	87	37	08.7	St. James (M.R.C.).....	3.389732	2,453.2	8,049
	89	20	52.190	303	50	06.2	123	50	46.6	Woodcock (M.R.C.).....	3.306573	2,025.7	6,646
Kase (M.R.C.) (Ky.), 1880.....	36	36	46.228	185	36	27.1	5	36	31.2	Hubbard (M.R.C.).....	3.243269	1,750.9	5,744
	89	20	59.076	234	51	56.7	54	52	59.0	St. James (M.R.C.).....	3.506005	3,206.3	10,519
Lovalle (M.R.C.), 1880.....	36	36	26.227	223	20	40.9	43	21	34.3	Hubbard (M.R.C.).....	3.511115	3,244.3	10,644
	89	22	21.815	253	18	11.1	73	19	00.4	Kase (M.R.C.).....	3.331760	2,146.6	7,043
Esley (M.R.C.) (Ky.), 1880.....	36	35	45.521	154	40	21.0	334	40	06.8	Lovalle (M.R.C.).....	3.142460	1,388.2	4,554
	89	21	57.919	218	00	14.8	38	00	49.9	Kase (M.R.C.).....	3.375657	2,375.0	7,792

Mississippi River arc, second-order triangulation—Continued

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Phillippo (M.R.C.), 1880.....	36 35 04.791	89 22 55.694	198 32 32.4	228 50 09.0	18 32 52.6	48 50 43.4	15 32 52.6	45 50 43.4	Lovalle (M.R.C.).....	3.422875	2,647.7	8,687	
									Esley (M.R.C.).....	3.280482	1,907.6	6,259	
Mitcham (M.R.C.) (Ky.), 1880.....	36 34 22.082	89 22 35.881	159 29 16.0	200 08 48.9	339 29 04.2	20 09 11.5	339 29 04.2	20 09 11.5	Phillippo (M.R.C.).....	3.147885	1,405.6	4,612	
									Esley (M.R.C.).....	3.437694	2,739.6	8,988	
Abbot (M.R.C.), 1880.....	36 33 55.681	89 23 36.347	205 22 47.6	241 34 11.4	25 23 11.8	61 34 47.4	25 23 11.8	61 34 47.4	Phillippo (M.R.C.).....	3.372522	2,357.9	7,736	
									Mitcham (M.R.C.).....	3.232888	1,709.6	5,609	
Old J.B. (M.R.C.) (Ky.), 1880.....	36 33 11.764	89 23 20.094	163 22 41.3	206 53 32.4	343 22 31.6	26 53 58.7	343 22 31.6	26 53 58.7	Abbot (M.R.C.).....	3.150071	1,412.8	4,635	
									Mitcham (M.R.C.).....	3.385677	2,430.4	7,974	
Phillips Landing (M.R.C.), 1880.....	36 32 48.169	89 24 39.779	217 09 32.2	249 50 30.8	37 10 09.9	69 51 18.2	37 10 09.9	69 51 18.2	Abbot (M.R.C.).....	3.416884	2,611.3	8,567	
									Old J.B. (M.R.C.).....	3.324504	2,111.1	6,926	
Lester (M.R.C.) (Ky.), 1880.....	36 31 16.646	89 24 20.290	170 15 02.7	202 52 27.5	350 14 51.1	22 53 03.3	350 14 51.1	22 53 03.3	Phillips Landing (M.R.C.).....	3.456742	2,862.5	9,391	
									Old J.B. (M.R.C.).....	3.585619	3,851.4	12,636	
Brier (M.R.C.), 1880.....	36 31 15.510	89 25 25.757	201 49 13.0	268 45 46.8	21 49 40.4	88 46 25.8	21 49 40.4	88 46 25.8	Phillips Landing (M.R.C.).....	3.488078	3,076.6	10,094	
									Lester (M.R.C.).....	3.211978	1,629.2	5,345	
Boom (M.R.C.) (Tenn.), 1880.....	36 29 47.647	89 24 29.171	152 32 02.3	184 36 18.7	332 31 28.6	4 36 24.0	332 31 28.6	4 36 24.0	Brier (M.R.C.).....	3.484651	3,052.5	10,015	
									Lester (M.R.C.).....	3.439680	2,752.2	9,030	
Birdsall (M.R.C.), 1880.....	36 30 00.491	89 25 23.812	213 56 59.1	286 13 39.5	33 57 36.9	106 14 12.0	33 57 36.9	106 14 12.0	Lester (M.R.C.).....	3.451784	2,830.1	9,285	
									Boom (M.R.C.).....	3.151166	1,416.3	4,647	
Kentuck (M.R.C.) (Tenn.), 1880.....	36 28 49.442	89 24 51.600	159 53 43.8	197 16 59.5	339 53 24.6	17 17 12.8	339 53 24.6	17 17 12.8	Birdsall (M.R.C.).....	3.367757	2,332.2	7,652	
									Boom (M.R.C.).....	3.273918	1,879.0	6,165	
Donaldson (M.R.C.), 1880.....	36 28 56.477	89 26 28.158	241 57 07.3	275 08 49.7	61 58 18.0	95 09 47.1	61 58 18.0	95 09 47.1	Boom (M.R.C.).....	3.525750	3,355.4	11,009	
									Kentuck (M.R.C.).....	3.382623	2,413.4	7,918	
Tennessee (M.R.C.) (Tenn.), 1880.....	36 26 57.051	89 26 04.385	170 52 03.9	207 36 31.7	350 51 49.7	27 37 14.9	350 51 49.7	27 37 14.9	Donaldson (M.R.C.).....	3.571525	3,728.4	12,232	
									Kentuck (M.R.C.).....	3.592140	3,909.7	12,827	
Grampus (M.R.C.) (Tenn.), 1880.....	36 28 35.282	89 28 36.709	258 27 04.0	308 35 20.3	78 28 20.3	128 36 50.8	78 28 20.3	128 36 50.8	Donaldson (M.R.C.).....	3.514033	3,266.1	10,716	
									Tennessee (M.R.C.).....	3.686018	4,853.1	15,922	
State line (M.R.C.) (Tenn.), 1880.....	36 29 50.934	89 28 59.934	293 56 39.4	320 47 28.2	113 58 09.5	140 49 12.5	113 58 09.5	140 49 12.5	Donaldson (M.R.C.).....	3.616358	4,133.9	13,563	
									Tennessee (M.R.C.).....	3.839835	6,915.7	22,689	
									Grampus (M.R.C.).....	3.380654	2,402.4	7,882	
Bryan's (M.R.C.), 1880.....	36 29 46.993	89 27 38.098	33 26 29.8	93 26 44.0	213 25 54.9	273 25 55.3	213 25 54.9	273 25 55.3	Grampus (M.R.C.).....	3.422865	2,647.7	8,687	
									State line (M.R.C.).....	3.309717	2,040.4	6,694	
Everett (M.R.C.) (Ky.), 1880.....	36 31 17.169	89 29 09.868	320 35 46.1	354 41 10.0	140 36 40.7	174 41 15.9	140 36 40.7	174 41 15.9	Bryan's (M.R.C.).....	3.550069	3,598.1	11,805	
									State line (M.R.C.).....	3.426442	2,669.6	8,759	
Bob Watson (M.R.C.) (Ky.), 1880.....	36 31 27.859	89 31 45.298	274 51 25.8	305 58 04.6	94 52 58.3	125 59 43.0	94 52 58.3	125 59 43.0	Everett (M.R.C.).....	3.588951	3,881.1	12,733	
									State line (M.R.C.).....	3.706294	5,085.0	16,683	
Compromise (M.R.C.) (Tenn.), 1880.....	36 29 52.717	89 31 19.091	167 27 55.0	270 53 51.2	347 27 39.4	90 55 14.0	347 27 39.4	90 55 14.0	Bob Watson (M.R.C.).....	3.477739	3,004.3	9,857	
									State line (M.R.C.).....	3.539544	3,463.73	11,363.9	
Island No. 11 (M.R.C.), 1880.....	36 28 53.382	89 32 55.324	200 05 46.0	232 37 42.2	20 06 27.6	52 38 39.4	20 06 27.6	52 38 39.4	Bob Watson (M.R.C.).....	3.705044	5,070.4	16,635	
									Compromise (M.R.C.).....	3.479096	3,013.7	9,887	
Beshire (M.R.C.) (Tenn.), 1880.....	36 27 27.928	89 32 12.275	157 51 43.5	196 31 08.6	337 51 17.9	16 31 40.2	337 51 17.9	16 31 40.2	Island No. 11 (M.R.C.).....	3.453886	2,843.7	9,330	
									Compromise (M.R.C.).....	3.667935	4,655.2	15,273	
Point Pleasant (M.R.C.), 1880.....	36 26 52.066	89 33 21.483	189 52 41.6	237 19 05.8	9 52 57.1	57 19 46.9	9 52 57.1	57 19 46.9	Island No. 11 (M.R.C.).....	3.579292	3,795.7	12,453	
									Beshire (M.R.C.).....	3.311216	2,047.5	6,718	
Lazalla (M.R.C.), 1880.....	36 25 17.799	89 31 56.326	143 52 40.7	174 20 43.3	323 51 50.1	354 20 33.8	323 51 50.1	354 20 33.8	Point Pleasant (M.R.C.).....	3.555997	3,597.5	11,803	
									Beshire (M.R.C.).....	3.605377	4,030.7	13,224	
Cronin (M.R.C.) (Tenn.), 1880.....	36 26 15.374	89 31 34.650	116 55 26.0	113 02 16.2	196 56 13.1	293 01 12.7	196 56 13.1	293 01 12.7	Lazalla (M.R.C.).....	3.288336	1,855.0	6,086	
									Point Pleasant (M.R.C.).....	3.461064	2,891.1	9,485	
Nall (M.R.C.) (Tenn.), 1880.....	36 25 01.201	89 30 46.320	106 21 15.6	152 13 58.9	286 20 34.0	332 13 30.2	286 20 34.0	332 13 30.2	Lazalla (M.R.C.).....	3.259482	1,817.5	5,963	
									Cronin (M.R.C.).....	3.412270	2,583.9	8,477	
Gold (M.R.C.), 1880.....	36 24 15.398	89 31 31.479	162 09 38.6	218 33 00.0	342 09 23.8	38 33 26.8	342 09 23.8	38 33 26.8	Lazalla (M.R.C.).....	3.305473	2,020.6	6,629	
									Nall (M.R.C.).....	3.256551	1,805.3	5,923	
Phillips (M.R.C.), 1880.....	36 23 53.199	89 30 47.133	121 46 10.5	180 33 13.0	301 45 44.2	0 33 13.5	301 45 44.2	0 33 13.5	Gold (M.R.C.).....	3.113851	1,299.7	4,264	
									Nall (M.R.C.).....	3.321418	2,096.1	6,877	
New York (M.R.C.) (Tenn.), 1880.....	36 24 04.853	89 29 41.681	77 35 05.4	137 09 56.5	257 34 26.5	317 09 18.1	257 34 26.5	317 09 18.1	Phillips (M.R.C.).....	3.222739	1,670.1	5,479	
									Nall (M.R.C.).....	3.374497	2,368.6	7,771	
Buddell (M.R.C.), 1880.....	36 23 01.484	89 30 42.294	175 40 26.5	217 42 42.8	355 40 23.6	37 43 18.8	355 40 23.6	37 43 18.8	Phillips (M.R.C.).....	3.203736	1,598.6	5,245	
									New York (M.R.C.).....	3.392556	2,469.2	8,101	
Tiptonville (M.R.C.) (Tenn.), 1880.....	36 22 55.056	89 29 27.537	96 04 32.7	170 41 46.2	276 03 48.4	350 41 37.9	276 03 48.4	350 41 37.9	Buddell (M.R.C.).....	3.272719	1,873.8	6,148	
									New York (M.R.C.).....	3.338468	2,180.1	7,153	
Reel Foot (M.R.C.) (Tenn.), 1880.....	36 21 47.253	89 31 15.500	199 53 09.3	232 09 36.8	19 53 29.0	52 10 40.8	19 53 29.0	52 10 40.8	Buddell (M.R.C.).....	3.386167	2,433.1	7,983	
									Tiptonville (M.R.C.).....	3.532427	3,407.4	11,179	

Mississippi River arc, second-order triangulation—Continued

Station	Latitude and longitude			Azimuth	Back Azimuth	To station	Distance		
	°	'	"				Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>									
Turkey (M.R.C.), 1880.....	36 22 16.730	89 32 14.787		239 05 56.4	59 06 51.3	Buddell (M.R.C.).....	3.429213	2,686.7	8,815
				301 34 31.9	121 35 07.1	Reel Foot (M.R.C.).....	3.239280	1,734.9	5,692
Riley (M.R.C.) (Tenn.), 1880.....	36 21 28.784	89 32 56.179		214 55 17.8	34 55 42.4	Turkey (M.R.C.).....	3.255863	1,802.4	5,913
				257 12 49.4	77 13 49.2	Reel Foot (M.R.C.).....	3.410579	2,573.8	8,444
Stewart (M.R.C.), 1880.....	36 22 21.953	89 33 58.709		273 32 54.2	93 33 55.9	Turkey (M.R.C.).....	3.414232	2,595.6	8,516
				316 25 38.8	136 26 15.9	Riley (M.R.C.).....	3.354465	2,261.9	7,421
Joe Eckles (M.R.C.) (Tenn.), 1880.....	36 20 59.048	89 34 38.178		201 03 27.3	21 03 50.7	Stewart (M.R.C.).....	3.437480	2,738.3	8,984
				250 10 25.9	70 11 26.4	Riley (M.R.C.).....	3.431902	2,703.3	8,869
Atkinson (M.R.C.), 1880.....	36 21 27.028	89 35 57.766		240 17 26.2	60 18 36.8	Stewart (M.R.C.).....	3.533645	3,417.0	11,211
				293 28 57.7	113 29 44.9	Joe Eckles (M.R.C.).....	3.335204	2,163.7	7,099
Solitude (M.R.C.), 1880.....	36 19 32.668	89 35 55.228		178 58 17.3	358 58 15.8	Atkinson (M.R.C.).....	3.547216	3,525.5	11,567
				215 48 43.4	35 49 29.1	Joe Eckles (M.R.C.).....	3.516332	3,283.5	10,773
Bass (M.R.C.) (Tenn.), 1880.....	36 18 53.436	89 34 05.089		113 45 56.2	293 44 51.0	Solitude (M.R.C.).....	3.477366	3,001.7	9,848
				167 58 13.0	347 57 53.5	Joe Eckles (M.R.C.).....	3.597552	3,958.7	12,988
Ingram (M.R.C.), 1880.....	36 18 06.318	89 34 37.974		144 05 54.9	324 05 09.2	Solitude (M.R.C.).....	3.516671	3,286.0	10,781
				209 27 35.7	29 27 55.2	Bass (M.R.C.).....	3.222206	1,668.0	5,472
Royal Bill (M.R.C.) (Tenn.), 1880.....	36 17 48.122	89 33 28.746		107 59 34.6	287 58 53.6	Ingram (M.R.C.).....	3.259136	1,816.1	5,958
				155 45 22.1	335 45 00.6	Bass (M.R.C.).....	3.343982	2,207.9	7,244
Balson (M.R.C.), 1880.....	36 17 08.645	89 34 06.679		156 17 13.5	336 16 55.0	Ingram (M.R.C.).....	3.288153	1,941.6	6,370
				217 52 38.6	37 53 01.1	Royal Bill (M.R.C.).....	3.187979	1,541.6	5,058
River Bed (M.R.C.) (Tenn.), 1880.....	36 16 23.320	89 32 50.022		126 08 38.1	306 07 52.8	Balson (M.R.C.).....	3.374555	2,368.9	7,772
				159 42 46.9	339 42 24.1	Royal Bill (M.R.C.).....	3.445097	2,786.7	9,143
Island No. 14 (M.R.C.), 1880.....	36 15 57.197	89 34 23.068		190 32 23.9	10 32 33.7	Balson (M.R.C.).....	3.350250	2,240.0	7,349
				250 52 38.5	70 53 33.6	River Bed (M.R.C.).....	3.390725	2,458.8	8,067
Dr. Smith (M.R.C.) (Tenn.), 1880.....	36 14 44.638	89 34 33.032		186 19 36.8	6 19 42.7	Island No. 14 (M.R.C.).....	3.352212	2,250.2	7,383
				220 12 15.4	40 13 16.4	River Bed (M.R.C.).....	3.600209	3,983.0	13,068
Garrett (M.R.C.), 1880.....	36 15 25.144	89 36 11.873		249 59 52.9	70 00 57.3	Island No. 14 (M.R.C.).....	3.460826	2,889.5	9,480
				296 49 41.7	116 50 40.2	Dr. Smith (M.R.C.).....	3.441785	2,765.6	9,073
Le Duke (M.R.C.) (Tenn.), 1880.....	36 14 32.777	89 36 36.292		200 41 24.6	20 41 39.1	Garrett (M.R.C.).....	3.236886	1,725.4	5,661
				263 12 56.3	83 14 09.3	Dr. Smith (M.R.C.).....	3.491262	3,099.3	10,168
Hathaway (M.R.C.) (Tenn.), 1880.....	36 15 05.167	89 37 53.552		256 21 24.5	76 22 25.7	Garrett (M.R.C.).....	3.416986	2,612.1	8,570
				297 21 24.3	117 22 10.0	Le Duke (M.R.C.).....	3.336868	2,172.0	7,126
Mott (M.R.C.), 1880.....	36 16 02.986	89 38 46.082		286 50 37.1	106 52 09.0	Garrett (M.R.C.).....	3.604477	4,022.3	13,196
				323 38 55.1	143 39 26.2	Hathaway (M.R.C.).....	3.344901	2,212.6	7,259
Gayosa (M.R.C.), 1880.....	36 15 22.783	89 40 48.434		247 54 24.4	67 55 36.7	Mott (M.R.C.).....	3.517996	3,296.1	10,814
				277 04 28.1	97 06 11.5	Hathaway (M.R.C.).....	3.643417	4,399.6	14,434
Myers (M.R.C.) (Tenn.), 1880.....	36 13 39.781	89 39 46.823		154 09 07.1	334 08 30.7	Gayosa (M.R.C.).....	3.547510	3,527.8	11,574
				198 57 24.8	18 58 00.7	Mott (M.R.C.).....	3.669056	4,667.2	15,312
				227 03 09.0	47 04 16.0	Hathaway (M.R.C.).....	3.586975	3,863.5	12,675
Warden (M.R.C.), 1880.....	36 13 46.324	89 41 02.118		186 33 17.2	6 33 25.3	Gayosa (M.R.C.).....	3.476058	2,992.7	9,819
				276 06 55.7	96 07 40.2	Myers (M.R.C.).....	3.276728	1,891.2	6,205
Ferris (M.R.C.), 1880.....	36 12 30.520	89 40 08.087		149 59 39.7	329 59 07.8	Warden (M.R.C.).....	3.431069	2,698.2	8,852
				193 58 09.9	13 58 22.5	Myers (M.R.C.).....	3.342393	2,199.8	7,217
Island No. 15 (M.R.C.) (Tenn.), 1880.....	36 12 44.622	89 39 11.264		72 58 45.4	252 58 11.8	Ferris (M.R.C.).....	3.171566	1,484.5	4,870
				152 25 16.1	332 24 55.1	Myers (M.R.C.).....	3.282877	1,918.1	6,293
Caruthersville (M.R.C.), 1880.....	36 11 41.971	89 38 37.123		123 22 19.8	303 21 26.0	Ferris (M.R.C.).....	3.434714	2,720.9	8,927
				156 10 22.7	336 10 02.5	Island No. 15 (M.R.C.).....	3.324492	2,111.0	6,926
Perkins (M.R.C.) (Tenn.), 1880.....	36 12 05.057	89 37 07.287		72 25 12.7	252 24 19.6	Caruthersville (M.R.C.).....	3.371984	2,355.0	7,726
				111 29 59.0	291 28 45.7	Island No. 15 (M.R.C.).....	3.522302	3,328.9	10,922
Harbert (M.R.C.), 1880.....	36 11 03.659	89 37 22.602		122 23 19.5	302 22 35.5	Caruthersville (M.R.C.).....	3.343377	2,204.8	7,234
				191 26 40.3	11 26 49.4	Perkins (M.R.C.).....	3.285740	1,930.8	6,335
Williams (M.R.C.) (Tenn.), 1880.....	36 11 38.985	89 36 26.238		52 17 44.7	232 17 11.4	Harbert (M.R.C.).....	3.250456	1,780.1	5,840
				128 05 53.4	308 05 29.2	Perkins (M.R.C.).....	3.114773	1,302.5	4,273
Island No. 16 (M.R.C.), 1880.....	36 10 25.921	89 36 41.580		138 36 46.2	318 36 22.0	Harbert (M.R.C.).....	3.190448	1,550.4	5,087
				189 39 35.6	9 39 44.7	Williams (M.R.C.).....	3.358768	2,284.4	7,495
Linwood (M.R.C.) (Tenn.), 1880.....	36 09 44.335	89 35 20.560		122 20 25.1	302 19 37.3	Island No. 16 (M.R.C.).....	3.379579	2,396.5	7,863
				155 05 33.4	335 04 54.9	Williams (M.R.C.).....	3.590652	3,896.3	12,783
Johnson (M.R.C.), 1880.....	36 08 46.546	89 37 15.192		195 20 09.1	15 20 28.9	Island No. 16 (M.R.C.).....	3.501889	3,176.1	10,420
				238 07 33.2	58 08 40.8	Linwood (M.R.C.).....	3.528138	3,373.9	11,069

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Booth's Point (M.R.C.) (Tenn.), 1880	36 07 05.604	155 54 24.4	335 53 51.6	Johnson (M.R.C.)	3.532533	3,408.3	11,182						
	89 36 19.538	196 46 04.2	16 46 39.0	Linwood (M.R.C.)	3.708402	5,109.8	16,764						
Wilks (M.R.C.), 1880	36 07 16.992	196 35 15.8	16 35 35.2	Johnson (M.R.C.)	3.459411	2,880.1	9,449						
	89 37 48.081	279 00 01.2	99 00 53.4	Booth's Point (M.R.C.)	3.350625	2,241.9	7,355						
Parker (M.R.C.) (Tenn.), 1880	36 06 22.335	150 27 23.3	330 27 00.8	Wilks (M.R.C.)	3.287012	1,936.5	6,353						
	89 37 09.899	223 21 34.2	43 22 03.9	Booth's Point (M.R.C.)	3.263496	1,834.4	6,018						
Sand Bar (M.R.C.), 1880	36 06 02.015	214 07 34.0	34 08 10.9	Wilks (M.R.C.)	3.445885	2,791.8	9,159						
	89 38 50.712	256 02 38.3	76 03 37.7	Parker (M.R.C.)	3.414685	2,598.3	8,525						
Bells Point (M.R.C.) (Tenn.), 1880	36 04 57.510	162 48 47.0	342 48 32.5	Sand Bar (M.R.C.)	3.318295	2,081.1	6,828						
	89 38 26.128	216 06 02.1	36 06 47.0	Parker (M.R.C.)	3.510010	3,236.0	10,617						
Island No. 18 (M.R.C.), 1880	36 04 50.264	221 34 31.5	41 35 17.7	Sand Bar (M.R.C.)	3.470778	2,956.5	9,700						
	89 40 09.145	265 02 22.3	85 03 23.0	Bells Point (M.R.C.)	3.412825	2,587.2	8,488						
McAllister No. 2 (M.R.C.) (Tenn.), 1880	36 03 46.710	83 29 07.7	263 28 08.1	Cottonwood south base	3.406920	2,552.2	8,373						
	89 39 57.069	171 13 53.8	351 13 46.7	Island No. 18 (M.R.C.)	3.297105	1,982.0	6,503						
		226 11 37.4	46 12 31.0	Bells Point (M.R.C.)	3.498701	3,152.8	10,344						
Cottonwood north base (P. B. M. north base (M. R. C.)), 1879	36 04 13.543	223 07 04.4	43 07 29.3	Island No. 18 (M.R.C.)	3.100506	1,550.6	5,087						
	89 40 51.504	301 15 28.6	121 16 00.6	McAllister No. 2 (M.R.C.)	3.202387	1,593.6	5,228						
		46 24 50.1	226 24 22.5	Cottonwood south base	3.208507	1,619.97	5,314.9						
Mitchells Point (M.R.C.) (Tenn.) 1880	36 03 00.387	131 31 25.4	311 30 55.2	Cottonwood south base	3.234645	1,716.5	5,632						
	89 40 47.040	177 09 50.9	357 09 48.3	Cottonwood north base	3.353637	2,257.5	7,406						
Lindale (M.R.C.), 1880	36 02 27.913	219 39 02.3	39 39 44.0	Cottonwood south base	3.443723	2,777.9	9,114						
	89 42 49.217	251 52 07.3	71 53 19.2	Mitchells Point (M.R.C.)	3.507574	3,217.9	10,557						
Franklin (M.R.C.) (Tenn.), 1880	36 01 02.120	152 06 34.8	332 06 01.9	Lindale (M.R.C.)	3.475949	2,991.9	9,816						
	89 41 53.309	204 28 01.4	24 28 40.4	Mitchells Point (M.R.C.)	3.602596	4,004.9	13,139						
Missouri (M.R.C.), 1880	36 00 31.541	198 37 25.4	18 37 53.8	Lindale (M.R.C.)	3.578066	3,785.0	12,418						
	89 43 37.503	250 07 55.2	70 08 56.5	Franklin (M.R.C.)	3.443041	2,774.2	9,102						
Island No. 21 (M.R.C.) (Tenn.), 1880	35 59 55.139	128 35 50.8	308 35 17.8	Missouri (M.R.C.)	3.254951	1,798.7	5,901						
	89 42 41.371	210 14 23.8	30 14 52.1	Franklin (M.R.C.)	3.378340	2,389.7	7,840						
Arkansas (M.R.C.) (Ark.), 1880	35 59 05.565	172 07 28.7	352 07 20.1	Missouri (M.R.C.)	3.427343	2,675.1	8,777						
	89 43 22.867	214 13 26.1	34 13 50.5	Island No. 21 (M.R.C.)	3.266689	1,847.9	6,063						
Stevens (M.R.C.) (Tenn.), 1880	35 58 49.639	107 55 17.5	287 54 41.9	Arkansas (M.R.C.)	3.202919	1,595.6	5,235						
	89 42 22.264	166 39 50.0	346 39 38.8	Island No. 21 (M.R.C.)	3.316959	2,074.7	6,807						
Czar (M.R.C.) (Ark.), 1880	35 57 38.462	161 04 08.6	341 03 47.0	Arkansas (M.R.C.)	3.453039	2,838.2	9,312						
	89 42 46.110	195 14 00.4	15 14 14.4	Stevens (M.R.C.)	3.356726	2,273.7	7,460						
Mrs. H. (M.R.C.) (Tenn.), 1880	35 57 08.151	123 39 39.4	303 39 06.5	Czar (M.R.C.)	3.226760	1,685.6	5,530						
	89 41 50.121	165 33 49.6	345 33 30.7	Stevens (M.R.C.)	3.509198	3,230.0	10,597						
Slater (M.R.C.) (Tenn.), 1880	35 57 38.188	56 01 44.2	236 01 12.0	Mrs. H. (M.R.C.)	3.219212	1,656.6	5,435						
	89 40 55.302	90 10 58.8	270 09 53.7	Czar (M.R.C.)	3.443529	2,776.7	9,110						
Casselberry (M.R.C.) (Ark.), 1880	35 56 34.932	123 16 28.9	303 15 52.3	Mrs. H. (M.R.C.)	3.270998	1,866.4	6,123						
	89 40 47.858	174 32 05.8	354 32 01.4	Slater (M.R.C.)	3.291928	1,958.5	6,426						
Michell = B.M. $\frac{36}{2}$ (M.R.C.) (Tenn.), 1880	35 56 49.022	77 52 02.8	257 51 15.5	Casselberry (M.R.C.)	3.314951	2,065.1	6,775						
	89 39 27.304	124 30 06.1	304 29 14.4	Czar (M.R.C.)	3.427443	2,675.7	8,779						
Wright's Point (M.R.C.) (Ark.), 1880	35 56 10.266	114 53 33.4	294 52 55.0	Casselberry (M.R.C.)	3.256835	1,806.5	5,927						
	89 39 42.479	197 39 42.2	17 39 51.1	Michell (M.R.C.)	3.098160	1,253.6	4,113						
Obion = P.B.M. 32 (M.R.C.) (Tenn.), 1880	35 56 02.789	95 52 54.8	275 52 02.3	Wright's Point (M.R.C.)	3.352459	2,251.4	7,386						
	89 38 13.133	127 28 31.0	307 27 47.4	Michell (M.R.C.)	3.369654	2,342.4	7,685						
Worthen (M.R.C.) (Ill.), 1880	37 46 13.361	15 25 41.0	195 24 42.3	Fountain Bluff (M.R.C.)	3.946860	8,848.3	29,030						
	89 28 22.751	111 02 19.8	290 56 01.4	O'Harrarh (M.R.C.)	4.208996	16,180.7	53,086						
Backbone = B.M. $\frac{26}{4}$ (M.R.C.), 1880	37 44 48.649	119 16 24.6	299 11 46.1	Killion (M.R.C.)	4.105524	12,750.4	41,832						
	89 39 51.760	191 45 13.8	11 45 57.6	O'Harrarh (M.R.C.)	3.933839	8,587.0	28,173						
		261 08 20.4	81 15 22.1	Worthen (M.R.C.)	4.232152	17,066.8	55,993						
		292 07 21.3	112 13 23.9	Fountain Bluff (M.R.C.)	4.195376	15,681.1	51,447						
Manskear (M.R.C.) (Ill.), 1880	37 51 54.638	298 17 11.7	118 20 51.8	O'Harrarh (M.R.C.)	3.998467	9,964.8	32,693						
	89 44 39.023	30 39 59.3	210 38 16.6	Killion (M.R.C.)	3.904610	8,028.0	26,339						
Chester lower base (M.R.C.), 1880	37 49 28.420	67 12 53.5	247 10 30.5	Killion (M.R.C.)	3.791531	6,187.7	20,301						
	89 43 33.201	160 21 34.3	340 20 53.9	Manskear (M.R.C.)	3.680033	4,786.7	15,704						
Chester upper base (M.R.C.), 1880	37 50 40.312	312 54 40.4	132 55 30.2	Chester lower base (M.R.C.)	3.512560	3,255.1	10,679						
	89 45 10.687	35 44 09.6	215 42 46.3	Killion (M.R.C.)	3.754688	5,684.4	18,650						
Chester (M.R.C.) (Ill.), 1880	37 54 09.550	304 58 00.1	125 00 29.4	Manskear (M.R.C.)	3.860586	7,254.1	23,799						
	89 48 42.227	350 29 00.5	170 29 47.0	Killion (M.R.C.)	4.049995	11,220.1	36,811						
Rozier (M.R.C.), 1880	37 51 49.935	183 28 32.8	3 28 49.7	Kaskaskia (M.R.C.)	4.045371	11,101.2	36,421						
	89 54 53.037	244 33 32.9	64 37 20.6	Chester (M.R.C.)	4.001385	10,031.9	32,913						
		301 43 19.4	121 47 53.3	Killion (M.R.C.)	4.108746	12,845.4	42,144						

Mississippi River arc, second-order triangulation—Continued

Station	Latitude and longitude			Azimuth	Back Azimuth	To station	Distance						
	°	'	"				Logarithm (meters)	Meters	Feet				
<i>Principal points—Continued</i>													
Vause (M.R.C.), 1880.....	37	54	48.330	141	56	46.5	321	53	21.0	Correll (M.R.C.).....	4.121329	13,223.0	43,382
	89	59	19.414	232	06	38.1	52	09	38.8	Kaskaskia (M.R.C.).....	3.958663	9,092.1	29,830
				274	20	16.6	94	26	48.1	Chester (M.R.C.).....	4.193449	15,611.7	51,219
				310	10	30.6	130	13	14.2	Rozier (M.R.C.).....	3.930525	8,521.7	27,958
Reagan (M.R.C.) (Ill.), 1880.....	38	01	39.388	315	55	21.8	135	58	14.9	Kaskaskia (M.R.C.).....	3.994279	9,869.1	32,379
	89	59	06.706	75	02	16.9	254	58	43.3	Correll (M.R.C.).....	3.942393	8,757.6	28,732
Brewerville (M.R.C.) (Ill.), 1880.....	38	03	35.250	299	46	17.4	119	48	55.1	Reagan (M.R.C.).....	3.856694	7,189.4	23,587
	90	03	22.576	20	48	31.7	200	47	35.7	Correll (M.R.C.).....	3.795509	6,244.7	20,488
Magnolia (M.R.C.), 1880.....	38	02	42.443	127	24	16.5	307	21	43.0	Brickey (M.R.C.).....	3.882581	7,631.0	25,036
	90	08	38.803	258	02	56.3	78	06	11.2	Brewerville (M.R.C.).....	3.896527	7,880.0	25,853
				307	26	08.1	127	28	26.9	Correll (M.R.C.).....	3.840231	6,922.0	22,710
County line (M.R.C.) (Ill.), 1880.....	38	06	42.106	342	52	13.5	162	53	43.8	Correll (M.R.C.).....	4.084090	12,136.4	39,818
	90	07	20.031	14	34	15.9	194	33	27.3	Magnolia (M.R.C.).....	3.882791	7,634.7	25,048
				70	58	25.3	250	55	03.2	Brickey (M.R.C.).....	3.926480	8,442.7	27,699
				129	39	34.3	309	36	06.3	Kidd (M.R.C.).....	4.027278	10,648.2	34,935
Ceasars (M.R.C.), 1880.....	38	09	39.678	260	25	23.1	80	28	41.8	Kidd (M.R.C.).....	3.899704	7,937.9	26,043
	90	18	18.374	315	34	49.8	135	38	14.0	Brickey (M.R.C.).....	4.061412	11,518.9	37,792
Weisenborn (M.R.C.) (Ill.), 1880.....	38	14	24.143	162	43	21.6	342	42	20.1	Salt Bluff (M.R.C.).....	3.909480	8,118.6	26,636
	90	16	25.068	325	46	32.5	145	48	41.3	Kidd (M.R.C.).....	3.954871	9,013.0	29,570
				17	27	33.9	197	26	23.8	Ceasars (M.R.C.).....	3.963500	9,193.9	30,164
Herculanum (M.R.C.), 1880.....	38	15	16.454	224	54	00.3	44	56	36.4	Salt Bluff (M.R.C.).....	3.938020	8,670.0	28,445
	90	22	16.208	280	40	00.8	100	43	38.2	Weisenborn (M.R.C.).....	3.938993	8,689.5	28,509
				330	51	01.7	150	53	28.8	Ceasars (M.R.C.).....	4.075077	11,887.1	39,000
Sulphur Springs (M.R.C.), 1880.....	38	19	40.999	287	18	24.8	107	21	09.9	Salt Bluff (M.R.C.).....	3.830642	6,774.0	22,224
	90	22	30.505	357	33	35.3	177	33	44.2	Herculanum (M.R.C.).....	3.911911	8,164.2	26,785
Meramec=B.M. 4¼ (M.R.C.), 1880.....	38	24	23.690	348	20	37.5	168	21	34.1	Salt Bluff (M.R.C.).....	4.039806	10,959.9	35,958
	90	19	35.454	26	00	22.0	205	58	33.3	Sulphur Springs (M.R.C.).....	3.986644	9,697.1	31,815
Bocan (M.R.C.) (Ill.), 1880.....	38	22	13.391	27	59	49.9	207	58	18.7	Salt Bluff (M.R.C.).....	3.881148	7,605.9	24,954
	90	15	37.356	124	49	49.9	304	47	22.0	Meramec (M.R.C.).....	3.847444	7,037.9	23,090
				162	18	29.9	342	17	16.3	Twin Hollow (M.R.C.).....	3.975272	9,446.5	30,992
Gummershimer (M.R.C.) (Ill.), 1880.....	38	25	43.892	23	27	32.1	203	26	20.0	Bocan (M.R.C.).....	3.849714	7,074.8	23,211
	90	13	41.336	73	58	18.7	253	54	38.6	Meramec (M.R.C.).....	3.951316	8,939.6	29,329
				113	49	64.0	293	47	28.2	Twin Hollow (M.R.C.).....	3.793359	6,213.8	20,386
				197	45	53.8	17	47	00.3	Dreyer.....	3.929135	8,494.4	27,869
Forder, 1873.....	38	30	39.544	186	21	18.9	6	21	48.5	Insane asylum.....	4.015918	10,373.3	34,033
	90	17	31.487	277	08	19.2	97	11	49.1	Dreyer.....	3.915529	8,232.4	27,009
				328	30	45.0	148	33	08.2	Gummershimer (M.R.C.).....	4.028897	10,688.0	35,066
Standpipe (M.R.C.), 1880.....	38	40	13.481	258	46	39.7	78	54	11.4	Sugar Loaf.....	4.250442	17,800.9	58,402
	90	12	30.176	309	59	06.1	130	04	16.7	Clarks Mound.....	4.196369	15,717.0	51,565
				39	45	03.6	219	42	25.1	Insane asylum.....	3.982543	9,606.0	31,616
Robinson (M.R.C.), 1880.....	38	45	30.563	291	56	01.4	112	02	47.6	Sugar Loaf.....	4.228162	16,910.7	55,481
	90	11	16.766	332	41	18.0	152	45	43.1	Clarks Mound.....	4.349734	22,373.5	73,404
				10	17	16.3	190	16	30.4	Standpipe (M.R.C.).....	3.997253	9,936.9	32,601
Soechtig (M.R.C.) (Ill.), 1880.....	38	43	03.741	45	28	45.3	225	26	27.3	Standpipe (M.R.C.).....	3.874194	7,485.0	24,557
	90	08	49.417	141	50	35.6	321	49	03.4	Robinson (M.R.C.).....	3.760318	5,758.6	18,893
Pettingill (M.R.C.) (Ill.), 1881.....	38	46	16.638	0	02	31.8	180	02	31.7	Soechtig (M.R.C.).....	3.774379	5,948.1	19,515
	90	08	49.236	68	15	58.3	248	14	25.9	Robinson (M.R.C.).....	3.583735	3,834.7	12,581
Terrapin (M.R.C.), 1881.....	38	48	04.661	356	14	28.4	176	14	34.1	Pettingill (M.R.C.).....	3.523506	3,338.2	10,952
	90	08	58.300	35	08	01.1	215	06	34.4	Robinson (M.R.C.).....	3.764136	5,809.5	19,060
Moore (M.R.C.) (Ill.), 1881.....	38	48	07.988	36	22	11.8	216	21	06.2	Pettingill (M.R.C.).....	3.629788	4,263.7	13,988
	90	07	04.501	87	52	13.3	267	51	02.0	Terrapin (M.R.C.).....	3.439009	2,748.0	9,016
Missouri River (M.R.C.), 1881.....	38	48	39.840	313	09	59.9	133	10	27.1	Moore (M.R.C.).....	3.157028	1,435.6	4,710
	90	07	47.893	57	26	47.8	237	26	03.7	Terrapin (M.R.C.).....	3.304415	2,015.6	6,613
Gillan (M.R.C.) (Ill.), 1881.....	38	49	36.297	16	40	24.6	196	40	03.4	Moore (M.R.C.).....	3.453709	2,842.6	9,326
	90	06	30.702	46	56	06.2	226	55	17.8	Missouri River (M.R.C.).....	3.406408	2,509.2	8,364
Shirley (M.R.C.), 1881.....	38	50	48.197	331	24	43.5	151	25	14.9	Gillan (M.R.C.).....	3.402238	2,524.9	8,284
	90	07	20.788	9	22	56.0	189	22	39.0	Missouri River (M.R.C.).....	3.603325	4,011.7	13,162
Gessler (M.R.C.) (Ill.), 1881.....	38	50	51.370	3	26	16.5	183	26	12.9	Gillan (M.R.C.).....	3.365330	2,319.2	7,609
	90	06	24.937	85	50	58.5	265	50	23.5	Shirley (M.R.C.).....	3.130463	1,350.4	4,430
Ringering (M.R.C.) (Ill.), 1881.....	38	51	32.773	302	38	10.8	122	39	02.6	Gessler (M.R.C.).....	3.374174	2,366.9	7,765
	90	07	47.590	334	48	58.8	154	49	15.6	Shirley (M.R.C.).....	3.181533	1,518.9	4,983
Freeman (M.R.C.), 1881.....	38	51	29.279	266	29	44.8	86	30	30.7	Ringering (M.R.C.).....	3.246905	1,765.7	5,793
	90	09	00.682	297	43	56.0	117	44	58.7	Shirley (M.R.C.).....	3.434826	2,721.6	8,929

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Russell (M.R.C.) (Ill.), 1881.....	38 52 31.036	324 43 12.1	144 43 45.2	Ringering (M.R.C.).....	3.342563	2,200.7	7,220						
	90 08 40.306	14 27 57.3	194 27 44.5	Freeman (M.R.C.).....	3.293736	1,966.7	6,452						
Glassworks (M.R.C.) (Ill.), 1881.....	38 53 01.904	291 41 51.7	111 42 54.0	Russell (M.R.C.).....	3.410552	2,573.7	8,444						
	90 10 19.507	326 21 25.6	146 22 15.1	Freeman (M.R.C.).....	3.535370	3,430.6	11,255						
Watkins (M.R.C.), 1881.....	38 52 05.539	193 52 29.2	13 52 40.4	Glassworks (M.R.C.).....	3.252933	1,790.3	5,874						
	90 10 37.319	254 24 56.8	74 26 10.3	Russell (M.R.C.).....	3.466622	2,928.3	9,607						
Strong (M.R.C.), 1881.....	38 52 57.154	266 07 28.7	86 08 25.1	Glassworks (M.R.C.).....	3.336732	2,171.4	7,124						
	90 11 49.389	312 29 17.9	132 30 03.1	Watkins (M.R.C.).....	3.372201	2,356.1	7,730						
Alton (M.R.C.) (Ill.), 1881.....	38 53 30.804	296 18 14.0	116 19 00.9	Glassworks (M.R.C.).....	3.303329	2,010.6	6,596						
	90 11 34.288	19 19 46.5	199 19 37.0	Strong (M.R.C.).....	3.041238	1,099.6	3,608						
Sawmill (M.R.C.) (Ill.), 1881.....	38 53 55.079	311 51 33.7	131 51 55.5	Alton (M.R.C.).....	3.049877	1,121.7	3,680						
	90 12 08.953	345 12 39.4	165 12 51.7	Strong (M.R.C.).....	3.266556	1,847.4	6,061						
Nicholson (M.R.C.), 1881.....	38 54 00.495	276 37 53.6	96 38 31.0	Sawmill (M.R.C.).....	3.159855	1,445.0	4,741						
	90 13 08.514	315 40 46.4	135 41 36.1	Strong (M.R.C.).....	3.436119	2,729.7	8,956						
Hop Hollow (M.R.C.) (Ill.), 1881.....	38 54 41.393	313 17 07.4	133 17 46.9	Sawmill (M.R.C.).....	3.318643	2,082.8	6,833						
	90 13 11.870	356 19 53.2	176 19 55.3	Nicholson (M.R.C.).....	3.101663	1,263.8	4,146						
Weper (M.R.C.), 1881.....	38 54 27.168	256 36 51.7	76 37 39.8	Hop Hollow (M.R.C.).....	3.277787	1,895.8	6,220						
	90 14 28.417	293 07 30.8	113 08 21.0	Nicholson (M.R.C.).....	3.320906	2,093.7	6,869						
Hull (M.R.C.) (Ill.), 1881.....	38 55 11.225	304 13 05.9	124 13 41.2	Hop Hollow (M.R.C.).....	3.213685	1,635.6	5,366						
	90 14 08.006	19 54 01.0	199 53 48.2	Weper (M.R.C.).....	3.159818	1,444.8	4,740						
Barwise (M.R.C.), 1881.....	38 54 59.080	262 21 59.9	82 23 12.8	Hull (M.R.C.).....	3.450711	2,823.0	9,262						
	90 16 04.150	293 05 49.9	113 06 50.0	Weper (M.R.C.).....	3.399272	2,507.7	8,227						
Reihl (M.R.C.) (Ill.), 1881.....	38 56 12.170	297 21 52.7	117 23 27.3	Hull (M.R.C.).....	3.611386	4,086.8	13,408						
	90 16 38.666	339 44 52.8	159 45 14.5	Barwise (M.R.C.).....	3.380629	2,402.3	7,882						
Eagles Nest (M.R.C.—Mo.R.C.) (Ill.), 1881.....	38 56 04.794	265 29 38.7	85 30 54.2	Reihl (M.R.C.).....	3.462684	2,901.9	9,521						
	90 18 38.780	298 32 00.9	118 33 38.1	Barwise (M.R.C.).....	3.627404	4,240.4	13,912						
Echele (M.R.C.), 1881.....	38 54 33.449	188 40 55.4	8 41 06.6	Eagles Nest (M.R.C.—Mo.R.C.).....	3.454755	2,849.4	9,348						
	90 18 56.638	227 30 03.9	47 31 30.6	Reihl (M.R.C.).....	3.653899	4,507.1	14,787						
Portage (M.R.C.), 1881.....	38 55 10.664	239 31 21.8	59 32 35.8	Eagles Nest (M.R.C.—Mo.R.C.).....	3.517452	3,291.9	10,800						
	90 20 36.572	295 28 32.8	115 29 35.6	Echele (M.R.C.).....	3.426050	2,667.2	8,751						
Starr (M.R.C.) (Ill.), 1881.....	38 56 28.945	335 14 00.3	155 14 43.1	Echele (M.R.C.).....	3.593516	3,922.1	12,868						
	90 20 04.831	17 34 38.2	197 34 18.2	Portage (M.R.C.).....	3.403480	2,532.1	8,307						
Pourie (M.R.C.), 1881.....	38 55 46.848	249 54 33.4	69 56 06.1	Starr (M.R.C.).....	3.577647	3,781.4	12,406						
	90 22 32.288	291 48 19.3	111 49 32.0	Portage (M.R.C.).....	3.477483	3,002.5	9,851						
Elsah (M.R.C.) (Ill.), 1881.....	38 57 20.457	298 00 51.4	118 02 09.3	Starr (M.R.C.).....	3.529016	3,380.8	11,092						
	90 22 08.761	11 06 25.6	191 06 10.8	Pourie (M.R.C.).....	3.468597	2,941.7	9,651						
Grafton east base (M.R.C.), 1881.....	38 56 43.186	257 21 12.9	77 23 26.8	Elsah (M.R.C.).....	3.720758	5,257.2	17,248						
	90 25 41.801	290 49 16.4	110 51 15.5	Pourie (M.R.C.).....	3.688759	4,883.8	16,023						
Grafton (M.R.C.) (Ill.), 1881.....	38 58 22.291	284 49 26.4	104 52 34.2	Elsah (M.R.C.).....	3.871563	7,439.8	24,409						
	90 27 07.469	325 58 44.3	145 59 38.2	Portage east base (M.R.C.).....	3.666660	3,686.9	12,066						
Grafton west base (M.R.C.), 1881.....	38 56 14.089	176 31 29.3	356 31 23.0	Grafton (M.R.C.).....	3.597764	3,960.6	12,994						
	90 26 57.485	243 47 02.9	63 47 50.5	Grafton east base (M.R.C.).....	3.307840	2,031.6	6,665						
River Mouth (M.R.C.) (Ill.), 1881.....	38 58 21.727	269 42 53.4	89 44 29.2	Grafton (M.R.C.).....	3.564379	3,667.6	12,033						
	90 29 39.811	315 11 08.0	135 12 50.1	Grafton west base (M.R.C.).....	3.744055	5,547.0	18,199						
		99 19 13.2	279 17 28.0	Thompson (M.R.C.).....	3.610622	4,079.6	13,384						
Point Landing (M.R.C.) (Ill.), 1881.....	38 54 43.323	171 52 18.1	351 51 50.5	Thompson (M.R.C.).....	3.873300	7,469.6	24,507						
	90 31 43.183	203 47 40.2	23 48 57.7	River Mouth (M.R.C.).....	3.869943	7,361.1	24,151						
		247 50 39.4	67 53 38.9	Grafton west base (M.R.C.).....	3.870962	7,429.5	24,375						
Calhoun (M.R.C.) (Ill.), 1881.....	38 55 26.576	206 50 12.9	26 51 33.0	Thompson (M.R.C.).....	3.832060	6,793.0	22,287						
	90 34 34.463	287 53 52.3	107 55 39.9	Point Landing (M.R.C.).....	3.637146	4,336.6	14,228						
Droege (M.R.C.) (Ill.), 1881.....	38 58 44.563	270 20 02.0	90 23 07.4	Thompson (M.R.C.).....	3.851073	7,097.0	23,284						
	90 37 21.892	326 32 46.7	146 34 31.9	Calhoun (M.R.C.).....	3.864294	7,316.3	24,004						
Keel (M.R.C.) (Ill.), 1881.....	38 56 58.175	216 34 40.7	36 35 44.3	Droege (M.R.C.).....	3.611273	4,085.8	13,405						
	90 39 03.043	293 33 55.1	113 36 43.8	Calhoun (M.R.C.).....	3.848714	7,058.5	23,158						
Cahill (M.R.C.) (Ill.), 1881.....	38 59 24.175	285 56 31.5	105 58 23.1	Droege (M.R.C.).....	3.647683	4,443.1	14,577						
	90 40 19.378	337 47 22.5	157 48 10.5	Keel (M.R.C.).....	3.686886	4,862.8	15,954						
Winfield (M.R.C.), 1881.....	38 59 18.196	268 08 21.3	88 10 51.3	Cahill (M.R.C.).....	3.759074	5,742.1	18,839						
	90 44 17.843	299 38 41.2	119 41 59.1	Keel (M.R.C.).....	3.940627	8,722.2	28,616						
Wilson (M.R.C.) (Ill.), 1881.....	39 02 23.330	357 06 28.6	177 06 35.9	Cahill (M.R.C.).....	3.742857	5,531.7	18,149						
	90 40 30.975	43 43 59.1	223 41 30.3	Winfield (M.R.C.).....	3.897538	7,998.4	25,913						

Mississippi River arc, second-order triangulation—Continued

Station	Latitude and longitude			Azimuth	Back Azimuth	To station	Distance			
	°	'	"				Logarithm (meters)	Meters	Feet	
<i>Principal points—Continued</i>										
Kilham (M.R.C.), 1881.....	39	01	38.694	172	26	27.3	Knox (M.R.C.).....	3.883555	7,648.1	25,092
	90	44	56.149	257	47	54.2	Wilson (M.R.C.).....	3.814569	6,524.9	21,407
				301	53	43.5	Cabill (M.R.C.).....	3.894625	7,845.6	25,740
Peets (M.R.C.) (Ill.), 1881.....	39	06	18.681	7	27	28.3	Wilson (M.R.C.).....	3.864480	7,319.5	24,014
	90	39	51.473	40	20	11.0	Kilham (M.R.C.).....	4.053942	11,322.5	37,147
				82	49	37.5	Knox (M.R.C.).....	3.923942	8,393.5	27,538
Hamburg (M.R.C.) (Ill.), 1881.....	39	14	08.518	342	21	20.9	Peets (M.R.C.).....	4.181919	15,202.6	49,877
	90	43	03.251	13	27	32.7	Knox (M.R.C.).....	4.203556	15,979.2	52,425
				102	23	05.3	Saltpetre (M.R.C.).....	3.984788	9,655.8	31,679
Bellevue (M.R.C.) (Ill.), 1881.....	39	21	54.945	335	21	35.5	Hamburg (M.R.C.).....	4.199243	15,821.3	51,907
	90	47	38.278	12	58	06.8	Saltpetre (M.R.C.).....	4.101768	12,640.6	41,472
				95	11	14.0	Clarksville (M.R.C.).....	4.001565	10,036.1	32,927
Long (M.R.C.) (Ill.), 1881.....	39	28	49.388	318	45	05.2	Bellevue (M.R.C.).....	4.230159	16,988.7	55,737
	90	55	26.172	354	12	33.3	Clarksville (M.R.C.).....	4.077041	11,941.0	39,176
				133	01	34.7	Rockport (M.R.C.).....	4.033605	10,804.5	35,448
Salt River (M.R.C.), 1881.....	39	28	07.292	208	28	41.0	Rockport (M.R.C.).....	3.993925	9,861.1	32,353
	91	04	13.895	264	04	37.4	Long (M.R.C.).....	4.103127	12,680.2	41,602
				307	22	32.7	Clarksville (M.R.C.).....	4.240843	17,411.8	57,125
McLean (M.R.C.), 1881.....	39	25	02.968	128	31	52.6	Salt River (M.R.C.).....	3.960492	9,130.4	29,955
	90	59	15.087	170	22	48.2	Rockport (M.R.C.).....	4.163042	14,556.0	47,756
				218	04	21.8	Long (M.R.C.).....	3.948041	8,872.4	29,109
Louisiana inner base (M.R.C.) (Ill.), 1881.....	39	29	04.654	338	31	33.7	McLean (M.R.C.).....	3.903570	8,008.8	26,276
	91	01	17.659	67	14	04.9	Salt River (M.R.C.).....	3.659787	4,568.6	14,989
Louisiana outer base (M.R.C.) (Ill.), 1881.....	39	27	46.453	102	09	06.9	Salt River (M.R.C.).....	3.485129	3,055.8	10,026
	91	02	08.922	206	55	43.6	Louisiana inner base (M.R.C.).....	3.432183	2,705.1	8,875
Louisiana (M.R.C.), 1881.....	39	27	23.712	220	44	27.0	Louisiana inner base (M.R.C.).....	3.613765	4,109.3	13,482
	91	03	09.818	307	41	05.8	McLean (M.R.C.).....	3.851064	7,096.8	23,283
Red House (M.R.C.), 1881.....	39	36	28.654	240	52	38.3	Gard (M.R.C.).....	3.992710	9,833.5	32,262
	91	12	51.786	291	39	18.7	Rockport (M.R.C.).....	4.263964	18,363.9	60,249
				321	17	58.3	Salt River (M.R.C.).....	4.296654	19,799.5	64,959
See Horn (M.R.C.) (Ill.), 1881.....	39	45	38.592	313	16	12.3	Gard (M.R.C.).....	4.249271	17,753.0	58,245
	91	15	53.658	345	38	58.0	Red House (M.R.C.).....	4.243173	17,505.4	57,432
				102	01	34.7	Heather (M.R.C.).....	4.178993	15,100.6	49,543
Hannibal (M.R.C.), 1881.....	39	41	19.444	138	36	05.0	Heather (M.R.C.).....	4.171390	14,838.5	48,683
	91	19	21.970	211	48	39.6	See Horn (M.R.C.).....	3.973448	9,406.9	30,862
				283	06	27.3	Gard (M.R.C.).....	4.264146	18,371.6	60,274
Marblehead (M.R.C.) (Ill.), 1881.....	39	50	41.237	346	09	56.7	Hannibal (M.R.C.).....	4.251460	17,842.7	58,539
	91	22	21.016	41	50	49.1	Heather (M.R.C.).....	3.920260	8,322.6	27,305
Nelson (M.R.C.), 1881.....	39	52	20.474	285	27	59.9	Marblehead (M.R.C.).....	4.058698	11,447.2	37,556
	91	30	05.064	329	20	33.1	Heather (M.R.C.).....	4.032017	10,765.1	35,318
Quincy (M.R.C.) (Ill.), 1881.....	39	56	30.686	6	46	01.0	Heather (M.R.C.).....	4.232953	17,098.3	56,097
	91	24	49.695	44	10	35.8	Nelson (M.R.C.).....	4.031607	10,754.9	35,285
				180	06	31.6	Lima Lake (M.R.C.).....	4.404073	25,355.5	83,187
La Grange (M.R.C.), 1881.....	40	02	46.539	207	59	40.4	Lima Lake (M.R.C.).....	4.192876	15,591.1	51,152
	91	29	56.944	327	48	42.7	Quincy (M.R.C.).....	4.136509	13,693.3	44,925
				0	34	21.4	Nelson (M.R.C.).....	4.285787	19,310.2	63,354
Canton University (M.R.C.), 1881.....	40	07	50.216	202	08	52.2	Gillham (M.R.C.).....	4.335856	21,669.9	71,095
	91	31	48.161	246	07	37.7	Lima Lake (M.R.C.).....	4.036661	10,880.8	35,698
				344	16	42.0	La Grange (M.R.C.).....	3.988104	9,729.8	31,922
Coughl (M.R.C.), 1881.....	40	11	27.425	209	12	18.6	Gillham (M.R.C.).....	4.185203	15,318.0	50,256
	91	31	18.719	283	56	23.2	Lima Lake (M.R.C.).....	3.979276	9,534.0	31,279
				5	56	24.9	Canton University (M.R.C.).....	3.828374	6,735.6	22,098
Yellow Banks (M.R.C.) (Iowa), 1881.....	40	24	24.305	336	21	09.7	Gillham (M.R.C.).....	4.063135	11,564.7	37,942
	91	29	18.634	6	45	38.9	Coughl (M.R.C.).....	4.382546	24,129.4	79,165
Fox River (M.R.C.), 1881.....	40	21	34.467	238	20	59.6	Yellow Banks (M.R.C.).....	3.999675	9,992.5	32,784
	91	35	19.380	292	06	33.9	Gillham (M.R.C.).....	4.152320	14,201.2	46,592
Warsaw (M.R.C.) (Ill.), 1881.....	40	22	01.095	86	37	01.9	Fox River (M.R.C.).....	4.136963	13,707.6	44,972
	91	25	39.466	130	32	00.3	Yellow Banks (M.R.C.).....	3.832487	6,799.7	22,309
Boardman (M.R.C.) (Iowa), 1881.....	40	24	39.337	348	15	44.3	Warsaw (M.R.C.).....	3.697672	4,985.1	16,355
	91	26	22.449	83	38	51.3	Yellow Banks (M.R.C.).....	3.621183	4,180.1	13,714
Hughes (M.R.C.) (Iowa), 1881.....	40	24	37.712	24	09	27.9	Warsaw (M.R.C.).....	3.723791	5,294.1	17,369
	91	24	07.636	90	54	55.6	Boardman (M.R.C.).....	3.502302	3,179.1	10,430
Worster (M.R.C.) (Ill.), 1881.....	40	22	49.557	74	23	50.8	Warsaw (M.R.C.).....	3.744337	5,550.6	18,211
	91	21	52.879	136	24	03.1	Hughes (M.R.C.).....	3.663464	4,607.5	15,116

Station	Latitude and longitude			Azimuth	Back Azimuth	To station	Distance						
	°	'	"				°	'	"	Logarithm (meters)	Meters	Feet	
<i>Principal points—Continued</i>													
Keokuk (M.R.C.) (Iowa), 1881.....	40	24	34.355	339	47	39.8	159	48	12.5	Worster (M.R.C.).....	3.537104	3,444.3	11,300
	91	22	43.311	41	19	42.9	221	17	48.8	Warsaw (M.R.C.).....	3.708900	6,293.6	20,618
Hamilton (M.R.C.) (Ill.), 1881.....	40	24	11.934	12	25	37.3	192	25	21.9	Worster (M.R.C.).....	3.415278	2,601.8	8,536
	91	21	29.143	111	34	56.1	291	34	08.0	Keokuk (M.R.C.).....	3.274304	1,880.6	6,170
Rapids (M.R.C.) (Ill.), 1881.....	40	25	16.320	347	14	20.2	167	14	32.6	Hamilton (M.R.C.).....	3.308827	2,036.2	6,680
	91	21	48.217	45	06	19.6	225	05	43.9	Keokuk (M.R.C.).....	3.293343	1,833.8	6,016
Keokuk lower base (M.R.C.) (Iowa), 1881.....	40	25	04.231	256	28	45.9	76	29	28.5	Rapids (M.R.C.).....	3.202894	1,595.5	5,235
	91	22	54.019	308	51	46.0	128	52	41.0	Hamilton (M.R.C.).....	3.410003	2,570.4	8,433
Keokuk upper base (M.R.C.) (Iowa), 1881.....	40	25	43.165	292	03	50.8	112	04	47.0	Rapids (M.R.C.).....	3.343134	2,203.6	7,230
	91	23	14.844	337	45	47.9	157	46	01.5	Keokuk lower base (M.R.C.).....	3.113067	1,297.4	4,257
Church (M.R.C.) (Ill.), 1891.....	40	26	07.908	28	56	56.5	208	56	26.7	Keokuk lower base (M.R.C.).....	3.351110	2,214.4	7,364
	91	22	07.939	64	10	55.1	244	10	11.7	Keokuk upper base (M.R.C.).....	3.243530	1,752.0	5,748
Vineyard=B. M. ¹¹² /c (M.R.C.) (Iowa), 1891.....	40	26	25.842	286	49	28.2	106	49	18.6	Church (M.R.C.).....	3.281546	1,912.3	6,274
	91	23	25.605	349	05	36.3	169	05	43.3	Keokuk upper base (M.R.C.).....	3.127288	1,340.6	4,398
Waggoner (M.R.C.) (Ill.), 1891.....	40	27	09.790	3	51	12.9	183	51	09.4	Church (M.R.C.).....	3.281731	1,913.1	6,277
	91	22	02.484	55	19	22.2	235	18	28.3	Vineyard (M.R.C.).....	3.376965	2,382.1	7,815
Sandusky (M.R.C.) (Iowa), 1891.....	40	27	44.200	309	46	03.3	129	46	38.4	Waggoner (M.R.C.).....	3.219882	1,659.5	5,445
	91	22	56.617	15	46	55.2	195	46	36.4	Vineyard (M.R.C.).....	3.400001	2,511.9	8,241
Larry (M.R.C.) (Ill.), 1891.....	40	28	00.787	18	17	51.3	198	17	37.0	Waggoner (M.R.C.).....	3.219260	1,656.8	5,436
	91	21	40.410	74	06	33.6	254	05	44.2	Sandusky (M.R.C.).....	3.271100	1,866.8	6,125
<i>Supplementary points</i>													
Chester, church spire (M.R.C.) (Ill.), 1880.....	37	54	55.27	326	50	39	146	51	02	Chester (M.R.C.).....	3.226229	1,683.6	5,524
	89	49	19.92	54	50	47	234	54	12	Rozier (M.R.C.).....	3.997612	9,945.2	32,629
Kaskaskia Catholic Church (M.R.C.) (Ill.), 1880.....	37	57	41.73	353	18	56	178	19	04	Rozier (M.R.C.).....	4.035469	10,851.0	35,600
	89	55	06.09	49	11	14	229	08	39	Vause (M.R.C.).....	3.912548	8,176.1	26,824
Kennetts Castle (M.R.C.), 1880.....	38	11	38.08	281	56	00	102	00	40	Kidd (M.R.C.).....	4.051167	11,250.4	36,911
	90	20	29.02	318	55	56	138	57	17	Caesars (M.R.C.).....	3.694964	4,841.3	15,883
Jefferson Barracks, flagstaff (M.R.C.), 1903.....	38	30	11.48	271	20	11	91	23	06	Dreyer.....	3.834038	6,824.0	22,388
	90	16	35.92	332	49	44	152	51	33	Gummershimer (M.R.C.).....	3.967232	9,273.3	30,424
St. Louis, smokestack (M.R.C.), 1880.....	38	33	04.12	332	21	57	152	23	11	Dreyer.....	3.791759	6,191.0	20,312
	90	13	52.88	49	55	24	229	53	08	Forder.....	3.840218	6,921.8	22,709
Hannibal, elevator (M.R.C.), 1880.....	39	42	18.94	227	33	24	47	41	25	See Horn (M.R.C.).....	3.061091	9,143.0	29,997
	91	20	37.48	315	32	23	135	34	11	Hannibal (M.R.C.).....	3.409881	2,569.7	8,431
Alton Schoolhouse No. 5 (M.R.C.) (Ill.), 1881.....	38	53	31.62	310	31	47	130	32	44	Russell (M.R.C.).....	3.458570	2,874.6	9,431
	90	10	10.95	12	41	39	192	41	34	Glassworks (M.R.C.).....	2.972850	9,943	3,082
Alton, Catholic Church (M.R.C.) (Ill.), 1881.....	38	53	25.73	300	43	17	120	44	31	Russell (M.R.C.).....	3.518565	3,300.4	10,828
	90	10	38.01	328	44	53	148	45	05	Glassworks (M.R.C.).....	2.934183	859.4	2,820
Quincy, Catholic Church, spire (M.R.C.) (Ill.), 1881.....	39	55	03.32	11	11	55	191	10	39	Heather (M.R.C.).....	4.163215	14,561.8	47,775
	91	24	15.51	58	51	54	238	48	10	Nelson (M.R.C.).....	3.987003	9,705.2	31,841
La Grange College (M.R.C.), 1881.....	40	02	54.24	163	35	53	343	34	40	Canton University (M.R.C.).....	3.978490	9,516.8	31,223
	91	29	54.66	208	13	55	28	17	13	Lima Lake (M.R.C.).....	4.186287	15,356.3	50,381
Canton, church spire (M.R.C.), 1881.....	40	07	46.04	100	17	05	280	16	46	Canton University (M.R.C.).....	2.858896	722.6	2,371
	91	31	18.13	243	52	24	63	56	36	Lima Lake (M.R.C.).....	4.012450	10,290.8	33,762
Pumphouse (M.R.C.) (Iowa), 1881.....	40	25	43.649	294	08	00.3	114	08	52.0	Rapids (M.R.C.).....	3.314106	2,061.1	6,762
	91	23	08.005	344	49	35.4	164	49	44.5	Keokuk lower base (M.R.C.).....	3.100274	1,259.7	4,133
Mount Bell (M.R.C.) (Ill.), 1891.....	40	26	15.675	55	54	11.1	235	53	30.4	Keokuk upper base (M.R.C.).....	3.252486	1,788.5	5,868
	91	22	12.015	100	15	19.1	280	14	31.4	Vineyard (M.R.C.).....	3.246137	1,762.5	5,782
Hamilton, church spire (M.R.C.) (Ill.), 1881.....	40	23	34.252	67	06	29.2	247	03	22.6	Warsaw (M.R.C.).....	3.867984	7,378.8	24,209
	91	20	51.354	112	56	27.0	292	54	19.8	Hughes (M.R.C.).....	3.701180	5,025.5	16,488
				125	05	11.3	305	03	68.7	Keokuk (M.R.C.).....	3.508665	3,226.0	10,584
Mrs. H. W. Sample's house, cupola (M.R.C.) (Iowa), 1881.....	40	23	40.572	323	55	25.6	143	55	57.1	Worster (M.R.C.).....	3.289313	1,946.8	6,387
	91	22	41.477	53	51	23.8	233	49	28.5	Warsaw (M.R.C.).....	3.716024	5,200.2	17,061
				130	56	53.6	310	55	57.8	Hughes (M.R.C.).....	3.429697	2,689.7	8,824
Keokuk, Unitarian Church, spire (M.R.C.) (Iowa), 1881.....	40	23	48.974	325	34	22.9	145	34	57.4	Worster (M.R.C.).....	3.346689	2,221.7	7,289
	91	22	46.127	50	52	36.7	230	50	44.4	Warsaw (M.R.C.).....	3.721948	5,271.7	17,286
				128	02	15.1	308	01	22.3	Hughes (M.R.C.).....	3.387412	2,440.1	8,006
Keokuk, Presbyterian Church, spire (M.R.C.) (Iowa), 1881.....	40	23	52.766	320	00	48.6	140	01	33.5	Worster (M.R.C.).....	3.405578	2,544.4	8,348
	91	23	02.192	47	08	18.6	227	08	36.7	Warsaw (M.R.C.).....	3.704350	5,062.3	16,609
				131	56	26.4	311	55	44.0	Hughes (M.R.C.).....	3.316907	2,074.5	6,806

98297°-34-5

Mississippi River arc, second-order triangulation—Continued

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Warsaw, Presbyterian Church, spire (M.R.C.) (Ill.), 1881.	40	21	32.358	90	17	00.4	270	11	06.8	Fox River (M.R.C.)	4.110104	12,885.6	42,276
	91	26	13.301	140	27	10.8	320	25	10.7	Yellow Banks (M.R.C.)	3.836552	6,863.6	22,518
				222	24	19.1	42	24	41.1	Warsaw (M.R.C.)	3.073249	1,183.7	3,884
Warsaw, Methodist Church, spire (M.R.C.) (Ill.), 1881.	40	21	39.900	89	19	03.0	269	13	03.3	Fox River (M.R.C.)	4.117550	13,108.4	43,006
	91	26	03.890	137	50	44.1	317	48	37.9	Yellow Banks (M.R.C.)	3.835197	6,842.2	22,448
				221	23	37.1	41	23	53.0	Warsaw (M.R.C.)	2.940251	871.5	2,859

Ninety-third meridian arc

<i>Principal points</i>													
Clio (Iowa), 1928	40	36	32.022										
	93	27	41.968										
Sewal (Iowa), 1928	40	37	22.589	85	01	26.69	264	53	17.28	Clio	4.2489802	17,741.09	58,205.6
	93	15	10.164										
Easter, 1928	40	24	52.937	184	01	49.31	4	02	31.29	Clio	4.3347955	21,617.00	70,921.8
	93	28	46.596	219	39	31.68	39	48	22.11	Sewal	4.4780992	30,067.63	98,646.9
Fry, 1928	40	26	23.196	82	24	02.63	262	14	34.55	Easter	4.3188344	20,836.96	68,362.6
	93	14	10.575	134	35	22.19	314	26	34.97	Clio	4.4278935	26,785.11	87,877.5
Olive, 1928	40	17	14.034	176	03	38.56	356	02	59.83	Sewal	4.3093632	20,387.46	66,887.9
	93	29	22.100	183	23	03.82	3	23	26.81	Easter	4.1516556	14,179.33	46,520.0
Harris, 1928	40	16	27.902	231	41	42.41	51	51	32.75	Fry	4.4373796	27,376.60	89,818.1
	93	17	00.025	94	42	25.06	274	34	25.28	Olive	4.2452213	17,588.20	57,704.0
Dunlap, 1928	40	06	08.574	133	06	45.05	312	59	07.63	Easter	4.3583148	22,819.95	74,868.5
	93	26	31.308	192	16	12.50	12	18	02.23	Fry	4.2739679	18,791.78	61,652.7
Whaley, 1928	40	05	59.955	168	52	49.41	348	50	59.18	Olive	4.3205387	20,918.89	68,631.4
	93	17	27.670	215	13	36.97	35	19	45.62	Harris	4.3692025	23,399.28	76,769.1
Ruddy, 1928	40	05	59.955	91	13	52.56	271	08	02.38	Dunlap	4.1098953	12,879.39	42,255.1
	93	17	27.670	140	57	33.60	320	49	52.52	Olive	4.4280145	26,792.58	87,902.0
Purdin, 1928	39	57	11.800	181	55	53.16	1	56	11.00	Harris	4.2873329	19,379.07	63,579.5
	93	20	25.169	152	21	36.53	332	17	41.05	Dunlap	4.2716964	18,693.75	61,331.1
Meadville, 1928	39	57	18.240	194	28	15.87	14	30	10.03	Whaley	4.2259450	16,824.61	55,198.7
	93	08	29.047	89	23	39.93	269	16	00.05	Ruddy	4.2304420	16,999.73	55,773.3
Heckman, 1928	39	46	38.872	122	36	36.76	302	25	00.68	Dunlap	4.4833215	30,431.37	99,840.3
	93	17	21.686	141	36	31.35	321	30	44.93	Whaley	4.3126747	20,543.51	67,399.8
Hale, 1928	39	47	16.480	167	25	23.07	347	23	25.46	Ruddy	4.3010679	20,001.75	65,622.4
	93	05	57.936	212	39	06.92	32	44	50.35	Purdin	4.3698282	23,433.02	76,879.8
Campfield, 1928	39	47	16.480	85	58	59.80	265	51	42.28	Meadville	4.2125048	16,311.91	53,516.7
	93	05	57.936	131	46	23.18	311	37	07.23	Ruddy	4.4409510	27,602.66	90,559.7
Bosworth, 1928	39	35	38.167	169	03	43.40	349	02	06.53	Purdin	4.2765436	18,903.56	62,019.4
	93	19	11.007	187	16	32.94	7	17	42.75	Meadville	4.3126527	20,542.47	67,396.4
Shackle, 1928	39	36	50.755	221	11	41.53	41	20	08.03	Heckman	4.4571502	28,651.69	94,001.4
	93	03	43.534	84	18	18.31	264	08	27.06	Hale	4.3471390	22,240.22	72,966.5
Utz, 1928	39	36	50.755	133	00	35.25	312	51	52.68	Meadville	4.4253157	26,626.60	87,357.4
	93	08	43.534	170	35	26.98	350	34	01.13	Heckman	4.2914064	19,561.69	64,178.6
Pittman, 1928	39	28	15.581	105	33	47.89	15	35	29.30	Hale	4.1513627	14,169.77	46,488.7
	93	21	50.337	238	25	41.58	58	37	13.49	Campfield	4.4832822	30,428.62	99,831.2
Missouri, 1928	39	30	43.068	78	36	03.68	258	26	07.73	Bosworth	4.3588878	22,850.06	74,967.3
	93	06	13.248	118	10	42.93	296	02	27.66	Hale	4.3155367	20,679.34	67,845.5
High Hill (Mo.R.C.), 1887	39	22	38.401	197	28	49.22	17	30	24.58	Campfield	4.0751587	11,889.37	39,007.0
	93	13	54.290	132	26	40.61	312	21	38.29	Bosworth	4.1880900	15,420.20	50,591.1
Slater, 1928	39	16	32.352	216	22	16.01	36	27	08.92	Pittman	4.2688769	18,572.78	60,934.2
	93	15	36.648	167	37	06.71	337	33	11.05	Bosworth	4.3703119	23,459.13	76,965.5
Shackle, 1928	39	16	32.352	192	14	41.01	12	15	45.88	Missouri	4.0626447	11,551.67	37,599.1
	93	03	30.705	207	06	53.74	27	14	51.30	Pittman	4.4697732	29,496.69	96,773.7
Utz, 1928	39	18	19.987	79	15	42.65	259	08	02.95	Utz	4.2482402	17,710.88	58,106.4
	93	03	30.705	118	06	30.02	298	01	54.71	Missouri	4.2285698	16,926.60	55,533.4
High Hill (Mo.R.C.), 1887	39	05	44.160	170	22	59.64	350	21	16.45	Pittman	4.3663044	23,243.65	76,258.5
	93	17	43.144	188	37	30.41	8	38	50.33	Utz	4.3057422	20,219.19	66,332.5
Slater, 1928	39	09	50.451	221	11	40.11	41	20	38.87	High Hill (Mo.R.C.)	4.4915119	31,010.72	101,741.0
	93	03	45.132	69	24	02.54	249	15	13.69	Shackle	4.3327182	21,513.85	70,583.4
Slater, 1928	39	09	50.451	126	02	48.86	305	55	18.97	Utz	4.3241514	21,093.63	69,204.7
	93	03	45.132	181	15	36.64	1	15	45.76	High Hill (Mo.R.C.)	4.1963699	15,717.01	51,564.9

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Reid, 1928	38	55	18.280	168	43	39.56	348	41	58.80	Shackle	4.2940453	19,680.91	64,569.8
	93	15	03.057	211	09	50.76	31	16	57.79	Slater	4.4976333	31,450.91	103,185.2
				308	59	46.30	129	14	21.61	Syracuse	4.6379914	43,450.16	142,552.7
				350	36	04.01	170	37	42.24	Heard	4.3651730	23,183.18	76,060.1
Ridge, 1928	38	57	10.130	79	56	10.05	259	47	46.51	Reid	4.2923194	19,602.86	64,313.7
	93	01	41.842	124	30	49.35	304	20	44.07	Shackle	4.4477110	28,035.67	91,980.4
				172	48	18.16	352	47	00.48	Slater	4.3735175	23,632.92	77,535.7
				334	58	34.31	155	04	47.71	Syracuse	4.5320577	34,045.34	111,697.1
			30	37	17.26	210	30	33.10	Heard	4.4852891	30,569.56	100,293.6	
Ross, 1928	38	19	43.507	169	29	26.24	349	27	57.00	Schnackenburg	4.2806131	19,081.53	62,603.3
	93	09	04.035	253	34	52.90	73	41	14.49	Bowers	4.1921581	15,565.32	51,067.2
Sory, 1928	38	06	57.133	191	36	17.42	11	40	00.12	Schnackenburg	4.6362832	43,279.59	141,993.1
	93	17	26.929	207	19	36.99	27	24	48.14	Ross	4.4250146	26,608.15	87,286.9
			224	02	35.61	44	14	07.69	Bowers	4.5914822	39,037.52	128,075.6	
Vogel, 1928	38	04	22.910	102	58	48.39	282	50	03.02	Sory	4.3281245	21,287.49	69,840.7
	93	03	15.389	163	23	25.16	343	19	49.55	Ross	4.4716597	29,625.09	97,185.0
			191	09	45.00	11	12	29.81	Bowers	4.5238096	33,404.85	109,595.7	
Preston, 1928	37	56	15.298	170	17	09.92	350	15	44.25	Sory	4.3027095	20,077.50	65,870.9
	93	15	07.863	229	04	56.24	49	12	14.94	Vogel	4.3613802	22,981.60	75,398.8
Branch, 1928	37	54	20.344	99	08	41.18	278	59	22.36	Preston	4.3519786	22,489.44	73,784.1
	92	59	58.593	132	27	57.79	312	17	12.22	Sory	4.5393126	34,618.85	113,578.7
			165	31	25.56	345	29	24.44	Vogel	4.2830452	10,188.69	62,954.9	
Butler, 1928	37	43	32.922	144	24	29.88	324	17	27.03	Preston	4.4612826	28,925.61	94,900.1
	93	03	38.453	195	03	34.53	15	05	49.33	Branch	4.3153865	27,622.19	67,822.0
Blue, 1928	37	35	14.774	171	32	31.24	351	30	06.31	Preston	4.5943024	39,291.85	128,910.0
	93	11	11.198	204	56	23.09	25	03	14.84	Branch	4.5907130	38,968.44	127,849.0
			215	48	48.76	35	53	25.36	Butler	4.2775594	18,947.83	62,164.7	
Bateman, 1928	37	32	22.350	99	08	53.05	278	55	02.43	Blue	4.5296660	33,858.37	111,083.7
	92	48	28.719	132	54	05.26	312	44	49.79	Butler	4.4830639	30,413.32	99,781.0
			157	28	54.04	337	21	51.95	Branch	4.6435163	44,006.44	144,377.8	
Elkland, 1928	37	27	35.970	135	04	39.73	314	58	49.24	Blue	4.3008836	19,993.26	65,594.6
	93	01	35.757	245	23	16.26	65	31	15.38	Bateman	4.3274170	21,252.84	69,727.0
Strafford, 1928	37	19	18.834	170	35	22.42	350	33	21.35	Blue	4.4752925	29,873.94	98,011.4
	93	07	52.109	211	06	10.63	31	09	59.17	Elkland	4.2529764	17,905.09	58,743.6
			229	43	16.84	49	55	03.96	Bateman	4.5733089	37,437.68	122,826.8	
Marshfield, 1928	37	19	51.562	87	22	33.27	267	13	45.83	Strafford	4.3312145	21,439.49	70,339.4
	92	53	22.256	139	44	53.68	319	39	53.97	Elkland	4.2734732	18,770.39	61,582.5
			197	17	30.32	17	20	28.75	Bateman	4.3846166	24,244.69	79,542.8	
Rogersville west base, 1928	37	07	19.815	168	21	37.69	348	19	45.41	Strafford	4.3547280	22,632.27	74,252.7
	93	04	46.655	215	59	55.92	36	06	49.96	Marshfield	4.4573643	28,665.82	94,047.8
Rogersville east base, 1928	37	10	09.581	74	31	29.33	254	23	48.81	Rogersville west base	4.2908168	19,535.152	64,001.58
	92	52	04.012	126	00	26.66	305	50	52.84	Strafford	4.4602492	28,856.87	94,674.6
			173	52	19.23	353	51	31.87	Marshfield	4.2503445	18,044.49	59,201.0	
Sparta, 1928	36	59	34.952	179	59	16.99	359	59	16.91	Rogersville west base	4.1562522	14,330.20	47,015.0
	93	04	46.534	223	50	51.96	43	58	31.72	Rogersville east base	4.4338683	27,156.16	89,094.8
Painter, 1928	37	01	09.606	82	59	30.81	262	49	59.50	Sparta	4.3738003	23,648.32	77,586.2
	92	48	57.352	116	01	45.85	295	52	13.61	Rogersville west base	4.4163177	26,080.25	85,565.0
			164	32	12.39	344	30	19.81	Rogersville east base	4.2373490	17,272.25	56,667.4	
Taney, 1928	36	46	27.405	159	38	57.96	339	35	19.36	Sparta	4.4132667	25,898.03	84,967.1
	92	58	42.321	207	59	25.69	28	05	16.89	Painter	4.4887058	30,811.00	101,085.8
Knight, 1928	36	42	11.050	114	11	45.71	294	04	40.54	Taney	4.2861062	19,324.41	63,400.2
	92	46	51.536	140	28	34.23	320	17	49.55	Sparta	4.6208738	41,770.89	137,043.3
			174	56	09.37	354	54	53.89	Painter	4.5469724	35,234.85	115,599.7	
Irma, 1928	36	44	37.359	213	05	58.15	33	13	16.08	Sparta	4.5191920	33,051.56	108,436.7
	93	16	56.435	262	47	03.49	82	57	58.27	Taney	4.4369484	27,349.44	89,729.0
			275	35	59.95	95	53	59.21	Knight	4.6533633	45,015.63	147,688.8	
Thomason, 1928	36	33	44.359	174	15	41.59	354	14	52.91	Irma	4.3959977	20,230.08	66,371.5
	93	15	34.901	226	49	41.95	46	59	46.65	Taney	4.5369529	34,431.26	112,963.2
Burlington (Ark.), 1928	36	25	44.729	172	53	44.19	352	53	00.12	Thomason	4.1731448	14,898.58	48,879.8
	93	14	20.802	173	41	21.46	333	39	48.69	Irma	4.5456309	35,126.18	115,243.1
			211	15	41.38	31	25	00.95	Taney	4.6517401	44,847.69	147,137.8	
Bergman (Ark.), 1928	36	22	40.325	106	56	11.25	286	48	44.97	Burlington	4.2918362	19,581.06	64,242.2
	93	01	48.813	134	55	48.47	314	47	37.44	Thomason	4.4626370	29,015.97	95,196.6
			186	00	06.21	6	01	57.34	Taney	4.6157389	44,232.23	145,118.6	

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Supplementary points</i>													
Fairview, church spire, 1928	40 33 59.585	160 15 23.7	340 14 37.0	Clio	3.698613	4,995.9	16,391						
	93 26 30.180	248 33 10.1	68 40 32.6	Sewal	4.234829	17,172.3	56,339						
		10 47 59.1	190 46 30.6	Easter	4.234636	17,164.7	56,315						
Airplane beacon no. 2, 1928	40 27 45.621	41 49 53.3	221 41 21.0	Harris	4.447522	28,023.5	91,940						
	93 03 48.942	80 12 35.6	260 05 52.3	Fry	4.172232	14,867.3	48,777						
		138 03 00.6	317 55 37.7	Sewal	4.379346	23,952.2	78,583						
Airplane beacon no. 3, 1928	40 23 06.096	17 17 29.6	197 15 44.9	Harris	4.106319	12,862.3	42,199						
	93 14 18.206	99 13 11.8	279 03 49.0	Easter	4.316852	20,742.1	68,051						
		181 41 39.9	1 41 44.9	Fry	3.784055	6,082.1	19,954						
Unionville, power plant smokestack, 1928	40 28 35.703	46 03 49.4	225 53 11.7	Harris	4.509222	32,301.5	105,976						
	93 00 35.485	78 03 33.0	257 54 44.1	Fry	4.293033	19,635.1	64,419						
		128 22 32.2	308 13 03.5	Sewal	4.418701	26,224.1	86,037						
Iamo, 1928	40 34 48.502	123 23 31.9	303 21 17.8	Clio	3.763790	5,804.7	19,044						
	93 24 15.814	193 52 29.3	13 54 07.8	Corydon south base	4.170353	14,803.1	48,567						
		249 37 19.6	69 43 14.7	Sewal	4.136127	13,681.3	44,886						
Airplane beacon no. 4, 1928	40 19 08.403	153 36 37.9	333 34 13.0	Easter	4.074276	11,865.2	38,928						
	93 25 02.915	228 52 08.5	48 59 11.1	Fry	4.308887	20,412.1	66,969						
		293 25 14.2	113 30 26.5	Harris	4.094578	12,433.1	40,791						
Princeton, primary school, 1928 ¹	40 23 38.62	255 16 14	75 20 15	Easter	3.955970	9,035.9	29,645						
	93 34 57.25	326 16 19	146 19 56	Olive	4.154058	14,258.0	46,778						
Ridgeway, city water tank, 1928 ¹	40 22 43.32	263 56 50	84 14 32	Easter	4.589480	38,858.0	127,487						
	93 56 05.55	264 52 36	105 09 54	Olive	4.593166	39,189.2	128,573						
Milan, Catholic Church, spire, 1928	40 12 20.072	2 24 47.3	182 24 15.5	Purdin	4.444664	27,839.7	91,337						
	93 07 39.664	40 56 28.4	229 50 09.2	Whaley	4.260004	15,197.2	59,702						
		120 02 21.2	299 56 19.1	Barris	4.184498	15,293.2	50,174						
Milan, city standpipe, 1928	40 12 11.831	3 08 02.1	183 07 21.2	Purdin	4.440941	27,602.0	90,558						
	93 07 25.473	51 13 46.4	231 07 18.1	Whaley	4.262333	18,295.0	60,023						
		120 15 03.7	300 06 52.5	Harris	4.195929	15,701.1	51,513						
Trenton, Chicago, Rock Island & Pacific Ry. shops, smokestack, 1928	40 04 36.075	203 58 14.9	24 02 58.9	Olive	4.408112	25,592.5	83,965						
	93 36 42.270	258 47 41.0	78 54 14.4	Dunlap	4.168859	14,752.3	48,400						
		300 30 33.4	120 41 01.5	Ruddy	4.430092	26,921.0	88,323						
Trenton, standpipe, 1928	40 04 50.464	206 53 37.4	26 58 55.3	Olive	4.410364	25,725.5	84,401						
	93 37 34.726	261 13 31.8	81 20 39.1	Dunlap	4.201387	15,899.6	52,164						
		299 59 42.7	120 10 44.7	Ruddy	4.450530	28,218.2	92,579						
Trenton, courthouse, 1928	40 04 25.274	204 49 21.1	24 54 20.8	Olive	4.417199	26,133.6	85,740						
	93 37 06.554	257 59 23.1	78 06 12.2	Dunlap	4.187041	15,383.0	50,469						
		299 17 14.4	119 27 58.2	Ruddy	4.435427	27,253.8	89,415						
Church, spire A, 1928 ¹	40 04 57.49	350 48 20	170 49 23	Ruddy	4.162949	14,549.5	47,734						
	93 22 03.11	109 03 49	289 00 56	Dunlap	3.827439	6,721.1	22,051						
Chillicothe, water tank, 1928	39 47 41.735	194 13 03.6	14 16 58.1	Dunlap	4.546802	35,221.0	115,554						
	93 32 36.527	224 36 17.8	44 44 06.7	Ruddy	4.393092	24,722.5	81,110						
		275 00 29.1	95 10 14.6	Meadville	4.339546	21,854.8	71,702						
Chillicothe, church spire, 1928 ¹	39 47 55.62	226 06 04	46 14 06	Ruddy	4.393908	24,769.0	81,263						
	93 32 57.05	275 59 14	96 09 13	Meadville	4.349895	22,381.8	73,431						
Chillicothe, smokestack, 1928 ¹	39 47 04.48	224 57 15	45 05 41	Ruddy	4.423257	26,500.7	86,944						
	93 33 33.96	271 52 06	92 02 29	Meadville	4.364559	23,150.4	75,953						
Brookfield, city standpipe, 1928	39 47 44.219	356 43 30.6	176 44 01.6	Campfield	4.305049	20,185.9	66,227						
	93 04 31.875	43 10 05.3	223 00 43.9	Hale	4.486598	30,661.8	100,596						
		83 47 26.0	263 39 13.5	Meadville	4.265479	18,428.0	60,459						
Brookfield, Brown shoe factory, smokestack, 1928	39 47 09.701	359 24 11.9	179 24 17.2	Campfield	4.280502	19,050.8	62,630						
	93 03 51.868	45 50 31.6	225 04 44.6	Hale	4.485295	30,570.0	100,295						
		93 59 49.8	273 58 29.2	Heckman	3.478137	3,007.0	9,865						
Brookfield, Catholic Church, spire, 1928	39 47 16.427	356 18 54.7	176 19 28.0	Campfield	4.283369	10,336.1	33,439						
	93 04 35.629	44 09 48.1	224 00 29.1	Hale	4.476835	29,980.2	98,360						
		90 03 17.0	270 02 24.4	Heckman	3.291913	1,953.4	6,425						
Brookfield, electric power plant, smokestack, 1928	39 47 09.039	355 45 51.7	175 46 29.5	Campfield	4.281498	19,120.4	62,731						
	93 04 42.736	44 14 03.5	224 04 49.0	Hale	4.472742	29,699.0	97,437						
		97 18 52.1	277 18 04.0	Heckman	3.256243	1,804.0	5,919						
Marceline, city water tank, 1928	39 43 07.236	42 03 10.1	221 58 30.0	Campfield	4.193887	15,627.4	51,271						
	92 56 24.722	67 05 09.2	246 50 37.2	Hale	4.548927	35,393.8	116,121						
		119 26 38.1	299 20 31.5	Heckman	4.194852	15,662.2	51,385						

¹ No check on this position.

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Marceline, tall masonry smokestack, 1928.....	39	43	01.843	40	51	30.6	220	47	05.9	Campfield.....	4.179648	15,123.3	49,617
	92	56	48.780	121	02	31.5	300	56	40.3	Heckman.....	4.183296	15,250.9	50,036
				147	50	04.3	327	42	35.6	Purdin.....	4.494474	31,223.0	102,437
Carrollton, city water tank, 1928.....	39	21	25.970	210	06	35.1	30	13	21.4	Hale.....	4.482847	30,398.1	99,731
	93	29	60.100	222	12	54.6	42	17	59.2	Bosworth.....	4.232167	17,067.4	55,995
				293	48	44.9	113	57	45.6	Utz.....	4.349483	22,360.6	73,361
Brunswick (Mo.R.C.), 1887.....	39	25	31.474	335	02	28.59	155	05	12.51	High Hill (Mo.R.C.).....	4.1665655	14,674.57	48,144.8
	93	07	49.146	58	36	39.26	238	32	47.49	Missouri.....	4.0102210	10,238.14	33,589.6
Hawkins (Mo.R.C.), 1887.....	39	21	16.485	114	41	02.36	294	38	36.60	Missouri.....	3.7820289	6,053.81	19,861.5
	93	10	04.476	202	22	18.89	22	23	44.77	Brunswick (Mo.R.C.).....	3.9296438	8,504.40	27,901.5
				299	57	19.18	120	01	28.75	High Hill (Mo.R.C.).....	4.0369982	10,889.26	35,725.8
				42	16	26.76	222	12	56.31	Utz.....	4.0732221	11,836.47	38,833.6
Brunswick, city water tank, 1928.....	39	25	43.776	193	17	35.3	13	18	33.3	Pittman.....	3.977013	9,484.5	31,117
	93	07	44.536	336	02	13.7	156	04	54.7	High Hill (Mo.R.C.).....	4.175346	14,974.3	49,128
			57	09	44.1	237	05	49.4	Missouri.....	4.022562	10,533.2	34,558	
Brunswick, church steeple, 1928.....	39	25	35.79	57	41	33	237	37	44	Missouri.....	4.009733	10,226.6	33,552
	93	07	53.17	194	08	17	14	09	20	Pittman.....	3.990013	9,772.7	32,063
Brunswick, short spire, top of dome, 1928 ¹	39	25	35.80	33	33	11	213	28	17	Utz.....	4.303212	20,100.7	65,947
	93	07	53.16	138	58	50	318	51	39	Hale.....	4.391713	24,644.1	80,853
Slater, city water tank, 1928.....	39	13	12.273	4	29	54.5	184	29	41.6	Slater.....	3.795393	6,243.0	20,482
	93	03	24.737	109	26	01.9	289	18	18.8	Utz.....	4.269600	18,603.7	61,036
				172	55	08.0	352	53	21.0	Pittman.....	4.513957	32,655.6	107,138
Slater, Slater Mill & Elevator Co., tall smokestack, 1928.....	39	13	06.380	0	33	51.3	180	33	49.8	Slater.....	3.781207	6,042.4	19,824
	93	03	42.654	110	25	01.4	290	17	29.7	Utz.....	4.261538	18,261.6	59,913
				173	42	01.1	353	40	25.5	Pittman.....	4.515689	32,786.0	107,565
Marshall, city water plant, smokestack, 1928.....	39	07	19.516	9	40	00.4	189	38	21.4	Reid.....	4.353344	22,560.3	74,017
	93	12	25.802	68	56	16.4	248	52	58.2	Shackle.....	3.912330	8,172.0	26,811
				164	58	51.2	344	56	50.5	Utz.....	4.246812	17,652.7	57,916
Marshall, International Shoe Co., water tank, 1928.....	39	07	21.751	10	14	49.8	190	13	04.4	Reid.....	4.355458	22,670.3	74,377
	93	12	15.645	69	05	55.0	249	02	28.4	Shackle.....	3.925545	8,424.5	27,639
				164	09	35.2	344	07	28.1	Utz.....	4.246775	17,651.2	57,911
Marshall, Saline County, courthouse, 1928.....	39	07	14.935	162	15	12.9	342	12	47.8	Utz.....	4.256490	18,060.5	59,221
	93	11	47.115	210	05	59.7	30	11	13.4	High Hill (Mo.R.C.).....	4.375043	23,716.1	77,809
				247	27	08.5	67	32	12.7	Slater.....	4.067919	12,529.1	41,106
Marshall, gas plant, smokestack, 1928.....	39	07	23.610	11	13	29.4	191	11	33.4	Reid.....	4.357974	22,802.1	74,810
	93	11	58.804	69	41	27.4	249	37	50.2	Shackle.....	3.945634	8,823.4	28,948
				162	51	10.7	342	48	53.0	Utz.....	4.248246	17,711.1	58,107
Marshall, city water tank, 1928.....	39	07	06.781	73	30	11.2	253	26	20.4	Shackle.....	3.962477	9,172.3	30,083
	93	11	37.171	246	13	09.9	66	18	08.0	Slater.....	4.092865	12,384.1	40,630
				12	45	21.8	192	43	12.2	Reid.....	4.351461	22,462.6	73,696
Sedalia, Sacred Heart Catholic Church, tallest spire, 1928.....	38	42	31.025	175	54	36.3	355	53	52.3	Reid.....	4.375109	23,719.7	77,820
	93	13	52.832	249	22	17.6	69	23	11.7	Heard.....	3.348790	2,232.5	7,324
				351	27	07.4	171	28	38.1	Schnackenburg.....	4.374163	23,668.1	77,651
East Sedalia, Missouri Pacific R.R. shops, tall masonry stack, 1928.....	38	42	18.512	168	14	02.1	348	11	51.8	Reid.....	4.390275	24,562.6	80,586
	93	11	35.140	207	26	46.0	27	32	58.0	Ridge.....	4.491300	30,995.6	101,691
				276	34	57.1	96	47	20.5	Syracuse.....	4.461402	28,933.6	94,926
Sedalia, city electric power plant, tallest smokestack, 1928.....	38	42	13.114	174	12	31.4	354	11	27.5	Reid.....	4.386249	24,336.0	79,842
	93	13	21.122	211	18	52.1	31	26	10.6	Ridge.....	4.510516	32,397.8	106,292
				224	40	04.1	44	40	38.4	Heard.....	3.274693	1,882.3	6,176
Sedalia, Missouri-Kansas-Texas R.R. shops, stack, 1928.....	38	41	37.000	178	43	32.9	358	43	18.2	Reid.....	4.403657	25,331.3	83,108
	93	14	39.674	232	42	40.0	52	44	03.4	Heard.....	3.607307	4,048.6	13,283
				347	55	06.2	167	57	06.2	Schnackenburg.....	4.346962	22,312.2	72,937
Cole Camp, tallest church spire, 1928.....	38	27	31.844	192	32	48.9	12	33	13.6	Schnackenburg.....	3.645995	4,425.8	14,520
	93	12	07.335	342	51	48.3	162	53	42.1	Ross.....	4.179269	15,110.2	49,574
				11	33	31.8	191	30	13.7	Sory.....	4.589440	38,854.4	127,475
Buffalo, city water tower, 1928.....	37	38	43.802	196	43	00.0	16	44	06.9	Butler.....	3.968828	9,307.4	30,536
	93	05	27.774	295	06	19.9	115	16	41.6	Bateman.....	4.441352	27,628.2	90,644
				52	36	31.1	232	33	01.5	Blue.....	4.025511	10,605.0	34,793
Buffalo, courthouse, dome, 1928 ¹	37	38	36.91	53	19	22	233	15	54	Blue.....	4.018119	10,426.0	34,206
	93	05	30.38	196	43	00	16	44	08	Butler.....	3.979062	9,529.3	31,264
Marshfield, water tower, 1928.....	37	20	05.104	86	02	02.1	265	53	44.0	Strafford.....	4.306843	20,269.5	66,501
	92	54	10.835	141	49	22.2	321	44	52.0	Elkland.....	4.247745	17,690.7	58,040
				200	16	40.3	20	20	08.3	Bateman.....	4.384436	24,234.6	79,510
Springfield, City Gas & Electric Co., stack, 1928. ¹	37	13	00.03	233	04	39	53	11	02	Strafford.....	4.289208	19,462.9	63,855
	93	18	24.06	297	24	33	117	32	47	Rogersville west base.....	4.356611	22,730.6	74,575

¹ No check on this position.

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points</i>													
Squires, 1928	36 50 59.199	39 41 20.52	219 35 54.86	Knight	4.3251570	21,142.53	69,365.1						
	92 37 47.578	138 40 46.74	318 34 04.27	Painter	4.3992528	25,075.68	82,269.1						
Romance, 1928	36 42 19.360	89 36 31.02	269 24 31.70	Knight	4.4752914	29,873.86	98,011.2						
	92 26 48.032	134 28 07.48	314 21 32.60	Squires	4.3597779	22,896.96	75,121.1						
		136 43 37.97	316 30 20.51	Painter	4.6806856	47,938.63	157,278.7						
Twin, 1928	36 55 16.398	35 44 22.12	215 37 26.31	Romance	4.4696507	29,488.37	96,746.4						
	92 15 14.101	76 48 14.49	256 34 42.11	Squires	4.5370786	34,441.22	112,995.9						
		102 26 34.25	282 06 17.46	Painter	4.7094151	51,217.12	168,034.9						
Siloam, 1928	36 48 26.418	71 44 52.20	251 31 10.03	Romance	4.5552003	35,908.75	117,810.6						
	92 03 54.116	126 56 18.80	306 49 30.86	Twin	4.323+029	21,057.31	69,085.5						
Amy, 1928	36 36 20.656	105 45 02.66	285 29 11.97	Romance	4.6135013	41,067.78	134,736.5						
	92 00 15.603	147 35 46.33	327 26 48.56	Twin	4.6180514	41,500.31	136,155.6						
		166 23 25.96	346 21 15.35	Siloam	4.3620972	23,019.57	75,523.4						
Pomona, 1928	36 51 03.148	16 00 18.12	195 57 10.39	Amy	4.4517259	28,206.06	92,834.7						
	91 55 01.686	60 56 00.46	249 50 41.30	Siloam	4.1477066	14,050.98	46,098.9						
		104 40 35.43	284 28 27.70	Twin	4.4916504	31,021.26	101,775.6						
Homeland, 1928	36 39 39.535	53 54 28.69	233 51 06.93	Amy	4.0170158	10,399.88	34,119.3						
	91 54 37.472	178 22 09.72	358 21 55.23	Pomona	4.3238913	21,081.00	69,163.2						
Brands, 1928	36 38 57.422	80 28 08.00	260 16 43.87	Amy	4.4608620	28,897.61	94,806.2						
	91 41 08.916	93 45 55.65	273 37 52.94	Homeland	4.3037195	20,124.24	66,024.3						
		137 20 52.47	317 12 34.20	Pomona	4.4935982	30,450.06	99,901.6						
Congo, 1928	36 54 02.426	13 12 31.69	193 09 53.89	Brands	4.4571619	28,652.46	94,003.9						
	91 36 45.337	45 04 29.90	224 53 47.95	Homeland	4.5752897	37,007.00	122,382.3						
		78 35 13.37	258 24 15.47	Pomona	4.4426225	27,709.10	90,908.9						
Rover, 1928	36 45 53.098	38 37 57.01	218 33 50.70	Brands	4.2147046	16,394.74	53,788.4						
	91 34 16.840	166 18 09.27	346 16 40.25	Congo	4.1910639	15,526.15	50,938.7						
Pinwood, 1928	36 41 48.162	72 22 51.53	252 16 14.26	Brands	4.2389243	17,335.02	56,873.3						
	91 30 03.762	140 16 12.19	320 13 40.83	Rover	3.9921247	9,820.30	32,218.8						
		156 17 28.55	336 13 28.00	Congo	4.3931650	24,726.63	81,124.0						
Banner, 1928	36 52 57.969	17 53 16.77	197 50 36.02	Pinwood	4.3363211	21,693.08	71,171.4						
	91 25 35.345	44 39 47.93	224 34 35.37	Rover	4.2648106	18,400.08	60,367.6						
		96 53 08.17	276 46 25.97	Congo	4.2229317	16,708.28	54,817.1						
Alton, 1928	36 42 53.074	82 53 11.93	262 46 48.73	Pinwood	4.2051080	16,038.66	52,620.2						
	91 19 22.638	153 40 15.42	333 36 32.17	Banner	4.3182696	20,909.88	68,273.7						
Tram, 1928	36 51 42.648	26 20 15.42	206 17 00.46	Alton	4.2603296	18,210.82	59,746.7						
	91 13 57.093	52 40 59.95	232 31 21.17	Pinwood	4.4796187	30,173.01	98,992.6						
		97 42 17.46	277 35 18.49	Banner	4.2417705	17,449.00	57,247.3						
Camp, 1928	36 45 46.998	72 42 17.78	252 35 24.12	Alton	4.2546832	17,975.59	58,974.9						
	91 07 51.092	140 25 21.50	320 21 42.20	Tram	4.1532003	14,229.85	46,685.8						
Dodd, 1928	36 40 31.704	102 47 08.11	282 39 23.44	Alton	4.2964302	19,789.29	64,925.4						
	91 08 25.034	151 34 34.03	331 30 03.43	Tram	4.3715348	23,525.28	77,182.5						
		167 36 50.01	347 35 58.55	Camp	3.9978580	9,950.80	32,646.9						
Montay, 1928	36 53 06.236	16 02 36.20	195 59 54.94	Dodd	4.3837881	24,198.48	79,391.2						
	91 01 55.707	33 04 23.65	213 00 50.64	Camp	4.2082329	16,152.25	52,992.8						
		81 51 13.30	261 44 00.43	Tram	4.2565103	18,051.38	59,222.6						
Brooks, 1930	36 42 44.833	80 24 30.52	260 14 59.79	Dodd	4.3879539	24,431.71	80,156.4						
	90 50 14.851	137 50 52.36	317 43 52.54	Montay	4.4126484	25,861.18	84,846.2						
Junction, 1930	36 55 48.679	5 42 13.42	185 41 15.14	Brooks	4.3852892	24,282.26	79,666.0						
	90 48 37.616	43 11 50.47	223 01 20.01	Dodd	4.5879233	38,718.93	127,030.4						
		75 50 40.94	255 42 41.66	Montay	4.3092507	20,382.18	66,870.5						
Martin, 1930	36 50 49.039	62 17 54.08	242 06 30.44	Brooks	4.5052380	32,006.49	105,008.0						
	90 31 13.060	109 44 20.01	289 33 53.00	Junction	4.4387813	27,465.11	90,108.4						
Berry, 1930	36 42 11.916	92 12 30.07	272 01 28.87	Brooks	4.4389233	27,474.09	90,137.9						
	90 31 48.686	135 16 42.77	315 06 38.16	Junction	4.5500491	35,485.35	116,421.5						
		183 10 09.78	3 10 31.11	Martin	4.2031661	15,964.90	52,378.2						
Deal, 1930	36 49 29.846	53 41 11.00	233 33 48.74	Berry	4.3572043	22,761.68	74,677.3						
	90 19 29.776	98 01 58.18	277 54 56.54	Martin	4.2454355	17,596.87	57,732.4						
Head, 1930	36 41 32.095	92 52 50.34	272 42 45.41	Berry	4.4006782	25,158.12	82,539.6						
	90 14 56.416	125 24 36.14	305 14 51.52	Martin	4.4725874	29,688.44	97,402.8						
		155 18 02.20	335 15 18.07	Deal	4.2096547	16,212.68	53,191.1						
Boyd, 1930	36 43 11.621	81 57 50.35	261 49 11.78	Head	4.3374932	21,751.70	71,363.7						
	90 00 28.830	112 29 19.72	292 17 56.70	Deal	4.4867613	30,602.81	100,402.7						

Ninety-third meridian to Cairo, Ill., arc—Continued

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>													
Poor, 1930.....	36	51	53.686	23	00	37.88	202	57	52.97	Boyd.....	4.2425661	17,480.99	57,352.2
	89	55	53.476	56	02	04.16	235	50	39.85	Head.....	4.5341684	34,211.20	112,241.2
				82	54	59.05	262	40	49.76	Deal.....	4.5486289	35,369.50	116,041.4
Idalia, 1930.....	36	53	21.447	38	47	34.49	218	41	29.98	Boyd.....	4.3820365	24,101.08	79,071.6
	89	50	20.384	71	52	16.67	251	48	56.78	Poor.....	3.9385979	8,681.56	28,482.8
Ditch, 1930.....	36	50	02.550	63	01	23.97	242	51	25.32	Boyd.....	4.4447369	27,844.34	91,352.6
	89	43	48.903	100	51	53.57	280	44	39.03	Poor.....	4.2618587	18,275.05	59,957.4
				122	20	08.80	302	16	13.96	Idalia.....	4.0596737	11,472.91	37,640.7
Bell, 1930.....	37	00	48.377	333	57	59.05	154	01	54.74	Ditch.....	4.3453762	22,150.13	72,670.9
	89	50	21.226	359	54	47.78	179	54	48.29	Idalia.....	4.1391598	13,777.17	45,200.6
				26	32	19.36	206	28	59.69	Poor.....	4.2652716	18,419.24	60,430.5
Morley, 1930.....	37	00	37.460	28	37	22.69	208	33	03.84	Ditch.....	4.3480893	22,288.93	73,128.3
	89	36	33.011	91	00	58.22	270	52	42.06	Bell.....	4.3086593	20,354.45	66,779.6
Sikeston, 1930.....	36	53	26.810	61	09	21.36	241	04	44.93	Ditch.....	4.1151359	13,035.75	42,768.1
	89	36	08.103	122	53	17.71	302	44	44.86	Bell.....	4.3999495	25,115.94	82,401.2
				176	48	43.24	356	48	25.26	Morley.....	4.1237173	13,295.89	43,621.6
Diehlstadt, 1930.....	36	58	45.472	57	53	44.22	237	47	24.82	Sikeston.....	4.2661379	18,456.01	60,551.1
	89	25	36.726	101	58	34.76	281	51	56.83	Morley.....	4.2230413	16,712.50	54,830.9
				303	44	10.68	123	50	27.53	Williams (northeast base).....	4.2712740	18,675.58	61,271.5
Armour, 1930.....	36	52	07.658	350	14	30.38	170	16	02.44	Prairie (southwest base).....	4.3510941	22,443.68	73,634.0
	89	27	35.045	100	54	46.72	280	49	38.81	Sikeston.....	4.1118664	12,937.98	42,447.4
				139	30	57.05	319	25	30.74	Morley.....	4.3154646	20,675.91	67,834.2
			193	25	16.02	13	26	27.10	Diehlstadt.....	4.1006395	12,607.81	41,364.1	
			264	07	59.19	84	15	26.56	Williams (northeast base).....	4.2685259	18,557.77	60,884.9	
			325	38	12.89	145	40	55.75	Prairie (southwest base).....	4.0769145	11,937.53	39,165.0	
<i>Supplementary points</i>													
Clark, 1930.....	36	46	26.068	69	38	42.4	249	31	20.6	Brooks.....	4.291132	19,549.3	64,135
	90	37	56.354	137	33	46.1	317	27	21.5	Junction.....	4.371423	23,519.2	77,163
				230	55	40.8	50	59	42.4	Martin.....	4.109585	12,870.2	42,225
				310	37	35.1	130	41	15.0	Berry.....	4.080063	12,024.4	39,450
Poplar Bluff, municipal water tank, 1930.....	36	45	32.175	60	31	58.1	240	27	35.1	Berry.....	4.098105	12,534.4	41,123
	90	24	29.034	134	18	53.2	314	14	51.1	Martin.....	4.145815	13,989.9	45,899
				225	20	15.6	45	23	14.8	Deal.....	4.018164	10,427.1	34,210
Poplar Bluff, standpipe, 1930.....	36	45	37.216	63	14	19.3	243	09	17.3	Berry.....	4.147183	14,034.0	46,043
	90	23	23.853	218	57	51.0	39	00	11.2	Deal.....	3.964970	9,225.1	30,266
				300	55	27.4	121	00	30.8	Head.....	4.166868	14,684.8	48,178
Poplar Bluff, stack, 1930 ¹	36	45	11.64	297	52	08	117	57	16	Head.....	4.160075	14,456.9	47,431
	90	23	31.22	65	52	16	245	47	19	Berry.....	4.131303	13,530.2	44,390
Dexter, municipal water tank, 1930.....	36	47	18.092	31	12	42.8	211	10	51.9	Boyd.....	3.948503	8,881.8	29,140
	89	57	23.364	194	41	08.2	14	42	02.1	Poor.....	3.943619	8,782.5	28,814
				255	50	09.6	75	58	17.6	Ditch.....	4.318374	20,814.9	68,290
Bloomfield, municipal water tank, 1930 ¹	36	53	07.74	266	59	53	87	03	10	Idalia.....	3.910713	8,141.7	26,712
	89	55	48.73	2	56	51	182	56	48	Poor.....	3.359045	2,285.8	7,499
Sikeston, municipal water tank, 1930.....	36	52	42.365	69	21	24.6	249	16	08.7	Ditch.....	4.144430	13,945.4	45,753
	89	35	02.262	130	02	45.0	310	02	05.5	Sikeston.....	3.328310	2,129.7	6,987
				231	18	11.1	51	23	50.9	Diehlstadt.....	4.253380	17,921.7	58,798
Sikeston, Scott Milling Co., stack, 1930.....	36	52	30.646	69	10	04.6	249	05	14.7	Ditch.....	4.107655	12,813.1	42,038
	89	35	45.625	162	10	41.1	342	10	27.6	Sikeston.....	3.259737	1,818.6	5,967
				175	04	02.5	355	03	31.0	Morley.....	4.177896	15,062.5	49,418
Morehouse, Leaming Lumber Co., stack, 1930.....	36	50	50.238	65	53	25.7	245	52	06.2	Ditch.....	3.559060	3,597.2	11,802
	89	41	36.400	239	16	52.1	59	20	09.1	Sikeston.....	3.975703	9,455.9	31,023
				263	23	51.5	83	32	16.2	Armour.....	4.321768	20,978.2	68,826
O'Fallon, municipal water tank, 1931 ²	38	48	43.380	333	18	17.8	153	23	09.4	Ganahl.....	4.400003	25,119.0	82,411
	90	41	53.890	44	34	26.4	224	32	40.9	Orf.....	3.762853	5,792.7	19,005
				149	39	16.6	329	35	12.6	Palmer.....	4.267738	18,524.1	60,774
Bowling Green, municipal water tank, 1931 ²	39	20	34.966	171	32	12.3	351	30	23.9	Gibbs.....	4.441766	27,654.5	90,730
	91	11	36.311	184	07	27.0	4	08	07.3	Ashburn.....	4.323406	21,057.5	69,086
				218	07	33.1	38	12	11.4	Louisiana.....	4.229855	16,976.8	55,698

¹No check on this position.

²This position was added in proof and is out of place. It belongs on p. 36

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points</i>													
Winter 2, 1933	38 27	41.271		168 37	50.47		348 36	35.15	Gasconade	4.1716513	14,847.43	48,711.9	
	91 26	02.992		219 06	37.27		39 11	58.09	Berger	4.2957006	19,756.07	64,816.4	
				292 38	05.2				Azimuth mark				
Jacobs 2, 1933	38 26	17.657		100 13	55.93		280 07	47.79	Winter 2	4.1639248	14,585.62	47,853.0	
	91 16	10.963		134 49	46.78		314 42	22.81	Gasconade	4.3861311	24,329.38	79,820.6	
				174 03	17.63		354 02	29.67	Berger	4.2551480	17,994.84	59,038.1	
				261 18	27.71		81 26	10.83	Peters	4.2616419	18,265.93	59,927.5	
			243 30	47.6				Azimuth mark					
Price, 1934	38 17	35.700		191 53	31.67		11 55	12.37	Winter 2	4.2806356	19,062.51	62,606.5	
	91 28	45.185		228 37	15.15		48 45	03.28	Jacobs 2	4.3869925	24,377.69	79,979.1	
				177 20	23.5				Azimuth mark				
Elmont, 1933	38 14	03.913		108 16	10.83		288 07	44.88	Price	4.3203097	20,907.87	68,596.2	
	91 15	08.185		147 48	27.41		327 41	41.15	Winter 2	4.4741992	29,798.83	97,765.0	
				176 08	59.77		356 08	20.84	Jacobs 2	4.3555515	22,675.22	74,393.6	
				194 48	34.5				Azimuth mark				
Bourbon, 1933	38 08	07.654		132 53	41.31		312 45	40.84	Price	4.4110152	25,764.11	84,527.8	
	91 15	48.473		185 05	50.63		5 06	15.54	Elmont	4.0425009	11,028.10	36,181.4	
			90 36	23.1				Azimuth mark					
Hughes, 1934	38 02	26.885		186 12	26.38		6 13	43.89	Price	4.4500483	28,186.96	92,476.7	
	91 30	50.601		226 48	00.47		46 57	42.47	Elmont	4.4975084	31,441.87	103,155.5	
				244 22	43.63		64 32	00.13	Bourbon	4.3867816	24,365.85	79,940.3	
				229 13	14.0				Azimuth mark				
Wallis, 1933	37 59	10.464		105 00	22.30		284 50	48.78	Hughes	4.3712726	23,511.08	77,135.9	
	91 15	19.318		177 32	42.99		357 32	25.03	Bourbon	4.2195294	16,577.90	54,389.3	
				218 31	39.8				Azimuth mark				
Perkins, 1933	37 52	29.892		186 54	48.09		6 55	44.40	Hughes	4.2681397	18,541.28	60,830.8	
	91 32	22.124		243 36	12.30		63 46	41.03	Wallis	4.4450561	27,864.81	91,419.8	
			86 00	57.0				Azimuth mark					
<i>Supplementary points</i>													
Dillard, 1934	37 46	35.058		111 53	00.76		291 41	34.49	Perkins	4.4694271	29,473.19	96,696.6	
	91 13	43.072		139 32	43.31		319 22	12.01	Hughes	4.5867761	38,610.79	126,695.3	
				174 14	29.36		354 13	30.27	Wallis	4.3693723	23,408.43	76,799.2	
				183 28	42.1				Azimuth mark				
Howe, 1934	37 41	58.752		174 05	29.57		354 04	39.09	Perkins	4.2914261	19,562.58	64,181.6	
	91 30	59.728		251 21	34.99		71 32	09.48	Dillard	4.4277111	20,773.87	67,840.6	
				202 08	45.6				Azimuth mark				
Penrod, 1934	37 37	08.523		113 42	00.54		293 33	30.75	Howe	4.3487648	22,323.63	73,240.1	
	91 17	05.326		141 45	49.81		321 36	28.57	Perkins	4.5587500	36,203.45	118,777.5	
				195 49	13.78		15 51	17.46	Dillard	4.2590092	18,155.54	59,565.3	
				98 17	15.6				Azimuth mark				
Grogan, 1934	37 33	20.687		175 37	05.42		355 36	34.93	Howe	4.2046281	16,018.73	52,554.8	
	91 30	09.769		224 33	14.65		44 43	17.60	Dillard	4.5367822	34,417.73	112,918.8	
				249 52	59.90		70 00	58.40	Penrod	4.3114926	20,487.67	67,216.6	
				106 31	07.0				Azimuth mark				
Lewis, 1934	37 27	07.119		162 19	27.58		342 17	56.54	Grogan	4.0823624	12,088.22	39,659.4	
	91 27	40.234		220 00	05.03		40 06	31.86	Penrod	4.3842254	24,222.86	79,471.2	
			216 11	16.1				Azimuth mark					
Bunker, 1933	37 27	19.197		89 06	45.88		268 57	38.00	Lewis	4.3453109	22,146.80	72,660.0	
	91 12	39.283		113 26	59.68		293 16	20.11	Grogan	4.4487849	28,105.06	92,208.1	
				160 14	58.23		340 12	16.15	Penrod	4.2857100	19,306.79	63,342.4	
				296 55	01.1				Azimuth mark				
Young, 1934	37 12	39.618		168 48	43.03		348 46	32.52	Lewis	4.4355773	27,263.23	89,446.1	
	91 24	05.014		211 50	47.75		31 57	43.61	Bunker	4.5043491	31,941.04	104,793.2	
			327 56	17.5				Azimuth mark					
Stegall, 1934	37 04	29.473		5 54	54.46		185 53	54.99	Tram	4.3759289	23,764.51	77,967.4	
	91 12	18.224		42 49	53.84		222 41	54.34	Banner	4.4629338	29,035.80	95,261.6	
				130 57	32.27		310 50	25.51	Young	4.3631911	23,077.62	75,713.8	
				151 35	00.36		331 25	42.11	Lewis	4.6778053	47,621.75	156,239.0	
				179 17	50.54		359 17	37.79	Bunker	4.6256084	42,228.77	138,545.6	
				180 54	59.7				Azimuth mark				
Webb, 1934	37 01	01.996		184 54	50.22		4 55	35.47	Young	4.3341550	21,585.14	70,817.2	
	91 25	20.000		251 36	59.23		71 44	50.22	Stegall	4.3085600	20,349.79	66,764.3	
				315 31	10.14		135 38	00.54	Tram	4.3827895	24,142.91	79,208.9	
				1 27	31.63		181 27	22.39	Banner	4.1739297	14,925.53	48,968.2	
				285 41	00.7				Azimuth mark				
Leslie, Zion Presbyterian Church, spire tip, 1934. ¹	38 25	13.76		116 08	11		296 06	28	Jacobs 2	3.650797	4,475.0	14,682	
	91 13	25.31		163 32	09		343 29	38	Berger	4.316387	20,719.9	67,979	
Sullivan, municipal water tank, silver, 1934. ¹	38 12	29.61		108 42	26		288 30	33	Price	4.470946	29,576.4	97,035	
	91 09	32.40		109 37	25		289 33	57	Elmont	3.938026	8,670.1	28,445	

¹ No check on this position.

Thirty-seventh parallel to thirty-ninth parallel arc—Continued

Station	Latitude and longitude			Azimuth			Back Azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Cuba, municipal water tank, 1934.....	38	03	36.830	76	44	48.2	256	40	57.2	Hughes.....	3.972409	9,384.5	30,789
	91	24	36.005	166	49	28.3	346	46	54.3	Price.....	4.424328	26,566.1	87,169
				236	56	47.2	57	02	12.7	Bourbon.....	4.185484	15,327.9	50,288
St. James, municipal water tank, 1934.....	37	59	48.517	199	37	03.7	19	42	01.9	Price.....	4.543330	34,940.6	114,634
	91	36	47.920	240	42	39.6	60	46	19.7	Hughes.....	3.998581	9,990.4	32,777
				334	20	17.6	154	23	01.0	Perkins.....	4.176102	15,000.4	49,214
Bourbon, municipal water tank, 1934 ¹	38	09	29.77	31	50	43	211	50	03	Bourbon.....	3.474244	2,980.2	9,778
	91	14	43.91	120	17	01	306	08	20	Price.....	4.404176	25,361.6	83,207
St. James, hospital, water tank, 1934 ¹	38	00	17.66	245	51	26	65	55	11	Hughes.....	3.989128	9,752.8	31,997
	91	36	55.57	335	08	01	155	10	49	Perkins.....	4.201198	15,892.7	52,141
Gulf pump station, south of Steelville, water tank, 1934.....	37	56	06.732	125	20	20.1	305	13	22.3	Hughes.....	4.307338	20,292.6	66,577
	91	19	31.758	227	23	17.2	47	25	52.5	Wallis.....	3.922750	8,370.5	27,462
				334	09	38.2	154	13	12.2	Dillard.....	4.291774	19,578.3	64,233
M.S.M., 1934.....	37	57	24.643	247	40	52.9	67	50	28.0	Hughes.....	4.391325	24,622.1	80,781
	91	46	24.684	293	45	07.7	113	53	45.5	Perkins.....	4.352138	22,497.7	73,811
				39	10	04.5				Azimuth mark.....			
Rolla, Missouri School of Mines, power plant, stack, 1934. ¹	37	57	14.08	185	57	58	5	57	59	M. S. M.....	2.514897	327.3	1,074
	91	46	26.06	247	00	53	67	10	29	Hughes.....	4.394081	24,778.8	81,295
Salem, municipal water tank, final, 1934.....	37	38	28.835	195	03	59.3	15	04	42.8	Howe.....	3.826227	6,702.3	21,989
	91	32	10.845	276	17	09.7	96	26	22.6	Penrod.....	4.349111	22,341.4	73,298
				342	37	42.1	162	38	56.0	Grogan.....	3.997977	9,953.5	32,656
Salem, municipal water tank, light, 1934.....	37	38	28.862	195	04	21.0	15	05	04.5	Howe.....	3.826183	6,701.7	21,987
	91	32	10.865	276	17	16.8	96	26	29.7	Penrod.....	4.349122	22,342.0	73,300
				342	37	37.2	162	38	51.1	Grogan.....	3.998018	9,954.5	32,659
Missouri School of Mines, water tank, 1934 ¹	37	57	23.68	228	14	24	48	14	25	M. S. M.....	1.649528	44.6	146
	91	46	26.05	247	38	48	67	48	24	Hughes.....	4.392066	24,664.1	80,919
Church spire, gold cross, 1934 ¹	38	24	18.37	142	13	27	322	06	16	Berger.....	4.436467	27,319.1	89,629
	91	05	56.41	206	11	16	26	12	37	Peters.....	3.854499	7,153.2	23,468
Primary traverse station no. 108 (U.S.G.S.), 1934. ¹	37	59	10.79	67	44	48	247	44	48	Wallis.....	1.418484	26.211	85.99
	91	15	18.32										

¹ No check on this position.

ELEVATIONS

The thirty-ninth parallel arc is the only arc included in this publication along which observations were made for the determination of trigonometric elevations.

The elevations given in the following tables are referred to mean sea level. The stations are divided into three classes: First, those fixed by direct connection with sea level, the elevations of which are subject to a probable error of ± 0.1 meter; second, the stations in the main scheme fixed by reciprocal measures of vertical angles and subject to probable errors varying from ± 0.1 to ± 1.5 meters; and, third, the intersection stations, the elevations of which are fixed by measurement of vertical angles which are not reciprocal (the station not being occupied). The probable errors of these last elevations may be as great as ± 3 meters.

Since recent adjustments have changed the elevations of bench marks in Missouri by slight amounts, the elevations of the class 1 stations, as given in the following table, do not agree exactly with the latest adopted elevations of these points. The differences are small, however, and it did not seem advisable to readjust the trigonometric elevations to eliminate these discrepancies, especially as the probable errors of the class 2 and class 3 elevations are several times as large as any changes that would be made by the readjustment.

Table of elevations, thirty-ninth parallel arc

Station	Point to which elevation refers	Elevation	
		Meters	Feet
<i>Class 1</i>			
Bowler.....	Top of surface stone.....	330.97	1,085.86
Baker.....	do.....	306.20	1,004.59
Knob Noster.....	do.....	279.40	916.66
Heard.....	do.....	281.29	922.87
Hubbard.....	Surface of ground.....	294.80	967.19
Cole.....	Top of surface stone.....	281.48	923.49
Christian.....	Surface of ground.....	278.90	915.02
Versailles north base.....	Copper bolt.....	322.30	1,057.41
Hunter.....	do.....	319.47	1,048.13
Medlock.....	Top of surface stone.....	266.90	875.65
<i>Class 2</i>			
Thornton.....	Station mark.....	319.7	1,048.9
Fulton.....	do.....	321.9	1,056.1
Hutton Mound.....	do.....	301.6	989.5
Chapel Hill.....	do.....	329.7	1,081.7
Normal.....	do.....	267.7	878.3
Caldwell.....	do.....	305.2	1,001.3
High Point Tebo.....	do.....	304.4	998.7
Kendrick.....	do.....	280.1	919.0
Schnsokenburg.....	do.....	332.6	1,091.2
Hughes.....	do.....	338.0	1,110.9
High Point.....	do.....	294.2	965.2
Moreau.....	do.....	279.8	918.0
Belshe.....	do.....	311.9	1,023.3
Cedar.....	do.....	269.8	885.2
Kennedy.....	do.....	288.6	946.8
McDaniel.....	do.....	292.0	958.0
Pilot Knob.....	do.....	298.3	978.7
Bradford.....	do.....	286.9	941.3
Turnpike Bluff.....	do.....	268.4	880.6
Geyer.....	do.....	295.6	969.8

Table of elevations, thirty-ninth parallel arc—Continued

Station	Point to which elevation refers	Elevation	
		Meters	Feet
<i>Class 2—Continued</i>			
Gasconade.....	do.....	288.6	946.8
Winter.....	do.....	281.7	924.2
Berger.....	do.....	284.5	933.4
Jacobs.....	do.....	283.5	930.1
Doermann Hill.....	Ground at station.....	294.9	967.5
<i>Class 3</i>			
Koeltztown church.....	Top of fourth (upper) step at front door.....	286.7	940.6
Jefferson City astronomic.....	Top of station mark.....	211.3	693.2
Cooks Knob (ice house).....	Top of cupola.....	266.5	874.3
Hazel Hill.....	Surface mark.....	273.1	896.0
Windsor public school.....	Top of cupola.....	292.7	960.3
Holden Methodist Church.....	Top of spire.....	295.8	970.5
Westport College.....	do.....	330.6	1,084.6
Belton South Methodist Church.....	do.....	358.0	1,174.5
Kansas City Catholic Cathedral.....	do.....	338.2	1,109.6
Lees Summit South Methodist Church.....	Top of cupola.....	331.5	1,087.6
Independence courthouse.....	Top of clock.....	344.0	1,128.6
Harrisonville Cumberland Presbyterian Church.....	Top of spire.....	320.7	1,052.2
Warrensburg Presbyterian Church.....	do.....	293.0	961.3
Centerview Cumberland Presbyterian Church.....	Top of cupola.....	281.3	922.9
Kingsville public school.....	do.....	291.1	955.1
Staley Mound.....	Top of chimney.....	309.6	1,015.7
Austin Methodist Church.....	Top of spire.....	295.1	968.2
Hicks City Christian Union Church.....	do.....	338.7	1,111.2

DESCRIPTIONS OF TRIANGULATION STATIONS

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

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

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

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

MARKING OF STATIONS

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

The old type of station mark referred to in the following notes and descriptions consists also of a disk and shank made of bronze and cast in one piece. (See fig. 3.) The disk, which is somewhat smaller than the disk of the marks described above, has a polished center with an inscribed triangle. Around the polished part are the letters "U.S. C. & G. S." and a raised flange around the edge.

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

The standard notes on the marking of stations which are given below serve as a guide to the field observer in selecting the best type of mark for each particular station. They are also useful to the observer in writing his descriptions, as he need not describe the marking used at a station but simply give the numbers of the standard notes which describe the station, underground, reference, and witness marks. The notes were made as general as possible in order that it might not be necessary in the field to describe small and unimportant variations.

At the end of the standard notes are given a few additional notes on station marks, which apply mostly to the old stations established when the old type of tablets were in use.

For the convenience of the reader a brief description of the marking is given in each of the following descriptions of stations. In addition, the number of the note describing the mark in detail is also given.

STANDARD NOTES ON THE MARKING OF STATIONS

Surface marks

Note 1.—A standard disk triangulation station mark set in the top of (a) a square block or post of concrete, (b) a concrete cylinder, (c) an irregular mass of concrete.

Note 2.—A standard disk triangulation station mark wedged in a drill hole in outcropping bedrock (a) and surrounded by a triangle chiseled in the rock, (b) and surrounded by a circle chiseled in the rock, (c) at the intersection of two lines chiseled in the rock.

Note 3.—A standard disk triangulation station mark set in concrete in a depression in outcropping bedrock.

Note 4.—A standard disk triangulation station mark wedged in a drill hole in a boulder.

Note 5.—A standard disk triangulation station mark set in concrete in a depression in a boulder.

Note 6.—A standard disk triangulation station mark set in concrete at the center of the top of a tile (a) which is embedded in the ground, (b) which is surrounded by a mass of concrete, (c) which is fastened by means of concrete to the upper end of a long wooden pile driven into the marsh, (d) which is set in a block of concrete and projects from 12 to 20 inches above the block.

Underground marks

Note 7.—A block of concrete 3 feet below the ground containing at the center of its upper surface (a) a standard disk triangulation station mark, (b) a copper bolt projecting slightly above the concrete, (c) an iron nail with the point projecting above the concrete, (d) a glass bottle with the neck projecting a little above the concrete, (e) an earthenware jug with the mouth projecting a little above the concrete.

Note 8.—In bedrock (a) a standard disk triangulation station mark wedged in a drill hole, (b) a standard disk triangulation station mark set in concrete in a depression, (c) a copper bolt set in cement in a drill hole or depression, (d) an iron spike set point up in cement in a drill hole or depression.

Note 9.—In a boulder 3 feet below the ground (a) a standard disk triangulation station mark wedged in a drill hole, (b) a standard disk triangulation station mark set in concrete in a depression, (c) a copper bolt set with cement in a drill hole or depression, (d) an iron spike set with cement in a drill hole or depression.

Note 10.—Embedded in earth 3 feet below the surface of the ground (a) a bottle in an upright position, (b) an earthenware jug in an upright position, (c) a brick in a horizontal position with a drill hole in its upper surface.

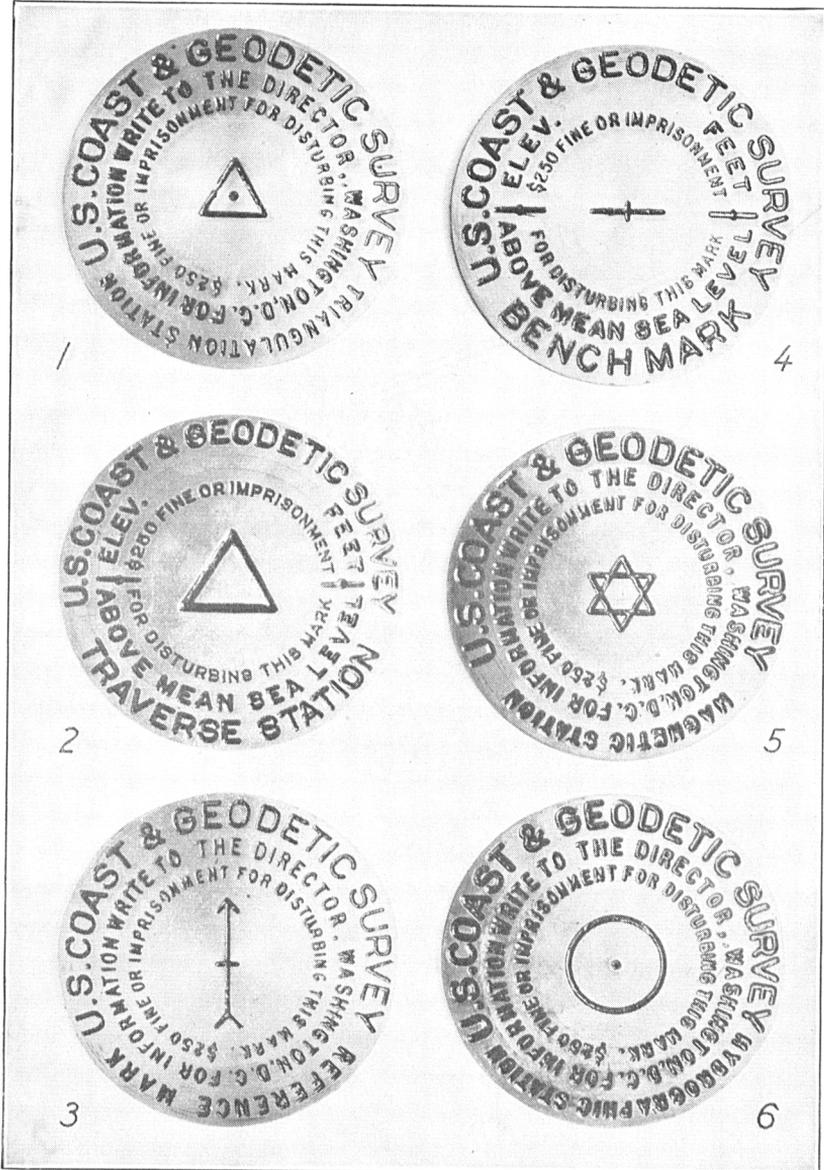


FIGURE 2.—STANDARD MARKS OF THE U.S. COAST AND GEODETIC SURVEY.

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

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



FIGURE 3.—OLD-TYPE STATION MARK.

Reference marks

Note 11.—A standard disk reference mark with the arrow pointing toward the station set at the center of the top of (a) a square block or post of concrete, (b) a concrete cylinder, (c) an irregular mass of concrete.

Note 12.—A standard disk reference mark with the arrow pointing toward the station (a) wedged in a drill hole in outcropping bedrock (b) set in concrete in a depression in outcropping bedrock, (c) wedged in a drill hole in a boulder, (d) set in concrete in a depression in a boulder.

Note 13.—A standard disk reference mark with the arrow pointing toward the station, set in concrete at the center of the top of a tile (a) which is embedded in the ground, (b) which is surrounded by a mass of concrete, (c) which is fastened by means of concrete to the upper end of a long wooden pile driven into the marsh, (d) which is set in a block of concrete and projects from 12 to 20 inches above the block.

Witness marks

Note 14.—A conical mound of earth surrounded by a circular trench.

Note 15.—A tree marked with (a) a triangular blaze with a nail at the center and each apex of the triangle, (b) a square blaze with a nail at the center and each corner of the square, (c) a blaze with a standard disk reference mark set at its center into the tree.

ADDITIONAL NOTES ON THE MARKING OF STATIONS

Station marks

Note 16.—The standard survey mark of the Mississippi River Commission consisting of a steel pipe, 4 inches in diameter and 4 feet long, resting on a vitrified tile, 18 inches square and 4 inches thick. The bottom end of the pipe is split for several inches and spread out to about 10 inches in diameter. A brass cap is riveted on top of pipe. The cap is marked "Mississippi River Commission. \$250 fine for disturbing this mark"; on each side of a small hole in the center are the letters "U.S."; below this are the words "Latitude, Longitude" and "Elevation above sea", with a blank space left for cutting in the data. In the tile is leaded a copper bolt surrounded with the inscription "Mississippi River Commission, U.S." in sunk letters.

Note 17.—A cross in the top of a sandstone or limestone post about 6 inches square and 30 inches long projecting 4 to 6 inches above ground. The letters "U.S." are inscribed in the face of the post. The underground mark is the apex of an earthenware pyramid about 30 inches below the ground. The pyramid is about 10 inches on an edge and has on one face the raised letters "U.S.C.S."

Note 18.—A cross in the top of a sandstone or limestone post about 6 inches square and 30 inches long projecting 4 to 6 inches above ground. The letters "U.S.C.S." are inscribed in the face of the post. The underground mark is a bottle filled with ashes. Two stone posts, each slightly smaller than the one marking the station, are, respectively, 5 feet north and 5 feet south of the station, and in the top of each is an inscribed diagonal cross with an arrowhead at the end of one diagonal pointing toward the station.

THIRTY-NINTH PARALLEL ARC

Principal points

Marty (Johnson County, Kans., F. D. Granger, 1884).—About 4 miles northeast of town of Lenexa, in SE $\frac{1}{4}$ sec. 19, T. 12 S., R. 25 E., in open field about one-fourth mile southeast of John Marty's house, 11 meters (36 feet) north of farm road, and 20 meters (66 feet) west of hedge. Surface mark is stone post surrounded with charcoal and witnessed by two others, and underground mark is bottle of ashes, note 18, except witness stones are 6 feet away. In 1922 it was reported that all land in this vicinity had been subdivided into town lots and sold, house was standing on lot where station had been established, and no trace of station could be found. It was also reported that marks had been destroyed about 20 years previous.

Haskin (Johnson County, Kans., F. D. Granger, 1885; 1922).—About $7\frac{1}{2}$ miles east of town of Spring Hill, in SW $\frac{1}{4}$ sec. 18, T. 15 S., R. 25 E., on place known as Widow Kearn farm, 217 feet east of center line of road on west section line, 666 feet north 5° east (magnetic) from southwest corner of section, 13.9 meters (46 feet) northeast of northeast corner of old foundation of barn, and nearly due south of old foundation of house. Large cottonwood trees and hedge fences are around lot. Surface mark is stone post surrounded with charcoal and witnessed by two others, and underground mark is bottle of ashes, note 18, except witness stones are 6 feet away. In 1922 standard disk station mark was set in top of surface mark and two standard reference disks were set in concrete, note 11a. No. 1 is at intersection of fence on north side of Missouri Pacific Railway right-of-way and east fence on north-and-south road on west section line, and 483.2 feet from station in magnetic azimuth 190° . No. 2 is on east fence line of roadway on west section line, and 187.8 feet from station in magnetic azimuth 262° .

Berry (Cass County, F. D. Granger, 1884; 1922).—About $1\frac{1}{2}$ miles west of town of Belton, in SW $\frac{1}{4}$ sec. 10, T. 46 N., R. 33 W., near east center of cultivated field belonging to estate of E. J. Walker. In 1922 land was farmed by S. G. Halloway, who lived about one-third mile due south of station on south side of Belton road. Station is about midway between Santa Fe Railroad to north and Belton wagon road to south. Forked cottonwood tree marked with triangular blaze is 85.2 meters (280 feet) from station in azimuth $93^\circ 23'$. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 a standard disk station mark was set in top of surface mark.

Bowler (Jackson County, F. D. Granger, 1884; 1922).—About $2\frac{1}{2}$ miles southwest of town of Lees Summit, in NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, T. 47 N., R. 31 W., on small hill, on land known as J. O. Bowler farm and belonging to J. O. Bowler heirs, about one-third mile west of the Bowler residence, 160 feet north of fence on south side of pasture, 573 feet in magnetic azimuth 67° from north end of coping on east retaining wall of concrete bridge on north-and-south stone road, 572 feet east of center line of north-and-south stone road, 632 feet south of center line of east-and-west road, and 854 feet in magnetic azimuth 130° from center of rock road at intersection of east road out from Bowler place. Surface mark is stone post witnessed by two others and underground mark is bottle of ashes, note 18. In 1922 standard disk station mark was set in top of surface mark. The south witness post was reported gone.

Fulton (Cass County, F. D. Granger, 1883; 1922).—About $2\frac{1}{2}$ miles east-southeast of Harrisonville, in sec. 2, T. 44 N., R. 31 W., on land belonging in 1922 to M. C. Fulton, 174 feet in magnetic azimuth 105° from half-section corner in center of road between sections 2 and 35, 92 feet south of east-and-west section-line road, 21.7 meters (71 feet) south of fence on south side of that road, 153 feet east of hedge on half-section line, 175.2 feet in magnetic azimuth 174° from southeast corner of G. B. Weaver's house, 21.8 meters (72 feet) east of small house, and 53.5 feet in magnetic azimuth 55° from center of well. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 surface mark was found slightly out of plumb but otherwise in good condition, and standard disk station mark was set in its top. Underground mark was left undisturbed.

Thornton (Cass County, F. D. Granger, 1883).—About 4 miles northeast of town of Pleasant Hill in NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, T. 46 N., R. 30 W., on land belonging to Charles Thornton in 1883, 3 meters (10 feet) south of fence on south side of county-line road between Cass and Jackson Counties. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 it was reported that stone posts had been broken off below plow line several years previous, all surface marks were gone and ground was in wheat. From most reliable information it was reasonably sure underground marks and parts of stone posts are in place. No distances to local objects were known to determine approximate location near enough to justify digging. Broken stone posts may possibly be recovered by deep plowing.

Chapel Hill (Johnson County, F. D. Granger, 1883; 1922).—About one-fourth mile south-southwest from village of Chapel Hill, in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 1, T. 47 N., R. 29 W., about 2 meters (7 feet) south of middle of line bounding 40-acre division, on land belonging to Mrs. Harman, daughter of Dr. Joseph Ragsdale, 335 feet west of center line of road, and about 125 meters (410 feet)

south-southeast of house. Road in front of house is boundary line between Johnson and Lafayette Counties, and new range line leads north from this road. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 standard disk station mark was set in top of original surface mark, and two reference marks were established, standard reference disks in concrete, note 11 (a). No. 1 is 1 foot west of fence on west side of public road, 100 feet south of southeast corner of timbered land, 12 feet north of large elm tree, and 365 feet from station in magnetic azimuth 54°. No. 2 is 1 foot west of fence on west side of public road, and 422.5 feet from station in magnetic azimuth 124°.

Baker (Johnson County, F. D. Granger, 1883; 1922).—About 1 mile north of town of Kingsville, in $S\frac{1}{2}E\frac{1}{2}SE\frac{1}{4}$ sec. 25, T. 46 N., R. 29 W., on highest part of prominent hill, on land owned in 1922 by Frank Baker, who lives one-half mile east. Station is close to house occupied by Edward Baker in 1883, and 246 feet east of hedge on east side of road. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 standard disk station mark, stamped with name of station and date established, was set in top of surface mark. West stone wall of old deserted building is 124 feet from station in magnetic azimuth 97°.

Hutton Mound (Cass County, F. D. Granger, 1883; 1922).—About 14 miles southeast of the town of Harrisonville, about $1\frac{1}{2}$ miles by road southeast or Garden City, in $NE\frac{1}{4}NW\frac{1}{4}SE\frac{1}{4}$ sec. 1, T. 43 N., R. 30 W., on highest point or land in vicinity, known locally as Big Mound, 183 feet from north-and-south fence on west side of pasture, on pasture land which in 1883 belonged to Thomas Hutton, who lived about five-eighths mile west of station. Rock post at northwest corner of pasture is 304 feet from station in magnetic azimuth 313°. Surface mark was stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 it was found that surface mark and north witness stone were gone, and south witness stone was broken off, but underground mark was undisturbed. Underground mark was left as found, and standard disk station mark, stamped with name of station and date established, was set in concrete block, note 1 (a), projecting 2 inches above surface of ground. In 1922 standard reference disk, stamped with name of station and date established, was set in concrete, note 11 (a), on east-and-west half-section line, 237.1 feet from station, in magnetic azimuth 352°.

Caldwell (Johnson County, F. D. Granger, 1882; 1922).—In northeast corner of $W\frac{1}{2}SE\frac{1}{4}$ sec. 26, T. 44 N., R. 26 W., a short distance west of Clinton road which forms boundary between Johnson and Henry Counties, on land owned by James Duffy, one-half mile east of Duffy's home, 212 feet west of center line of north-and-south road, 205 feet south of east-and-west road, and 275.8 feet due south of southeast corner of J. E. Caldwell's house. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 a standard disk station mark was cemented in top of original surface mark.

Normal (Johnson County, F. D. Granger, 1883; 1906).—At Warrensburg, on chimney at southeast corner of old Missouri State Normal School building. Chimney was 12 feet square and in 1883 was capped with four heavy blocks of sandstone. Station was at center of stone at northwest corner of chimney and was marked by a drill hole at center of triangle cut in stone. Reference mark similar to station mark described in note 18 was established in yard, 57.57 meters (188.9 feet) due south of station. In 1906 the station was recovered and two sets of ranges established, one set on the chimney itself, and one set on the campus. In 1922 it was reported that old normal school building had been destroyed by fire several years before; that new buildings had been erected, and grounds so changed that all station marks had been destroyed and no range marks could be found.

High Point Tebo (Johnson County, F. D. Granger, 1882).—About 6 miles northwest of town of Windsor, in $NW\frac{1}{4}SE\frac{1}{4}$ sec. 21, T. 44 N., R. 24 W., on land belonging in 1882 to General —, of New York. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 it was reported that ground was in cultivation and all surface marks gone. No distance or direction to local objects being given in original description, the approximate position of station could not be located. Underground mark is probably in place.

Knob Noster (Johnson County, F. D. Granger, 1882; 1922).—In $SW\frac{1}{4}NW\frac{1}{4}$ sec. 15, T. 46 N., R. 24 W., about two-thirds mile north by east from railroad sta-

tion called Knob Noster, on prominent hill known as Knob Noster in 1882, but since called Price or Guihen's Hill after the names of successive owners. Top of hill is rocky and cannot be cultivated. Surface mark is stone post witnessed by two others and underground mark is bottle of ashes, note 18. In 1922 a standard disk station mark was set in top of original surface mark. Concrete longitude pier built in 1907 is directly south of station. In 1922 standard reference disk was set in center of this pier 3.62 meters (11.9 feet) from station.

Kendrick (Pettis County, F. D. Granger, 1882; 1928).—About 4 miles northwest of Green Ridge, in NW $\frac{1}{4}$ sec. 26, T. 45 N., R. 23 W., on land owned in 1922 by S. M. Kendrick, in small pasture lot surrounded by hedge fence, 116 feet from east-and-west hedge on north side of lot, 328 feet from north-and-south fence on east side of lot, and 175 feet from east-and-west hedge on south side of lot. Southeast corner of Mr. Kendrick's house is 158.5 feet from station in magnetic azimuth 256°. Original surface mark was stone post witnessed by two others and underground mark was bottle of ashes, note 18, except north witness stone was 3.8 feet from station and south one 3.7 feet. In 1922 all marks were recovered. Surface mark was found broken off on top. New surface mark established is standard disk station mark in concrete, note 1 (a), flush with surface of ground. Other marks were left undisturbed.

Heard (Pettis County, F. D. Granger, 1880; 1931).—In northeast quarter of city of Sedalia, just east of cemetery, on land belonging in 1880 to George Heard, 42 meters (138 feet) east of east side of New York Avenue, 165 feet east of center of New York Avenue, 27 feet south of center of Tower Avenue, 4 meters (13 feet) south of south side of Tower Avenue, and nearly opposite house occupied by George Heard in 1880. Surface mark is stone post witnessed by two others and underground mark is bottle of ashes, note 18. In 1922 a standard disk station mark, stamped with name of station and date established, was set in top of surface mark. Witness stones are about level with ground. In 1928 two reference marks were established, standard reference disks in concrete, note 11 (a). No. 1 is on north side of Tower Avenue, 0.3 meter (1 foot) south of fence, about 137 meters (449 feet) (paced distance) east of east edge of New York Avenue, and 95.34 meters (312.8 feet) from station in azimuth 264°05'. No. 2 is in northwest corner of lot, 0.8 meter (3 feet) southeast of corner post, 12 meters (39 feet) southeast of center of intersection of New York and Tower Avenues, and 41.74 meters (136.9 feet) from station in azimuth 98°02'.

Schnackenburg (Benton County, F. D. Granger, 1882; 1928).—About 3 miles north and about one-third mile east of Cole Camp, in SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 13, T. 43 N., R. 20 W., on land owned in 1922 by Hermann Schnackenburg, under feed rack in feed lot, 3.4 meters (11 feet) east of southeast corner of new cattle shed. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 a standard disk station mark, stamped with the name of station and date established, was set in top of surface mark. In 1928 two reference marks were established, standard reference disks in concrete, note 11 (a). No. 1 is on west side of end of lane, in northeast corner of lot north of cattle shed, 0.6 meter (2 feet) southwest of corner post at north end of hedge fence, and 290 meters (951 feet) (paced distance) from station in azimuth 185°33'29''. No. 2 is about 100 meters (328 feet) southeast of the Schnackenburg residence, in southeast corner of garden lot, 1 meter (3 feet) northwest of corner post at south bend of road, and 136.52 meters (447.9 feet) from station in azimuth 354°28'46''.

Syracuse (Morgan County, E. O. Heaton, 1928; 1931).—About three-fourths mile northeast of Syracuse railroad station, near center of SE $\frac{1}{4}$ sec. 11, T. 45 N., R. 18 W., on land owned by A. M. Johansen, about one-eighth mile north of his home, 12.2 meters (40 feet) east of boundary fence line between two farms, 385 paces west of center line of Highway No. 5 running north and south, and 95 meters (312 feet) north of fence line at south end of field. Surface and underground marks are standard disk station marks in concrete. Upper mark is 2 feet below surface of ground, and lower mark 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 9.25 meters (30.3 feet) west of center line of Highway No. 5, 0.50 meter (1.6 feet) north of fence, and 350 meters (1,148 feet) (paced distance) from station, in azimuth 289°30'58''. No. 2 is in southwest fence corner of field, and 97.403 meters (319.56 feet) from station in azimuth 7°53'.

Bowers (Morgan County, E. O. Heaton, 1928).—About 8 miles southeast of Stover, in SE $\frac{1}{4}$ sec. 35, T. 42 N., R. 18 W., on land owned by J. Bowers, about one-eighth mile north of his home, on highest point of knoll in cultivated field, 50.3 meters (165 feet) south of center line of east-and-west road, and 180 meters (591 feet) northeast of center line of Proctor-and-Stover road. Surface and underground marks are standard disk station marks in concrete. Upper mark is 2 feet below surface of ground, and lower mark 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 13.70 meters (44.9 feet) south of center line of road, 0.50 meter (1.6 feet) north of Mr. Bowers' yard fence, and 260 meters (853 feet) (paced distance) from station in azimuth 19°29'51". No. 2 is 3.60 meters (11.8 feet) south of center line of road, 0.35 meter (1.1 feet) south of fence line, and 69.96 meters (229.5 feet) from station in azimuth 203°47'.

Hubbard (Morgan County, F. D. Granger, 1880; 1891).—About three-fourths mile northeast of Syracuse, near center of SE $\frac{1}{4}$ sec. 11, T. 45 N., R. 18 W., on land owned in 1891 by Joseph James. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1891 it was learned that at some previous date owner of land had removed surface marks by mistake but later had replaced them as near as possible in original positions. Underground mark was not disturbed. In 1922 it was reported that all surface marks were gone. Station was not recovered. Station site is in cultivated field.

Hughes (Morgan County, F. D. Granger, 1880; 1902).—On Warsaw road, about 5 miles nearly due west of Versailles, near center of sec. 5, T. 42 N., R. 18 W., on land owned by Robert Hughes. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. When recovered in 1902, station mark was found badly defaced but still in place. Reference marks were not found. In 1922 all surface marks were gone, and tool house and corn cribs had been built near or over the spot. It is probable that underground mark is in place.

Cole (Moniteau County, F. D. Granger, 1880; 1922).—About 3 miles east-southeast of town of Tipton, in northern part of sec. 30, T. 45 N., R. 16 W., on land owned and occupied in 1922 by John C. Cole. Station was originally at center of old windmill which was used as observing scaffold. In 1922 all marks were recovered in good condition, but old windmill was gone. Farm-house stands to southward of where old windmill stood. Station is in front yard directly north of house, 18 feet south of center line of east-and-west road, 46.4 feet in magnetic azimuth 320° from northeast corner of house, and 29 feet in magnetic azimuth 1° from northwest corner of house. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18, except witness stones are only 4 feet from station. In 1922 standard disk station mark was set in top of surface mark.

Versailles north base (Morgan County, F. D. Granger, 1880; 1922).—About 5 miles north-northeast of town of Versailles, in southern part of W $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 9, T. 43 N., R. 17 W., on land owned and farmed in 1922 by 5 daughters of Mr. Moses H. Tipton, all living at the home place. Station is 99.2 feet east of southeast corner of Tipton house, 27 feet north of center line of east-and-west public road, and 5 feet south of fence line. It is marked by cross in top of copper bolt set in rough-dressed block of Warrensburg sandstone, 0.65 meter (2.1 feet) square and 0.24 meter (0.8 foot) deep, set in concrete, and inscribed "U.S.C. & G.S. 1897". Underground mark is similar to surface mark except that sandstone block is 0.54 meter (1.8 feet) deep by 0.28 meter (0.9 foot) square. Two other stone posts, smaller than one marking station, are respectively, 5 feet north and 5 feet south of station, and in top of each is inscribed diagonal cross with arrowhead at end of one diagonal pointing toward station. In 1922 copper bolt marking station was replaced with standard disk station mark, stamped with name of station and date established.

Hunter (Versailles south base) (Morgan County, F. D. Granger, 1880; 1922).—In Moreau Township, about 4 miles east of Versailles, in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, T. 42 N., R. 17 W., on land known as the old Hunter farm and owned in 1922 by W. D. Wilson, on highest point of ground in cultivated field, about one-fourth mile east of Chicago, Rock Island & Pacific Railway tracks, 965 feet in magnetic azimuth 85° from southeast corner of old Hunter house, and 695 feet north of east-and-west line fence. It is marked by cross in top of copper bolt

set in rough-dressed block of Warrensburg sandstone, 0.65 meter (2.1 feet) square and 0.24 meter (0.8 foot) deep, set in concrete, and inscribed "U.S.C. & G.S. 1897." Underground mark is similar to surface mark, except that sandstone block is 0.54 meter (1.8 feet) deep by 0.28 meter (0.9 foot) square. Two other stone posts, smaller than one marking station, are respectively, 5 feet north and 5 feet south of station, and in top of each is inscribed diagonal cross with arrowhead at end of one diagonal, pointing toward station. In 1922 copper bolt marking station was replaced with standard disk station mark, stamped with name of station and date established.

Christian (Moniteau County, H. W. Blair, 1879).—About 1 mile east-southeast of courthouse in town of California, near center of southern edge of NE $\frac{1}{4}$ sec. 27, T. 45 N., R. 15 W., on narrow strip of land between State road and Missouri Pacific Railroad, owned and farmed in 1922 and during the preceding 18 years by Mr. J. H. Miller, about 75 meters (246 feet) south of railroad, and about 40 meters (131 feet) north of road. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1879 southwest corner of house belonging to heirs of J. J. Christian was about 300 meters (984 feet) from station in azimuth 249°28', and northeast corner of H. Boeppler's house was about 150 meters (492 feet) distant in azimuth 40°22'. In 1922 station site was visited and found growing in wheat. Station was not recovered. Mr. Miller stated that marks were gone when he moved on the farm.

Belshe (Cole County, H. W. Blair, 1879; 1922).—In southwestern part of Cole County, on road from Jefferson City to Tusculumbia, about 1 mile southeast of Spring Garden Hill, a little more than one-half mile northeast of Locust Mound post office, 50 meters (164 feet) east of county line, near center of N $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 19, T. 42 N., R. 13 W., in yard of home owned in 1922 by Mr. Parker D. Hanley, 30.9 feet in magnetic azimuth 55° from northeast corner of stone foundation of house, 9.8 feet from east yard fence, 86 feet south of center of highway, and 123 feet in magnetic azimuth 277° from center of well in barnyard. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 standard disk station mark and standard reference disks were set in tops of stones. Stump about 4 feet high used as fence post is 16.52 meters (54.2 feet) from station in azimuth 187°35'.

High Point (Moniteau County, H. W. Blair, 1880; 1902).—In southern part of county, about 12 miles south of town of California and $\frac{1}{2}$ mile northeast of village of High Point, near middle of southern edge of W $\frac{1}{2}$ sec. 9, T. 43 N., R. 15 W., on land owned in 1880 by George Radcliff, Sr. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1902 it was found that surface marks had been removed. In 1922 no marks could be found. Station site is probably in orchard about 75 meters (246 feet) southeast of large stone house owned and occupied by George Radcliff, Sr., in 1880. Underground mark is probably still in place.

Medlock (Cole County, H. W. Blair, 1879; 1922).—About 2 miles north-northwest of Elton and 6 miles east-northeast of Centertown, in northeast corner of SW $\frac{1}{4}$ sec. 37, T. 45 N., R. 13 W., on land owned in 1922 by L. M. Chambers, who lives in new house erected on site where Noah Hoover's house stood in 1879. Station is in southwest corner of pasture where road makes right-angle turn to north, 77 feet north of center line of road, 42 feet east of center line of road, and 622.4 feet in magnetic azimuth 275° from southwest corner of Mr. Chambers' house. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 standard disk station mark and standard reference disks, all stamped with name of station and date established, were set in tops of stones.

Moreau (Cole County, H. W. Blair, 1879; 1922).—In western part of county, about 7 miles south of Centerville and 1 mile northeast of village of Russellville, near center of NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, T. 44 N., R. 14 W., on land owned and occupied in 1922 by Mr. A. F. Neederweiner, 605.5 feet in magnetic azimuth 219° from southwest corner of concrete foundation of Mr. Neederweiner's house, 512 feet south of center line of east-and-west road, 154 feet south of fence on south side of pasture, and 1,224 feet east of center line of north-and-south public road. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 standard disk station mark and two standard reference disks were set in tops of stones.

Cedar (Callaway County, H. W. Blair, 1879; 1922).—On central and highest one of three points of prominent bluff on north side of Missouri River directly

opposite Jefferson City, on land owned in 1922 by Hermann Barister, in pasture unsuitable for cultivation, at center of small Indian mound about 12 meters (39 feet) in diameter and 2 meters (7 feet) high. Original surface mark was stone post witnessed by two others, and underground mark was bottle of ashes, note 18. In 1887 it was reported that surface marks had been removed leaving only underground mark. In 1922 surface mark and underground mark were found in place. Bottle of underground mark was 3 feet below surface with top broken but in place. One original stone reference post was found on surface near station. New underground mark is standard disk station mark in concrete, note 7 (a), placed immediately above old bottle mark. Surface mark is standard disk station mark in stone post 6 inches square by 26 inches long, top projecting 2 inches above surface. Reference mark is standard reference disk in top of stone post 6 inches square and 26 inches long. It is directly on line with station mark and dome of capitol building in Jefferson City, and distant 5.9 feet from station.

Kennedy (Osage County, H. W. Blair, 1879; 1922).—In southwestern part of county, about 14 miles southwest of Rich Fountain, near center of north side of NE $\frac{1}{4}$ sec. 36, T. 42 N., R. 11 W., on land owned in 1879 by Bernard Schwartze who lived about one-third mile south of station. In 1922 no people lived in immediate vicinity and owner of land was not known. Station is in timberland, on highest point of ridge, 82 feet east of center line of old Castle Rock and Vienna road, known as old State road, and 19 feet south of private road leading to eastward. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 standard disk station mark and standard reference disks were set in the tops of stones. Witness stones project 3 inches above surface, and their magnetic azimuths from station are 162° and 342°.

McDaniel (Osage County, H. W. Blair, 1879; 1922).—In southeast corner of NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, T. 43 N., R. 9 W., on high point of prominent ridge running nearly north and south through middle of Osage County, about 3 miles by road southwest by south from town of Linn, about midway between towns of Rich Fountain and L'Ours Creek, on northeast side of road connecting those two places, about one-fourth mile southeast of junction of this road with Linn-Westphalia road, in cultivated field owned in 1922 by George McDaniel about one-fourth mile south of Mr. McDaniel's house, and 46 feet east of center line of north-and-south road. Surface mark was stone post witnessed by two others, and underground mark was bottle of ashes, note 18. In 1922 reported that all surface marks had been taken out by Mr. McDaniel in 1920 because they projected about 8 inches above surface and were badly in way when reaping hay or grain. Underground mark was recovered, and station re-marked as follows: Underground mark is standard disk station mark in concrete, note 7 (a), 32 inches below surface. Surface mark is standard disk station mark in concrete, note 1 (a), 11 inches below surface. Reference marks are standard disk reference marks in concrete, note 11 (a), projecting 3 inches above ground. No. 1 is on fence line on side of public road, and 70.3 feet from station in magnetic azimuth 165°. No. 2 is on fence line on west side of public road, and 82.1 feet from station in magnetic azimuth 229°. All marks are stamped with name of station and date established.

Pilot Knob (Osage County, H. W. Blair, 1879).—In southeastern part of Osage County, about 5 miles from Rollin's ferry on Gasconade River, on northern one of two summits of prominent hill known locally as Pilot Knob, near middle of northern part of sec. 3, T. 41 N., R. 8 W., or possibly just across the line in sec. 34, T. 42 N. Surface mark was stone post witnessed by two others, and underground mark was bottle of ashes, note 18. In 1922 it was reported that in 1921 all stone posts which marked the station had been removed. Stones were found near station site. Ground had not been in cultivation for several years. Underground mark was not found.

Bradford (Osage County, H. W. Blair, 1879; 1934).—About 15 miles northeast of Lynn, about 2 miles northwest of Mint Hill post office, and 1 $\frac{1}{4}$ miles south by west of Bailey Creek post office, in SE $\frac{1}{4}$ sec. 14, T. 44 N., R. 8 W., on land owned by W. J. White, about one-half mile west of his home, about 150 feet west of center line of Lynn-Chamois Highway (Missouri Route 89), and 59 feet south of south side of large tank or pond. To reach from Linn, go east on U.S. Route 50 to junction with Missouri Route 89 leading north, and continue north 7.7 miles to station site. Original surface mark was stone post

witnessed by two others, and underground mark was bottle of ashes, note 18. In 1922 it was discovered that surface mark had been dug up and hauled away. Underground mark and south reference stone were recovered. Stone was 3 inches below surface. Station was re-marked in 1922. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Upper mark is 10 inches below and lower mark 30 inches below surface of ground. In 1922 two standard reference disks were set in concrete, note 11 (a). No. 1, projecting 4 inches, is 2 feet west of west road fence, and 89.2 feet from station in magnetic azimuth 89° . No. 2 is in southeast corner of field, at intersection of west road fence and east-and-west fence at south side of Mr. White's property, and 127.4 feet from station in magnetic azimuth 174° . Due to recent changes in road, these two reference marks may be thrown into cultivated field. Original stone post reference mark recovered, was left as found, but in 1934 permission was granted for its removal. In 1879 three trees, marked with one, two, or three notches, identifying number of mark, were at the following distances and azimuths from station: No. 1, 6.95 meters (22.8 feet), $99^\circ 05'$; no. 2, 17.53 meters (57.5 feet), $209^\circ 20'$; and no. 3, 8.53 meters (28.0 feet), $271^\circ 45'$.

Geyer (Gasconade County, H. W. Blair, 1878; 1934).—In NE $\frac{1}{4}$ sec. 28, T. 43 N., R. 6 W., about 3 miles airline southeast of Mount Sterling post office, $3\frac{1}{4}$ miles south of Capital Highway, on highest point of Geyer's ridge, 35 feet south of north edge of timber and south edge of old cleared field, and 63 feet east of old wagon road. Land on top of ridge to northward, distance of one-half mile, was at one time in cultivation, but in 1922 was partly covered with small bushes and briars. Station is best reached from Mount Sterling by following U.S. Route 50 east 2.8 miles to a private road leading south through a steep dip across a small creek. Follow this road south past Edward Kurrelmeyer's house, 0.8 mile and keep right fork 0.15 mile to fork at top of short steep hill, keep right fork through board gate 0.1 mile to burn, thence sharply back to right up steep grade 0.25 mile to field, turn south and follow along edge of field and up cleared ridge 1.4 miles to station. Station is about 25 yards southwest of large triangle blaze on 2-foot oak standing at south edge of old cleared field. Original surface mark was stone post witnessed by two others, and underground mark was bottle of ashes, note 18. In 1922 underground mark and two witness stones were recovered. Surface mark was gone. Station was re-marked. Underground mark is standard disk station mark in concrete, note 7 (a), 30 inches below surface. Surface mark is standard disk station mark in top of irregular shaped stone 10 inches square by 24 inches long. Standard disk reference marks were set in tops of witness stones. Name of station and date established were stamped on each mark.

Turnpike Bluff (Gasconade County, H. W. Blair, 1878; 1922).—About 13 miles southeast of Hermann, on prominent bluff called "Turnpike Bluff" in western part of Gasconade County overlooking Gasconade River which skirts southwest base of bluff about 360 feet below station, near center of sec. 3, T. 44 N., R. 6 W., at center of small Indian mound about 10 meters (33 feet) in diameter and $1\frac{1}{2}$ meters (5 feet) high made of stones roughly piled together. Two or three similar mounds are a short distance down slope of bluff. House owned in 1878 by Charles Brieske was at foot of the hill on northeast side, and best approach to station is from this direction. Small cleared field is about one-fourth mile to westward. With this exception, all the bluff and surrounding land is in timber and unsuitable for cultivation. Surface mark is stone post witnessed by two others, and underground mark is bottle of ashes, note 18. In 1922 standard disk station mark was set in top of surface mark.

Gasconade (Gasconade County, C. H. Boyd, 1874; 1933).—About 10 miles south of Hermann, and about 2.3 miles north of Swiss, about 235 paces east of center line of State Highway 19, a new highway built since 1922, near north side center of NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, T. 44 N., R. 5 W., on land owned in 1933 by Adolph Boesch, 92 feet south of old fence on east-and-west half-section line, 1,198 feet east of center line of Iron Road, about 1,350 feet north of east from intersection of Mount Sterling Road with Iron Road, 656 feet east of north-and-south line fence between lands owned in 1922 by Mr. J. Boesch, Jr., and Mr. Nick Flutsch, 801 feet south 19° east (magnetic) from southeast corner of house owned by Mr. Nick Flutsch in 1922, and 45 paces south 40° west (magnetic) from lone tree along east-and-west half-section-line fence. Original

surface mark was stone post and underground mark was earthenware pyramid, note 17. In 1922 station was remarked. Surface mark is standard disk station mark set in top of limestone post, projecting 2 inches above surface. Underground mark is standard disk station mark in concrete, note 7 (a), 32 inches below surface of ground. In 1933 concrete was cast around stone surface mark so that it now appears as circular concrete post projecting about 8 inches above surface of ground. In 1878 stone marking northeast corner of NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3 was 217 meters (712 feet), from station in azimuth 264°06'. At that time 3 oak trees, each marked with triangular blaze and 1, 2, or 3 notches identifying number of witnesses, were at following distances and azimuths from station: No. 1, 16.33 meters (53.6 feet), 58°51'; no. 2, 8.81 meters (28.9 feet), 228°36'; and no. 3, 11.66 meters (38.3 feet), 301°12'. In 1933 two standard reference disks were set in concrete, note 11 (b). No. 1 is along north-and-south fence line, and 30.32 meters (99.5 feet) from station in azimuth 157°59'. No. 2 is along north-and-south fence line, and 48.3 meters (158 feet) from station in azimuth 236°10'. No. 1 is about 169 feet from no. 2. Another mark (probably a standard reference disk in concrete) was set along Highway 19, south of corner of east-and-west fence line, about one-fourth mile east of Old Iron Road, and about one-third mile from station in azimuth 45°15'22". Azimuth from station to German Presbyterian Church, tip of spire, distant about 1½ miles, is 298°25'26".

Winter (Gasconade County, C. H. Boyd, 1874; 1878).—About 1¼ miles east of Drake post office, in southeast corner of NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, T. 43 N., R. 5 W., on land owned and occupied in 1874 by Henry Winters and in 1922 by Fritz Zimmerman, near fence line on south side of State road, on edge of small orchard (1878), nearly across road from house, and 31 meters (102 feet) (paced) east of east line of barns. Surface mark is stone post and underground mark earthenware pyramid, note 17. Southeast corner of house is 30.54 meters (100.2 feet) from station in azimuth 166°24', and southeast corner of NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24 is 71.93 meters (236.0 feet) in azimuth 290°28'. In 1922 the stone post, the original surface mark, was found set on south side of old State road on line between roadway and cultivated ground to south. Top projected about 4 inches above surface. Report that stone had been moved was confirmed by local measurements made in 1922 and by absence of underground mark. Stone had apparently been moved about 15 feet to north. No underground mark could be found beneath the stone nor at point established by measurements from reference points. Stone was left in position as found without additional marking. In 1933 measurements made indicated no further change.

Berger (Franklin County, C. H. Boyd, 1874; 1933).—About 5.6 miles by road west by south from New Haven, 0.6 mile by road south of old State Highway 100, in SW $\frac{1}{4}$ sec. 32, T. 45 N., R. 3 W., on land owned in 1933 by Mrs. Hale, on southern end of flat-top hill known locally as "Kaisers Hill", the most southerly one of four prominent hills forming a group. Top of hill is cultivated and station is on southeastern extremity of top of knoll, on southern side of cultivated ground, in edge of timber. To reach from New Haven, go west 5.0 miles on old State Highway 100, turn south at Mr. Borcharding's mail box on dirt T-road 0.25 mile to base of hill at southwest corner of cultivated field. This is as far as truck can be driven in wet weather. Station site is about three-fourths mile east and south up hill. Surface mark is stone post and underground mark earthenware pyramid, note 17. In 1922 standard disk station mark was set in top of stone post surface mark which projects about 8 inches above surface. In 1933 it was reported that concrete had been cast around limestone post. In 1906 latitude pier was constructed 16.69 meters (54.8 feet) north 9°46' west from station. In 1907 longitude station, marked by concrete pier surmounted by two pillars, each 14 by 9 inches, was established 19.89 meters (65.3 feet) north and 2.90 meters (9.5 feet) west of station. In 1922 a standard disk reference mark was set in center of longitude pier 20.12 meters (66.0 feet) from station in azimuth 171°55'. In 1933 two reference marks were set (probably standard reference disks in concrete, note 11 (a)). No. 1 is on north edge of timber, 23.50 meters (77.1 feet) from 1922 reference mark, and 34.95 meters (114.7 feet) from station in azimuth 131°48'. Other reference mark is on top of hill, in cleared field, on edge of timber, and about one-fourth mile from station in azimuth 194°11'38".

Jacobs (Franklin County, C. H. Boyd, 1874; 1922).—About 15 miles from town of New Haven, and 20 miles from town of Washington, in extreme south-

east corner of NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 28, T. 43 N., R. 3 W., on land owned in 1878 by E. B. Jacobs (nonresident), immediately west of cultivated land owned in 1878 by J. Schmidt, one-third mile southwest of Schmidt's home, northwest of Canaan road on western edge of branch road leading to State road, 17 meters (56 feet) west of fence along east side of road, and 97 meters (318 feet) north of right-angle bend in road. Original surface mark was stone post and underground mark was earthenware pyramid, note 17. In 1878 two oak trees, each marked with triangular blaze and notch, were at the following distances and azimuths from station: 12.92 meters (42.4 feet), 106°59'; and 13.41 meters (44.0 feet), 195°42'. Station was recovered in 1922, when it was reported that owner of property is unknown, Schmidt's place abandoned, house fallen down, field grown up in bushes, few people living in vicinity, nearly all farms deserted, but no changes in roads. Station was re-marked. Underground mark is original earthenware pyramid 33 inches below surface. Surface mark is standard disk station mark in top of limestone post, projecting 3 inches above surface. Reference mark is standard reference disk in concrete, note 11 (a), on northeast side of cut-off road leading from old Canaan road in northwest direction to old State road, just southwest of old fence line, and 55 feet from station in magnetic azimuth 10°. In 1933 station was not recovered. Cut-off road reported widened and graded. No other changes apparent.

Enoch Knob (Franklin County, C. H. Boyd, 1874; 1922).—In sec. 3, T. 44 N., R. 2 W., about 1 $\frac{1}{4}$ miles from town of Newport, or 1 $\frac{1}{2}$ miles southwest of the old Newport Church, on highest point of Enochs Knob, an isolated knob, the apex of which is about 150 feet above immediate surrounding country and which is covered with small timber and underbrush on all sides and on its top with outcrop of rock bluffs. In 1874 land was owned by Mr. Sellmeyer, and station was about 80 meters (262 feet) west of fence on east side of road east of mound. In 1922 public road leading southward passed about 100 yards to east of station and intersected Capital Highway about 1 mile to south. Original surface mark was stone post and underground mark was earthenware pyramid, note 17. In 1922 surface mark was gone. Underground mark was recovered and left as found 25 inches below surface. New surface mark is standard disk station mark in top of limestone post incased in concrete and projecting 3 inches above surface. Two reference marks were set. No. 1 is standard reference disk cemented in solid outcrop of rock, 31.55 feet S. 13° W. (magnetic) from station. No. 2 is standard reference disk in solid outcrop of rock, 37.1 feet N. 69° W. (magnetic) from station.

Peters (Franklin County, C. H. Boyd, 1874; 1933).—In western part of Union Township, about 4 miles west of courthouse, 3 miles west of Mann's store, 5.3 miles by road west of Union, 1.2 miles north of U. S. Highway 50, on highest point of hill in cleared but uncultivated field on farm owned in 1933 by Fritz Peters, who lives about 400 meters (1,312 feet) north of station. Center line of north-and-south road is 175 feet from station in bearing north 70° west (magnetic). In 1874 an oak tree marked with triangular blaze was beyond fence 53 meters (174 feet) southeast of station, and lane leading to spring was about 114 meters (374 feet) (paced) south. To reach from Union, follow U. S. Highway 50 west 4.1 miles, thence go north 1.2 miles on T-road, known locally as "Old Ox Road" leading to Washington, Mo. to station site. Original surface mark was stone post and underground mark earthenware pyramid, note 17. In 1922 standard disk station mark was set in top of stone surface mark which projects 6 inches above ground. In 1933 it was reported that circular concrete post 1 foot in diameter had been cast around stone post. Standard reference disk in concrete, note 11 (a), projecting 3 inches above surface of ground, is on north side of east-and-west fence which is south line of Mr. Peters' property, and 379.1 feet S. 14° W. (magnetic) from station. In 1933 another standard reference disk (no. 1) was set on knoll at south end of bare field on opposite side of road from station, 56.3 feet from center line of road, 50 feet from north-and-south fence, on south edge of timber, and about one-half mile from station in azimuth 213°09'23". The following azimuths are from station: Distant church spire, 205°25'58"; white church spire, distant one-half mile, 257°23'50".

Dieckhaus (St. Charles County, C. H. Boyd, 1873; 1922).—In Femme Osage Township, about 6 miles northeast of town of Washington, 2 miles north of Missouri River on land owned in 1922 by Henry Wilmhrusk, one-fourth mile northeast of his home, on prominent hill thickly covered with timber and underbrush. Slopes are very abrupt on all sides with outcrop of rock bluffs, giving no possi-

bility of hill being cultivated. Original surface mark was stone post and underground mark earthenware pyramid, note 17. In 1922 underground mark was found in good condition and left undisturbed 28 inches below surface. Original surface mark was gone, and later surface mark found over station but slightly out of position was iron pipe 5 inches in diameter and 28 inches long, with cast iron cap with triangle and inscription, "Missouri River Commission." Pipe was placed above underground mark with capped end down, filled with concrete, and standard disk station mark set in top. Mark projects 3 inches. About 7 feet west of station is hole about $2\frac{1}{2}$ feet deep and 4 feet in diameter.

Lynch (Jefferson County, C. H. Boyd, 1873; 1922).—About $3\frac{1}{2}$ miles southeast of Catawissa, $1\frac{1}{2}$ miles northeast of Rock Church, on highest part of highest hill in this vicinity, on land owned, in 1922 (and since 1890) by A. A. Greff. From station to northeast corner of Mr. Greff's house, is 35.6 feet S. 23° E. (magnetic). Original surface mark was stone post and underground mark earthenware pyramid, note 17. In 1922 standard disk station mark was set in top of stone post surface mark.

Halleck (Franklin County, C. H. Boyd, 1873; 1922).—About $7\frac{1}{2}$ miles west of Grays Summit, along Capital Highway from St. Louis to Kansas City via Jeffersonville, near old store building built of logs used in 1922 for storage of old junk, but at one time used for Halleck post office. Original surface mark was stone post and underground mark earthenware pyramid, note 17. In 1922 standard disk station mark was set in top of stone post surface mark, which projected 2 inches above surface of ground. In 1922 the following distances and magnetic azimuths were observed from station: Iron pipe with bronze cap, U.S. Geological Survey bench mark, elevation 789 feet, 1.32 meters (4.3 feet), 175° ; northeast corner of old store building, 68.1 feet, 166° ; northwest corner of old store building, 65.5 feet, 180° ; center of highway, 34 feet, 180° .

Clarks Mound (St. Clair County, Ill., R. E. Halter, 1871; 1931).—On bluffs overlooking the American Bottom, three-fourths mile south of French Village, near middle of south line of NW $\frac{1}{4}$ sec. 35, T. 2 N., R. 9 W., on land belonging in 1931 to estate of A. T. Spivey, on highest point of Signal Hill, about 6 feet to westward of east edge of mound about 20 feet in diameter, known locally as Clarks Mound, and on extreme end of a spur which makes out to northwest overlooking American Bottom. Original surface mark was white marble post inscribed with the letters "U.S.C. & G.S.", witnessed by two small posts of white marble with arrow in top of each pointing toward station. Underground mark is bottle. One reference mark was 15.24 meters (50.0 feet) (slope) from station in azimuth $21^{\circ}54'$, other was same distance in azimuth $278^{\circ}34'$. In 1871 or 1880 three trees, each marked with triangular blaze, were at following distances and magnetic bearings from station: Hickory, 19.6 meters (64.3 feet), N. $41^{\circ}30'$ E.; white oak, 12.0 meters (39 feet), S. $57^{\circ}30'$ E.; and hickory, 28.1 meters (92 feet), S. $51^{\circ}30'$ E. In 1922 all marks found in good condition and standard disk station mark was set in top of surface mark. At that time land was owned by Judge Kramer who lived about 125 meters (410 feet) southeast of station. In 1931 it was reported that surface mark had been moved several feet in westward direction and summer house had been built over station. Underground mark is probably in its original position, near center of house, and under concrete floor. One stone reference post was recovered.

Sugar Loaf Mound (Madison County, Ill., R. E. Halter, 1871; 1933).—About 3 miles northwest of Collinsville, near middle of north line of NE $\frac{1}{4}$ sec. 20, T. 3 N., R. 8 W., on land belonging in 1922 to Mrs. J. D. C. Witte, west of house in which Conrad Witte lived in 1850, on north side of top of very prominent mound known locally as "Sugarloaf Mound", which is on edge of bluff overlooking the American Bottom and about 150 or 200 feet above the general level to westward and 50 feet above that to eastward. Small private cemetery is just south of station. To reach from Collinsville, go to schoolhouse in west edge of town, just west of Forest City Manufacturing Co. building on U.S. Route 50. Turn north on street along east side of schoolhouse and go 0.4 mile. Jog west 0.1 mile and continue on main-traveled road in northerly direction 1.3 miles from jog to T-intersection with new concrete road (U.S. Route 50, bypass). Jog west 0.1 mile to T-road north about 50 yards east of small schoolhouse. Go north on T-road 0.3 mile to new concrete road leading north, which at present ends at railroad track. Go north on new concrete road 0.8 mile to dirt T-road east along north side of Sugarloaf Mound. Go east to top of rise and gate into pasture at foot of Sugarloaf Mound, which is end of truck travel.

thence to top of mound and station. Original surface mark was white marble post inscribed with the letters "U.S.C. & G.S." Underground mark was apex of earthenware pyramid about 6 inches on edge, 30 inches below ground, with raised letters "U.S.C.S." on one face. In 1922 marks were found in good condition and left as found except that a standard disk station mark was set in top of marble surface post. In 1933 station recovered in good condition, but surface mark was projecting 14 inches and underground mark was only 24 inches below surface. Underground mark was lowered to 3 feet below and surface mark to 2 inches above surface of ground.

Dreyer (St. Clair County, Ill., R. E. Halter, 1871; 1880).—On bluffs about 6 miles northwest of town of Centerville and about $1\frac{1}{2}$ miles a little west of south of Falling Springs, in southern part of sec. 27, T. 1 N., R. 10 W., about 17 meters (56 feet) north of Carondolet Road near where it strikes bluffs, in field belonging to Freidrick Dreyer, about 370 meters (1,214 feet) west by north from his house. Surface mark is spike in top of cedar post projecting about 4 inches above ground. Underground mark is apex of earthenware pyramid about 6 inches on edge, 30 inches below ground, with raised letters "U.S.C.S." on one face. Reference posts of white marble with arrow in top of each pointing toward station are in fence line on north side of road at the following distances and azimuths from station: 23.33 meters (76.5 feet), $325^{\circ}59'$; 32.90 meters (107.9 feet), $56^{\circ}17'$; and 19 meters (64.4 feet), $11^{\circ}08'$. The third reference post is inscribed with letters "U.S.C. & G.S." on its top, and is 368.8 meters (1,210 feet) from northwest corner of Dreyer's corn house.

Insane asylum (St. Louis County, R. E. Halter, 1871; 1908).—This asylum, known also as County Lunatic Asylum, is situated on county farm, which forms part of larger tract of land known as "Gratiot League Square." It is about 5 miles in southwesterly direction from courthouse at St. Louis and about 150 meters (492 feet) south of Arsenal Street Road at point about one-half mile westerly from its intersection with Kings Highway. Station is in cupola of building.

Minoma (St. Louis County, C. H. Boyd, 1872).—About 7 miles from St. Louis and one-half mile north of Natural Bridge Road. Station was flagstaff on cupola of residence occupied in 1872 by Jefferson Clark. In 1922 it was reported that flagpole had been taken down, that property was still known as the Jefferson Clark place, and that building was probably unchanged.

American Bottom lower base (St. Clair County, Ill., C. H. Boyd, 1872; 1922).—On west slope of Illinois bluffs, on east side of American Bottom, about 1 mile north of Belleville Rock Road and about one-fourth mile north of small settlement called French Village, on land owned in 1872 by Frances Simoin, 16.8 feet west of west rail of electric railway, and 30 feet west of center line of highway which extends north-and-south along foot of bluff. Surface mark was originally cross in copper bolt in top of limestone post 12 by 14 inches and 40 inches long, inscribed on three sides as follows: "U.S.C.S., 1872, BASE." Underground mark is apex of earthenware pyramid 4 feet below surface. One reference stone was 12.0 meters (39 feet) from station in azimuth $24^{\circ}38'$ (prolongation of base) and another 19.2 meters (63 feet) in azimuth $294^{\circ}38'$ (perpendicular to direction of base). In 1922 station mark was found in good condition, but the reference stones had been destroyed by change in roadway and landslide. Copper bolt with cross which marked surface was replaced with standard disk station mark, stamped with name of station and date 1872.

American Bottom upper base (St. Clair County, Ill., C. H. Boyd, 1872; 1922).—On west slope of Illinois bluffs, on east side of American Bottom, about one-fourth mile north of Collinsville road, 245 feet east of center line of road along foot of bluffs, on land owned in 1922 by Charles Maurer. Original surface mark was cross in a copper bolt set in top of limestone post 12 by 14 inches and 40 inches long. Underground mark is apex of earthenware pyramid 4 feet below surface. Two limestone reference posts 5 inches square and 30 inches long are at the following distances and azimuth from station: 7.3 meters (24 feet), $204^{\circ}40'$ (in prolongation of base); and 7.3 meters (24 feet), $294^{\circ}40'$ (right angles to base line). In 1922 copper bolt with cross was replaced with standard disk station mark, stamped with name of station and date 1872.

Kleinschmidt (St. Louis County, R. E. Halter, 1871; 1931).—In T. 44 N., R. 6 E., in town of Mehlville, about 12 miles south of free bridge in St. Louis, in northeast corner of intersection of Lemar Ferry Road (United States Highways 61 and 67) and Sappington Barracks Road (State Highway 77), on land

belonging in 1931 to H. H. Wietthrop, in cultivated field, on range with west edge of sidewalk leading to McEntee's mail box on north side of road, 34.5 meters (113 feet) from southeast corner of stucco garage in northeast corner of road intersection, 27.2 meters (89 feet) from pear tree that stands back of garage, and about 2.5 meters (8 feet) south of east prolongation of south wall of garage. Marked by 10-inch stone pyramid with the letters "U.S.C.S." on its south face, and about 2 feet below surface of ground. This mark will be destroyed in short time, hence *Kleinschmidt 2* (1931) (see description thereof) was established 3.856 meters (12.65 feet) away in azimuth $219^{\circ}15'$.

Morgan (St. Louis County, R. E. Halter, 1871; 1931).—About 11 miles in northwesterly direction from St. Louis, in NE $\frac{1}{4}$ sec. 1, T. 45 N., R. 5 E., on land belonging in 1922 to Moses Grunerfelder of Clayton, on highest ground about 200 yards west of Warson Road and 275 feet south of center line of concrete pavement on Olive Street, on south side of double row of shade trees, the ground to the north and south being used for truck farming. Original surface mark was a pine stub about 4 inches square surrounded by small mound of earth. In 1873 it was replaced by limestone post 6 inches square and 30 inches long. In 1922 surface mark was not found and standard disk station mark in concrete, note 1 (*a*), was set over original underground mark, an earthenware pyramid about 10 inches on an edge, and 32 inches below ground, with raised letters "U.S.C.S." on one face. In 1922 while Olive Street was being repaved standard disk reference mark was set in the fresh concrete 0.7 foot south of north edge of pavement, and 235.1 feet north (magnetic) from station. In 1931 all marks found in good condition, and an azimuth mark, standard reference disk stamped "Morgan 1871, 1931", was set in concrete, note 11 (*a*), projecting about 6 inches above ground, 1 meter (3 feet) south of east backstop of a tennis court, 77 meters (253 feet) west of road, 80 meters (262 feet) west of mail box marked "Hahler", and about 300 yards from station in azimuth $298^{\circ}41'06''$.

Patterson (Jefferson County, R. E. Halter, 1873; 1932).—About 7 miles in a southwesterly direction from town of Fenton, 0.3 mile north of High Ridge post office, one-fourth mile northwest of St. Louis-Fenton-High Ridge and Hillsboro gravel road, in north side of uncultivated field owned in 1922 by Frank H. Skwor, one-fourth mile northwest of his house, and 10.67 meters (35.0 feet) south of north property line of Mr. Skwor and south property line of C. J. Hilgert. Original surface mark was pine stub about 4 inches square surrounded by small mound of earth. Later in same year (1873) it was replaced by limestone post about 6 inches square and 30 inches long with letters "U.S." inscribed on one face and cross in top. In 1922 standard disk station mark was set in top of limestone post which projects 3 inches above ground and it was surrounded with concrete. In 1931 it was reported that limestone post was broken around edges but mark not otherwise disturbed. In 1932 original underground mark, apex of an earthenware pyramid about 10 inches on edge with raised letters "U.S.C.S." on one face, was still in place 32 inches below surface of ground. In 1922 standard reference disk in concrete, note 11 (*a*), was set on property line between lands of Mr. Skwor and Mr. Hilgert, and 35 feet from station in azimuth 180° . Azimuth from station to cross on church in High Ridge, distant about 0.3 mile, is $19^{\circ}31'36''$.

Kessler (St. Louis County, R. E. Halter, 1871; 1931).—In T. 45 N., R. 4 E., just northwest of intersection of Smith and Kehr Mill Roads, on property occupied in 1931 by J. C. Ganahl. In 1922 the following distances and magnetic azimuths were observed from station: Northeast corner of stone foundation of house, 37.6 feet, 153° ; northwest corner of stone foundation of house, 20.4 feet, 180° ; front yard iron fence, 59.9 feet, 35° ; center line of Kehr Mill Road, 78 feet, 35° . In 1931 it was reported that house occupied by Mr. Ganahl had been built very near station. Station is 3.15 meters (10.3 feet) west of northwest bend of porch on east side of house, and 8 inches from porch wall. Original surface mark was a pine stub about 4 inches square surrounded by a small mound of earth. In 1873 it was replaced by limestone post about 6 inches square and 30 inches long with letters "U.S." inscribed on one face and cross in top. In 1922 standard disk mark was set in top of limestone post. Original underground mark, apex of earthenware pyramid about 10 inches on edge with raised letters "U.S.C.S." on one face, is still in place. Close proximity to house

makes it inadvisable to use station on steel tower triangulation. Station *Ganahl* (see description thereof) is 57.22 meters (187.7 feet) from station in azimuth $139^{\circ}15'$.

Tavern Rock (Franklin County, C. H. Boyd, 1873).—On south bank of Missouri River, about 1 mile west of St. Louis County line, about $2\frac{1}{2}$ miles northwest of Melrose store, on top of small hill, on cultivated land owned in 1922 by Mrs. Johnson, who lives about 2 miles southwest of station. Station is 141 meters (463 feet) west by south of location of northwest corner of house owned in 1873 by Mr. Godair, but later torn down. Surface mark was stone post and underground mark earthenware pyramid, note 17. In about 1920 surface marks were removed to get them out of way of plough. Underground mark is probably still in place.

Ganahl (St. Louis County, H. W. Hemple, 1931).—In T. 45 N., R. 4 E., on large suburban estate of J. C. Ganahl, northwest of the intersection of Clayton Road and Kehr Mill Road, about 188 feet northwest of near face of east porch of Mr. Ganahl's house, and 54.5 feet west of center line of private road passing along east side of house. To reach from St. Louis follow Clayton Road west about 22 miles to above-mentioned intersection, thence northwest along private road to site. Surface and underground marks are standard disk station marks in concrete, notes 1 (*a*) and 7 (*a*). Station *Kessler* (see description thereof) is 57.22 meters (187.7 feet) from station in azimuth $319^{\circ}15'$. Azimuth from station to low squat water tank on horizon is $226^{\circ}20'08''$.

Kleinschmidt 2 (St. Louis County, H. W. Hemple, 1931).—In T. 44 N., R. 6 E., in town of Mehlville, about 12 miles south of free bridge in St. Louis, in northeast corner of intersection of Lemar Ferry Road (United States Highways 61 and 67) and Sappington Barracks Road (State Highway 77), on land belonging in 1931 to H. H. Wiethop and rented by L. G. Werner, in cultivated field, on range with west edge of sidewalk leading in to Mr. McEntee's house on south side of Sappington Barracks Road, 22.1 meters (73 feet) north of north end of sidewalk, 13.3 meters (44 feet) from tree at Mr. McEntee's mail box on north side of road, 34.8 meters (114 feet) from southeast corner of stucco garage that sets in northeast corner of road intersection, 27.3 meters (90 feet) from pear tree that stands back of garage, and 2.5 meters (8 feet) north of east prolongation of south wall of garage. Surface and underground marks are standard disk station marks in concrete, notes 1 (*a*) and 7 (*a*). Reference mark (no. 2) is standard reference disk in concrete, note 11 (*a*), at west fence line, near large tree, about 20 feet east of stucco garage, 15 meters (49 feet) north of Sappington Barracks Road, and 27.029 meters (88.68 feet) from station in azimuth $126^{\circ}20'$. Station *Kleinschmidt* (see description thereof) is 3.856 meters (12.65 feet) from station in azimuth $39^{\circ}15'$.

Supplementary points

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

Base 2 (Johnson County, Kans., F. D. Granger, 1885).—According to field records this station is 271.4 meters (889.9 feet) from *Base 1* in azimuth $18^{\circ}43'$. However, recent surveys by E. H. Owens, an engineer from Kansas City, indicate that this length is 50 feet too short. The corrected length of 939.9 feet was accordingly used in the computations.

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

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

State line 3, stake (Johnson County, Kans., F. D. Granger, 1885).—On west side of State Line Road, about one-half mile north from road running east from Aubry, and 552.1 meters (1,811 feet) a little west of north from State boundary

stone at northeast corner of southwest fractional quarter of sec. 23, T. 14 S., R. 25 E. Station is marked by nail in top of strong, well-driven stake.

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

Hazel Hill (Johnson County, F. D. Granger, 1882).—About 11 miles north of Warrensburg, on highest part of Hazel Hill, in northwest corner of SE $\frac{1}{4}$ -SW $\frac{1}{4}$ sec. 2, T. 47 N., R. 26 W. Surface mark is nail in top of 3-foot stake. Underground mark is small bottle of ashes 2 $\frac{1}{2}$ feet below surface of ground.

Cooks Knob ice house (Johnson County, F. D. Granger, 1882).—In northwest corner of SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 14, T. 47 N., R. 24 W., on knob about 7 miles north of station *Knob Noster*. Station is center of pole on ridge of E. Cook's ice house, 9 inches south of ventilator on building.

Jefferson City astronomic (Cole County, H. W. Blair, 1879).—On hill in extreme southeastern part of Jefferson City, on east side of Castle Rock road, about one-fourth mile south of the National Cemetery and about same distance north of fair grounds, in front yard of E. T. Manchester, on right-hand side of walk leading to house. Marked by cross in top of stone post, 6 inches square and 2 $\frac{1}{2}$ feet long, projecting about 2 inches above ground. Letters "U.S. C. S." are inscribed in top of post.

Koeltztown spire (Osage County, H. W. Blair, 1879).—The 125-foot spire of large brick Roman Catholic Church at Koeltztown.

L'Ours Creek spire (Osage County, H. W. Blair, 1879).—The 50-foot spire of small brick Catholic Church at L'Ours Creek.

Doermann Hill (Gasconade County, F. D. Granger, 1878).—Two miles north of Drake, one-fourth mile south of Doermann's house on west side of the Iron Road, and about 200 yards north of where Millers Landing Road branches from Iron Road. Marked by stone post 3 feet long, dressed to 6 inches square at top, projecting about 3 inches above surface, and inscribed with cross and letters "U.S.C.S." Stone at southeast corner of sec. 33, T. 43 N., R. 5 W., is 1,193 feet N. 59° E. (magnetic) from station.

Polemann's house (Franklin County, C. H. Boyd, 1874).—Near intersection of South Point road and county rock road to Union, about 2 miles west of station *Halleck*. Station is northeast corner of chimney at south end of Henry Polemann's house. Station *Corner fifth meridian* is 263.33 meters (863.9 feet) east and 146.45 meters (480.4 feet) north of station.

Corner fifth meridian (Franklin County, C. H. Boyd, 1874).—Stone marking half section corner at the east side of sec. 13, T. 43 N., R. 1 W., 263.33 meters (863.9 feet) east and 146.45 meters (480.4 feet) north of station *Polemann's house*. There are two white oak witness trees near station, one east and one west. Original marks on the trees, "S. 111X", were discovered in 1874 by cutting out a section of each tree.

Northwest corner 36 (Franklin County, C. H. Boyd, 1874).—Stone at northwest corner of sec. 36, T. 45 N., R. 2 E., about 318 meters (1,043 feet) north-northeast of station *Tavern Rock*.

St. Louis standpipe (St. Louis County, C. H. Boyd, 1871).—On top of cap of standpipe, 180 feet high, at corner of Grand Avenue and Fourteenth Street, St. Louis. Marked by nail in plank nailed to timbers which are framed in brick masonry at top of standpipe. Four arrows pointing toward station are cut in top of iron cap of standpipe.

MISSISSIPPI RIVER ARC, FIRST-ORDER TRIANGULATION

Principal points

Prairie (southwest base) (Mississippi County, H. W. Hemple, 1929; 1930).—In town of East Prairie, southeast of St. Louis Southwestern Railway station, 59.2 feet southeast of southeast rail of main track, 47 feet east of center line of dirt road leading across tracks west of station, and 74 feet northwest of center line of road running parallel to and south of tracks. Surface and under-

ground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in sidewalk southeast of telephone company building, 13 feet from center line of roadway, and 1,155 feet from station in azimuth $40^{\circ}07'05''$. No. 2 is in sidewalk at southeast corner of Farmers National Bank Building, 6 inches from wall of building and 71.0 meters (233 feet) from station in azimuth $115^{\circ}35'$.

Chalk (Hickman County, Ky., H. W. Hemple, 1929).—About $2\frac{1}{2}$ miles south of present site of Columbus, Ky., reached from highway at Arlington by dirt road to Columbus, then south to old railroad grade at South Columbus. Turn west one-fourth mile to first road turning south and follow southwest about $1\frac{1}{4}$ miles to R. Kerr's mail box. Station is on a knoll on right side of road, on edge of bluff, 60 feet northwest of bluff road leading south from Columbus, 18 feet southeast of blazed 10-inch gum tree, 50 feet southwest of blazed 30-inch oak, 52 feet north of blazed 24-inch pecan tree, and 70 feet north of R. Kerr's mail box. A conspicuous Indian mound is in field immediately east of station. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is on fence line north of road leading to Mr. Kerr's house, about halfway between main road and house, and 130 meters (427 feet) from station in azimuth $335^{\circ}01'36''$. No. 2 is in woods, 39.36 meters (129.1 feet) from station in azimuth $60^{\circ}10'$.

Williams (northeast base) (Mississippi County, H. W. Hemple, 1929; 1930).—About 6 miles east-southeast of Charleston, on land owned by Roy L. Williams. To reach from Wyatt, go west 1.5 miles on U.S. Route 60 to colored church on south side of road, turn south on dirt road and continue for 1.5 miles to railroad track and station site. Station is 103 feet north of north rail of the St. Louis Southwestern Railway, 33 feet north of road running northeast and southwest, 58 feet northwest of northwest corner of wooden bridge over drainage ditch running north and south which ends at the railway embankment, and about 50 feet south by east of southeast corner of large barn which has "Woodsdale Farm" painted on it in large letters. West of this barn is a two-story yellow farmhouse, with windmill alongside. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at fence corner southeast of farmyard about yellow house mentioned above, 26 feet north of center line of road running northeast and southwest, about 30 feet east of gate leading into yard about farmhouse, and 56.6 meters (186 feet) from station in azimuth $41^{\circ}51'$. No. 2 is about 485 feet north of road running northeast and southwest, 46 feet west of road running north and south, and 151.2 meters (496 feet) from station in azimuth $184^{\circ}16'32''$.

Mathis (Carlisle County, Ky., H. W. Hemple, 1929; 1930).—About 5 miles west of Bardwell, on land owned by Joe Mathis. Reached from highway at Bardwell by dirt road toward Laketon. Keep main road straight ahead at all forks to a T-crossroad about 4 miles from Bardwell, turn right (north) and continue 1 mile to road leading left at two mail boxes and stock corral on right. Turn west and follow main road 1.6 miles to Mathis' house, which is last one before descending bluff and just beyond relocated road. Station is on edge of bluff just east of old railroad station of Laketon, 150 yards from Mathis' house which is on the east side of road, in yard of an old house, 8.05 meters (26.4 feet) south of cistern, and 32 feet southwest of the corner of main wing of house. This house is on edge of bluff just west of orchard. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is between road and garden fence, 60 feet north of large beech tree near a white gate, and 110.72 meters (363.3 feet) from station in azimuth $278^{\circ}43'20''$. No. 2 is in the southwest corner of orchard, 10 feet east of 2-foot locust tree on edge of bluff, and 32.19 meters (105.6 feet) from station in azimuth $343^{\circ}32'$.

Big Lake (Mississippi County, H. W. Hemple, 1929; 1930).—About 6.5 miles northeast of the town of Charleston, on the Big Lake Road and on east side of lot on which is located the Big Lake School. To reach from Charleston, go east 4.8 miles on United States Route 60, north on concrete road and continue 4.6 miles to site of Big Lake School. Station is 16.13 meters (52.9 feet) south of center line of concrete road, and 12.8 meters (42 feet) east of east side of school, which is an old frame structure painted white. Surface and underground marks are standard disk station marks in concrete, notes

1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 75 feet east of driveway leading past barn of A. J. Drinkwater, at fence line, 44 feet south of center line of concrete road, and 156.6 meters (513.8 feet) from station in azimuth $210^{\circ}20'08''$. No. 2 is 7.16 meters (23.5 feet) north of center line of road, and 23.29 meters (76.4 feet) from station in azimuth $120^{\circ}22'$.

Wickliffe (Carlisle County, Ky., H. W. Hemple, 1929).—In the town of Wickliffe, on lot immediately south of water tank and owned by Wisconsin Chair Co. of Point Washington, Wis., whose agent, W. W. Graves, lives about 1 mile north of Wickliffe. Station is 35 feet southwest of southwest footing of tank, 30 feet northwest of 28-inch oak tree, and about 60 feet east of United States Route 60. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is about 2 feet west of sidewalk on Route 60, and 64.14 meters (210.4 feet) from station in azimuth $44^{\circ}08'$. No. 2 is about 2 feet west of sidewalk on Route 60, and 93.07 meters (305.3 feet) from station in azimuth $162^{\circ}42'32''$. Wickliffe water tank is 15.70 meters (51.5 feet) from station in azimuth $224^{\circ}29'$. Station *P.B.M. Wickliffe (M.R.C.)* (see description thereof) is 451.55 meters (1,481.5 feet) from station in azimuth $56^{\circ}47'23''$.

Cairo (Alexander County, Ill., H. W. Hemple, 1929; 1930).—About 2.3 miles north of underpass of Illinois Central Railroad which crosses United States Highway 51 north of Cairo, Ill. Mark is in northwest corner of small park (known as Marlow Park), which has dance hall in center, 336 feet west of center line of U.S. Highway 51, and 50 feet south of center line of east-and-west paved road called Sears, Roebuck & Co. cut-off. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is flush with ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 30 feet south of center line of Sears, Roebuck & Co. cut-off road, 2 feet west of 6-inch square concrete post which marks east property line of Sears, Roebuck & Co. and 296.4 meters (972 feet) from station in azimuth $91^{\circ}14'00''$. No. 2 is just west of fence line which marks western boundary of Marlow Park, 203 feet south of the center line of Sears, Roebuck & Co. cut-off road, and 46.9 meters (154 feet) from station in azimuth $7^{\circ}11'$.

Barlow (Carlisle County, Ky., H. W. Hemple, 1929; 1930).—In the town of Barlow, on lot owned by the town and just south of the water tank which is 1 block north and 1 block west of main corner in Barlow, and 150 yards southeast of railroad station. The station is 30 feet east of the southeast corner of a house owned by Hattie Dodson, 27 feet south of the southwest footing of the water tank, and 100 feet south of the street. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in fence line on Hoague Street, 130 feet east of intersection with road which passes under Illinois Central Railroad northeast of Barlow water tank, and 208.23 meters (683.2 feet) from station in azimuth $211^{\circ}20'46''$. No. 2 is about 50 feet west of pump house at Barlow, and 27.55 meters (90.4 feet) from station in azimuth $341^{\circ}53'$. Distance and azimuth from station of water tank at Barlow are 14.80 meters (48.6 feet), $214^{\circ}28'$.

Larrison (Pulaski County, Ill., P. A. Smith, 1930).—About 10 miles northwest of Cairo, 3 miles west of Mounds, on land owned by C. N. Larrison and occupied by his son, 12 meters (39 feet) east by south of southeast corner of house, 24 meters (79 feet) south of center line of road, and 23.2 meters (76 feet) east by north of brick masonry cistern. To reach from Mounds, turn left at west end of bridge over tracks, follow gravel road west 1.7 miles to fork, take right fork north 0.3 mile, and proceed west 1.4 miles to Larrison's house on south side of road. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in row of trees along north side of road 6 meters (20 feet) north of center line of road, and 36.60 meters (120.1 feet) from station in azimuth $200^{\circ}49'$. No. 2 is in northeast corner of fork in road, 5.5 meters (18 feet) south of center line of east-and-west road, 6.0 meters (20 feet) east of north road, and 100 meters (328 feet) from station in azimuth $254^{\circ}10'55''$.

Allen (Alexander County, Ill., P. A. Smith, 1930).—About $2\frac{1}{2}$ miles west of Elco, on land owned by S. J. Allen, in $SE\frac{1}{4}SE\frac{1}{4}$ sec. 10, T. 14 S., R. 2 W., 3rd

P.M., 25 meters (82 feet) west of highest part of Cullick Hill, 26 meters (85 feet) south of edge of timber where hill breaks abruptly to northward, and 70 meters (230 feet) west of row of trees. To reach from Elco take road leading west one block north of post office, and follow up valley 3.3 miles to lane turning left, just over summit of steep hill; follow lane southeast 0.2 mile to deserted house, thence northeast 200 meters (656 feet) to station site. Mark is standard disk station mark in concrete, note 7 (a), 18 inches below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at edge of field, just east of small draw which extends into field a short distance, and 25.29 meters (83.0 feet) from station in azimuth $180^{\circ}26'$. No. 2 is in row of small peach trees along southern edge of field, just north of road along edge of field, 100 meters (328 feet) east of house, in azimuth $49^{\circ}59'48''$ from station.

Levings (Pulaski County, Ill., P. A. Smith, 1930).—About $10\frac{1}{2}$ miles northeast of Mounds, $3\frac{1}{2}$ miles southwest of Grand Chain, and $2\frac{1}{2}$ miles north-northeast of Olmstead, in T. 15 S., R. 1 E., 3d P.M., in school yard of Pleasant Grove School, 31 feet east of west fence of school yard, 64 feet north of center line of road, and 116 feet west of west side of schoolhouse. Mark is standard disk station mark in concrete, note 1 (a), flush with ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in northwest corner of school yard, and 104 feet from station in azimuth $163^{\circ}52'$. No. 2 is 15 feet south of center line of road, about 150 feet east of schoolhouse, and 284 feet from station in azimuth $288^{\circ}42'$.

Adams (Johnson County, Ill., P. A. Smith, 1930).—Seven and one-half miles northeast of Dongola, along northern boundary of SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, T. 13 S., R. 2 E., 3d P.M., on land owned by Harrison Adams, 21 feet south of center line of road, nearly opposite 2-foot oak tree, and across road from house on farm owned by Melvin Hunter. To reach from Dongola, follow road leading northeast from northern limits of town for 3.5 miles to point one-half mile east of Karraker School, turn north 0.3 mile, continue northeast direction 3.7 miles to school on left, take road leading east from school 1.4 miles, turn south 0.4 mile, and proceed northwest 0.4 mile to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 18 inches below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is $4\frac{1}{2}$ meters (15 feet) north of center line of road, 12 meters (39 feet) east by south of above-mentioned oak tree, and 14.62 meters (48.0 feet) from station in azimuth $218^{\circ}31'$. No. 2 is in fence line along west side of field, 8 meters (26 feet) east of small farmhouse, and 140 meters (459 feet) from station in azimuth $37^{\circ}31'19''$.

Atwood (Union County, Ill., P. A. Smith, 1930).—About 5 miles southwest of Anna, 4 miles southwest of Jonesboro, on easterly of two highest knobs on high wooded hill known as "Atwood Ridge", about 15 yards to left of woods road, on land owned by R. Hunsaker and rented by a Mr. Newton. To reach from Anna, go $1\frac{1}{4}$ miles by good road to Jonesboro, and at square in Jonesboro take road leading straight west, follow 1.1 miles to filling station on left, turn left 1.6 miles to fork near church, keep right on straight road 0.9 mile to creek, keep straight ahead across bottoms and up steep grade 0.9 mile to lane turning left at top of hill; follow this lane 0.3 mile to Newton's house, and take old woods road leading southeast from house about 0.7 mile to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is on right side of woods road, and in azimuth $348^{\circ}01'$ from station. No. 2 is about 2 meters (7 feet) to left of woods road, and 69.4 meters (228 feet) from station in azimuth 101° .

Bald Knob (Union County, Ill., P. A. Smith, 1930; 1931).—About 8 miles northwest of Anna, 5 miles north of west from Cobden, 2 miles southwest of Alto Pass, in SE $\frac{1}{4}$ sec. 20, T. 11 S., R. 2 W., 7.4 meters (24 feet) south of southeast corner of garden fence, and 7.4 meters (24 feet) east of northeast corner of house on land owned by George Gunn of Mound City and occupied by Henry Rendleman. To reach from Cobden, go west 5 miles via gravel road to Mountain Glen to dirt road leading southwest down Clear Creek, follow 2.2 miles to road leading north up Dry Branch, follow 1 mile to point near group of buildings, and continue on private road to right up ridge about $1\frac{1}{2}$ miles to station site. Surface and underground marks are standard station disks in concrete notes 1 (a) and 7 (a). Reference marks are standard reference disks

in concrete, note 11 (a). No. 1 is in north corner of orchard, and 26.45 meters (86.8 feet) from station in azimuth $194^{\circ}46'$. No. 2 is in southeast corner of orchard, and 77.20 meters (253.3 feet) from station in azimuth $332^{\circ}04'$.

Hines (Union County, Ill., P. A. Smith, 1930).—About 12 miles northeast of Anna, 10 miles north of east of Cobden, in southwest corner of west half of NW $\frac{1}{4}$ sec. 14, T. 11 S., R. 1 E., 3d P.M., on land owned by Mrs. Mary F. Hines, 11.9 meters (39 feet) north of northeast corner of house, 16 meters (52 feet) southwest of southwest corner of barn, and 7.6 meters (25 feet) north by east of center of stone cistern. To reach from Anna, go south 0.7 mile on United States Route 51 to Vienna road; follow this road 0.8 mile, take left road 0.7 mile, take left fork 2.6 miles, turn right (east) 0.5 mile, jog north, and turn east 1.8 miles to Saratoga store, turn left (north), and go 3.5 miles to fork; keep right-hand road 1.4 miles to road turning north 0.1 mile east of Hall Church, follow this road north 0.9 mile (keeping left fork in creek bottom 0.4 mile), keep straight road 0.7 mile, and continue straight ahead on road bearing northeast 1.1 miles to Mrs. Hines' house. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is flush with ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at northeast corner of house, and 11.93 meters (39.1 feet) from station in azimuth $2^{\circ}03'$. No. 2 is 2 feet north of east-and-west fence, where it breaks to southwest, 20 feet north of center of road, and about 150 meters (492 feet) from station in azimuth $82^{\circ}51'29''$.

Farmer (Jackson County, Ill., P. A. Smith, 1930).—About 4 miles northeast of Carbondale, 4 miles southeast of De Soto, 7 miles southwest of Herrin, in west half of NW $\frac{1}{4}$ sec. 1, T. 9 S., R. 1 E., on land owned by Mrs. Cora Farmer, 8.8 meters (29 feet) north by west of northwest corner of barn, 8.2 meters (27 feet) east of north-and-south fence, and 45 meters (148 feet) southeast of house. To reach from Carbondale, go north 2 miles on Route 2, turn east just north of large water tank for 1.2 miles, continue along railroad track 1 mile to crossing, proceed $\frac{1}{4}$ mile to bridge, cross bridge, and climb hill to Mrs. Farmer's house. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in south edge of small grove of trees, 1 foot east of north-and-south fence, 2.3 meters (8 feet) south of 16-inch oak tree, and about 175 meters (574 feet) from station in azimuth $176^{\circ}39'07''$. No. 2 is 1 foot west of north-and-south wire fence, 13 meters (43 feet) northeast of northeast corner of barn, and 26.67 meters (87.5 feet) from station in azimuth $271^{\circ}34'$.

Levan (Jackson County, Ill., P. A. Smith, 1930; 1931).—About 7 miles airline northwest of Murphysboro, 6 miles southeast of Ava, on land owned and occupied by James W. Levan, 5.0 meters (16 feet) west of north barn lot fence, 1.0 meters (3 feet) south of south fence line of lane leading east past barn, and 12.4 meters (41 feet) east of northeast corner of concrete silo foundation slab on north side of barn. To reach from Murphysboro, go by main dirt road toward Ava, which, after 3 miles of zigzagging follows general course of heavy telephone line, and follow this road 11.5 miles to point where it turns squarely to north and another road leads south. This corner is $2\frac{1}{2}$ miles northwest of viaduct over railroad track, and 1 mile northwest of Pleasant Hill Church. Take road leading south $1\frac{1}{2}$ miles to corner $\frac{1}{4}$ mile south of Oak Ridge to Sodom School, turn east $\frac{1}{4}$ mile, proceed south $\frac{1}{4}$ mile across deep valley to Mr. Levan's house which is at corner of road where it turns east, and continue to station site, which is about 25 yards east of angle. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in corner of field, in east-and-west fence line, and 99.64 meters (326.9 feet) from station in azimuth $153^{\circ}46'51''$. No. 2 is under large oak tree, about 10 meters (33 feet) south of center line of road, and about $\frac{1}{4}$ mile from station in azimuth $278^{\circ}10'52''$.

Barnes (New Madrid County, H. W. Hemple, 1929).—About 8 miles south of East Prairie, on land owned by Wes Dawson, about one half mile north-northwest of Barnes Ridge School, about 380 feet west by south of T-junction of road running north and south with a road leading east and west, on the highest part of Barnes Ridge, which is bare on north side and has a sand pit on that side. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks

in concrete, note 11 (a). No. 1 is in the northeast corner of east fence line of north-and-south road at T-junction, and 119.2 meters (391 feet) from station in azimuth $243^{\circ}47'$. No. 2 is at the north fence line of road running east and west, about 880 feet from T-junction with north-and-south road, and 123.1 meters (404 feet) from station in azimuth $117^{\circ}04'52''$.

Hickman (Fulton County, Ky., H. W. Hemple, 1929).—In city of Hickman, in area laid out as public square and partially occupied by school, library, and standpipe. This square lies on the north side of State Highway 94, called Moscow Street, and east of Troy Avenue. Station is in southeast corner of square, 7.2 meters (24 feet) northeast of exposed bolt in standpipe foundation, and 8.3 meters (27 feet) west of 12-inch double locust tree. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in curb line on opposite side of Troy Avenue, on line (approximately) between northwest corner of Hickman School and southeast corner of E. C. Johnson's residence, and 125.91 meters (413.1 feet) from station in azimuth $105^{\circ}43'18''$. No. 2 is between road and edge of bluff, in northeast corner of square, and 65.06 meters (213.4 feet) from station in azimuth $171^{\circ}28'$. The Hickman standpipe is 9.45 meters (31 feet) from station in azimuth $82^{\circ}18'$.

Madrid (New Madrid County, H. W. Hemple, 1929).—About 1 mile west of New Madrid, 0.17 mile east of junction of United States Route 61 with the gravel road leading west from New Madrid. These two roads are also intersected here by a road running north and south. Station is 53 feet south of center line of gravel road. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Upper mark is 15 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is about 0.20 mile east of above junction, in fence line, 27 feet north of center line of gravel road, and 39 meters (128 feet) from station in azimuth $216^{\circ}50'$. No. 2 is 184 feet northeast of the junction, at fence line, 44 feet north of center line of Route 61, and 274.0 meters (899 feet) from station in azimuth $85^{\circ}38'30''$.

Fishgap (Obion County, Tenn., H. W. Hemple, 1929).—About 15 miles west of Union City, about 2 miles south of the Kentucky-Tennessee State line, on point of bluffs lying between Reelfoot Creek and Bayou Chien, on land owned by T. C. Wilson, of Union City. To reach from Union City go 18 miles toward Samburg to Midway School, take right-hand road (dirt) about one-fourth mile southwest of school at curve, 300 yards north of Reelfoot Creek bridge, and follow road west and north 0.7 mile to fork, take left fork and follow 0.6 mile to fork. Both forks lead to station; the right over the bluff via the Crescent School is, however, the better. Follow this road 2.4 miles to junction with lower road near top of Fishgap grade; from there go northeast 0.1 mile to station, in a wooded area, about 20 yards west of the Walnut Log and Hickman dirt road, at a point nearly opposite an old road leading south, 20 feet west of a 12-inch elm tree and 50 yards from edge of bluff. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in edge of road 50 feet southwest of junction of old road leading south, and 47.47 meters (155.7 feet) from station in azimuth $24^{\circ}36'$. No. 2 is about 20 yards east of edge of bluff, and 29.94 meters (98.2 feet) from station in azimuth $106^{\circ}17'$.

Pleasant (New Madrid County, H. W. Hemple, 1929; 1931).—About 5 miles south-southeast of town of Marston, in village of Point Pleasant, about 75 feet west of top of levee, and 101 feet north of center line of main road into Point Pleasant, where it ends at levee. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Upper mark is 6 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 18 feet south of center line of main road, at south fence line, 96 feet west of top of levee, and 36.4 meters (119 feet) from station in azimuth $9^{\circ}03'$. No. 2 is 24 feet south of center line of main road, 885 feet west of top of levee, and 244 meters (801 feet) from station in azimuth $81^{\circ}11'55''$.

Chigger (Obion County, Tenn., H. W. Hemple, 1929).—About 8 miles east of Tiptonville, $1\frac{1}{4}$ mile northeast of Samburg, a village on Reelfoot Lake, and 13.7 feet south of *B.M. and traverse station no. 11 (U.S.G.S.)*, on land owned by Killon and Dietzell of Union City. To reach from Union City go by gravel road to point 0.7 mile northeast of Samburg and immediately north of bridge over Indian Creek, take dirt road leading northeast up steep grade one-half mile to

station which is on west side of road about 30 feet south of 20-inch beech tree, and about 60 yards south of tenant house occupied by E. B. Tucker. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 5 feet west of edge of road, and is 30.8 meters (101 feet) from station in azimuth $31^{\circ}26'$. No. 2 is 6 feet from southwest corner of house, about 20 yards east of head of ravine making southwest, and 53.2 meters (175 feet) from station in azimuth $155^{\circ}03'$. *B.M. and traverse station no. 11 (U.S.G.S.)* is 4.176 meters (13.70 feet) from station in azimuth $181^{\circ}40'$.

Stewart (Pemiscot County, H. W. Hemple, 1929).—Station is about $6\frac{1}{2}$ miles east of town of Swifton, 3 miles west of Stewarts Lower Landing, on west side of levee road, about 600 feet south of L.M.P. 15/16, on farm of Jeff Harris, just south of road leading to Harris' house, about 150 feet west of top of levee, and 1,160 feet north of road leading westward from the levee road. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 21 feet west of center line of levee road, 53 feet north of center line of road running west from levee, 150 feet west of top of levee and 335.4 meters (1,100 feet) from station in azimuth $348^{\circ}20'45''$. No. 2 is 41 feet northeast of northeast corner of Harris' house, 3 feet southeast of corner of shed, and 60.0 meters (197 feet) from station in azimuth $100^{\circ}28'$.

Gratio (Obion County, Tenn., H. W. Hemple, 1929).—About 4 miles east of Ridgely, 1 mile northeast of the little village of Gratio, on land owned by J. K. White and Edward Rigglin of Dyersburg, and occupied by M. B. Davis. To reach from Ridgely go by gravel road east about 4 miles to road running north from Gratio to Push, turn left (north) 0.2 mile, then right, up steep grade to station, 0.2 mile. Village of Gratio can be reached from Dyersburg via Burnt Mill Bridge, and first gravel road to left, north of Obion River at Doo Drop Inn, or from Samburg by gravel road via Push. Station is 300 yards west of Davis' house, in small triangular field between county road and Booger Hollow Road, about 60 yards east of road fork, 16 feet south of edge of county road, and 80 feet west of very large chestnut tree growing in edge of orchard. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is about 125 yards south of point where Booger Hollow Road turns south, under a wild cherry tree, on east side of road at first rise, and 184.4 meters (605 feet) from station in azimuth $328^{\circ}14'50''$. No. 2 is 10 feet from edge of road, northwest of Booger Hollow Road junction, and 44.2 meters (145 feet) from station in azimuth $81^{\circ}31'$.

Caruthers (Pemiscot County, H. W. Hemple, 1929).—Located in northern part of town of Caruthersville, on land owned by T. J. Medlin, northeast of the Pemiscot County fairgrounds, 64 feet east of center line of State Highway 84, 95 feet north of the north rail of the St. Louis-San Francisco Railway, and 51 feet north of center line of Fourth Street. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Upper mark is about 15 inches below surface. Reference marks are standard reference disks in concrete, note 11 a. No. 1 is 262 feet east of center line of Route 84, 23 feet north of north rail of railroad, 12 feet south of center line of Fourth Street, and 67.9 meters (223 feet) from station in azimuth $126^{\circ}31'$. No. 2 is at fence line on east side of fairgrounds, 22.3 feet west of center line of Route 84, 56 feet north of center of main entrance to fairgrounds, and 160 meters (525 feet) from station in azimuth $16^{\circ}37'12''$.

Obion (Dyer County, Tenn., H. W. Hemple, 1929).—About 8 miles northwest of Dyersburg, and 10 miles south of Ridgely, on northwest salient of bluffs lying between the Forked Deer and Obion Rivers, and immediately south of the Obion. To reach from Dyersburg go west on Route 20 to crossroads 1.1 miles west of Finley, then north on gravel road 3.8 miles to intersection just east of Lennox, follow road along foot of bluff about $1\frac{1}{2}$ miles to house occupied by Mr. Rodgers. There is a plank bridge just north of house, and just north of bridge a triangular blaze on large locust in east fence of road. Pass through east fence, south of blazed tree, cross foot of gully near another blazed tree, follow old wagon tracks up north side of hillside pasture, then turn sharply to left around point of timber and proceed northwest about 200 yards to station. Station can also be reached from north by gravel roads via Tiptonville and Ridgely to Lennox. Station is in west end of narrow ridge pasture, 20 feet

east of an Indian mound. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in edge of pasture, 276.3 feet from station in azimuth 304°02'. No. 2 is in east end of point of timber, 364.6 feet from station in azimuth 328°44'18".

Cotton (Pemiscot County, H. W. Hemple, 1929).—Located at Cottonwood Point, on the west bank of the Mississippi River, about 8 miles south of Caruthersville, and about one-quarter mile east of main part of town of Cottonwood, on small knoll 475 feet east of levee, and 173 feet south of road running east and west, called locally the River Road. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Upper mark is 15 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 16 feet west of the River Road just after it turns north, after running east from Cottonwood, 84 feet north of where road turns north, and 80.9 meters (265 feet) from station in azimuth 230°59'08". No. 2 is at junction of the River and banquette roads, diagonally across from Cottonwood Gin Mill, 25 feet east of center line of banquette road, 48 feet north of center line of River Road, and about 150 meters (492 feet) from station in azimuth 159°33'45". Station *Cottonwood south base* (1879) is 116.51 meters (382.2 feet) from station in azimuth 126°41'18".

Head (Dyer County, Tenn., H. W. Hemple, 1929).—About 7 miles west of Dyersburg, 2 miles northwest of Finley, on land owned by J. M. Head. To reach from Dyersburg go about 7 miles on Route 20 to crossroads 1.1 miles west of Finley, take gravel road leading north 1.9 miles to Mr. Head's gate on the right side of road, at foot of bluff, and opposite shed on left. From gate follow private road 0.2 mile up steep grade to house and inquire for route through orchard to station. Truck can be driven to station in dry weather. Station is in a pasture just west of large orchard, on highest knoll of bluff, 20 feet west of orchard fence, 200 yards northwest of two-story square house, and 400 yards south of barn. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is along fence line, 199.50 feet from station in azimuth 203°43'. No. 2 is under apple tree in orchard 162.70 feet from station in azimuth 248°50'. Azimuth from station of final of black water tank at Dyersburg is 285°39'05".

School (Mississippi County, Ark., H. W. Hemple, 1929).—About 10 miles east of Blytheville, and 5.3 miles by road from town of Amorel, in southwest corner of grounds surrounding School No. 48, Hickman District, 68 feet east of center line of north-and-south road, and 129 feet north of center line of east-and-west road. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 22 feet south of center line of road running east and west, and 192 meters (630 feet) from station in azimuth 283°04'46". No. 2 is 53 feet west of center line of road running north and south, 22 feet south of center line of road running east and west, and 58.2 meters (191 feet) from station in azimuth 37°14'. Southwest corner of School No. 48, is 67.1 meters (220 feet) from station in azimuth 232°41'.

Miles (Jakson County, Ill., H. W. Hemple, 1931).—About 7 miles airline south of Ava, 9 miles north of west of Murphysboro, 3½ miles northwest of Grimsby, in NW¼NW¼ sec. 36, Kincaid Township, on land belonging to Mrs. S. A. Miles, 20 feet east of section-line fence, in brush and weeds between section-line fence and farm road along fence, 31.2 meters (102 feet) north of point where road turns west, and 150 feet east of deserted house on Henry Bowers' place. To reach from schoolhouse at Grimsby, go west 2.0 miles on road along foot of bluff, turn upgrade to right 0.6 mile, turn left, proceed 1.0 mile to forks, keep straight ahead on left fork 0.2 mile, take right fork, and proceed 1.3 miles to point where road turns from north to west and goes downgrade. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at edge of road passing around plowed field, and about 200 meters (656 feet) from station in azimuth 199°35'53". No. 2 is 2 meters (7 feet) south of valley in field, and 75.86 meters (249.0 feet) from station in azimuth 307°23'.

Fountain Bluff (M.R.C.) (Jackson County, Ill., Mississippi River Commission, 1880, P. A. Smith, 1930; 1931).—On southern end and highest point of detached

hill known as Fountain Bluff, about 12 miles southwest of Murphysboro, and 2 miles south of Gorham, on Illinois Central Railroad one-half mile south of Fountain Bluff station. To reach from small dam on west side of hill, follow trail up ridge to south over several points and through several small saddles. At bottom of short, steep pitch, turn southeast and climb to top of ridge. Marked by standard station disk (placed in 1930) in top of 6 by 6-inch stone post. Top of post is 8 inches below surface. Two reference marks, 3-inch capped iron pipes, projecting 1 foot above ground, are distant from station: 2.99 meters (9.8 feet) in azimuth $359^{\circ}20'$, and 3.06 meters (10.0 feet) in azimuth $181^{\circ}24'$.

Frohna (Perry County, H. W. Hemple, 1931).—In northeast edge of Frohna, in section 20, Brazeau Township, in yard owned by Paul Popp and occupied by his son, 1 foot north of woven wire fence and garden, 73 feet west of large cattle barn with galvanized-iron roof, 26 feet west of center line of road leading to house, 75 feet west-southwest of corner of house, and about 170 paces north of main road running through town. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in barnyard, 3 feet west of old barn, 12 feet south of wire fence separating yard and pasture, 12 feet south of corner of barn, and 47.63 meters (156.3 feet) from station in azimuth $251^{\circ}33'$. No. 2 is at northeast corner of shed used as machine shop, about 6 meters (20 feet) south of center line of main road at curve, and one-fourth mile from station in azimuth $338^{\circ}07'00''$. Azimuth from station to spire of Lutheran Church at Attenburg is $288^{\circ}17'02''$.

U. S. G. S. 15 (Perry County, H. W. Hemple, 1931).—About 7 miles east of Perryville, in north central part of section 29, Salem Township, in north-west corner of Hager School yard, 1 foot south of board fence and orchard, 21 feet east of center line of road, and 174 feet north-northwest of northwest corner of schoolhouse. Station is primary traverse station and bench mark of United States Geological Survey, marked by capped iron pipe, projecting about 1 foot above surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in northeast corner of schoolyard, 3 feet south of board fence and orchard, 12 feet west of split-rail fence, and 33.47 meters (109.8 feet) from station in azimuth $270^{\circ}24'$. No. 2 is in southwest corner of the schoolyard, 1 foot north of split-rail fence, 20 feet east of center line of road, and 83.8 meters (275 feet) from station in azimuth $3^{\circ}53'$. Azimuth from station to spire of Salem Lutheran Church at Farrar is $293^{\circ}47'03''$, and to water tank at St. Marys Seminary at Perryville is $94^{\circ}56'29''$.

Degonia (Jackson County, Ill., H. W. Hemple, 1931).—In row of three stumps on crest of ridge, about $2\frac{1}{2}$ miles, airline, northeast of Cora City, 11 miles east-southeast of Chester, in central part of NW $\frac{1}{4}$ sec. 11, Degonia Township, near property line between farms of Harvey Clendenin and William Cluster, 2.5 meters (8 feet) north of tree line and property line, and 4 meters (13 feet) northeast of 14-inch stump. To reach from Cora City, go northeast across railroad to fork in road at bridge, take right fork before crossing bridge, proceed 0.8 mile, turn left, follow ridge road 2.2 miles, bear left onto main road 0.4 mile to forks at cemetery, follow right fork 0.5 mile to crossroad, turn left onto farm road, and go 0.1 mile to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 8 inches below surface. Reference mark is standard reference disk in concrete, note 11 (a), on property line, 2.5 meters (8 feet) (slope) north of farm road and 29.95 meters (98.3 feet) from station in azimuth $274^{\circ}45'$. Azimuth from station to church spire at Degonia, distant one-half mile, is $189^{\circ}27'15''$.

Dowl (Perry County, H. W. Hemple, 1931).—On highest point of high, round hill which is bare on north and wooded on south, about 6 miles, airline, north-west by north of Perryville, about $2\frac{1}{2}$ miles, airline, northeast by north of Brewer, in section 23, Saline Township, on land owned and occupied by Mark Dowl, and about 30 meters (98 feet) north of east-and-west wire fence. Surface and underground marks are probably standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are probably standard reference disks in concrete, note 11 (a). No. 1 is in east-and-west fence line, directly under power line which crosses knoll, and 75.46 meters (247.6 feet) from station in azimuth $293^{\circ}28'$. No. 2 is in east-and-west fence line, about 150 meters (492 feet) east of east end of yellow house, and 48.60 meters (159.4 feet) from

station in azimuth $51^{\circ}46'$. Azimuth from station to municipal water tank at Chester, Ill. is $211^{\circ}29'04''$.

Chester (Randolph County, Ill., H. W. Hemple, 1931).—One mile southeast of Chester, in SW $\frac{1}{4}$ sec. 19, Chester Township, on property line between farms of Rudolph Zang and Miss Clem Cole, 3.0 meters (10 feet) west of garden fence, 8.0 meters (26 feet) north of wire fence, 7.1 meters (23 feet) southeast of corner of the barn, and 40 meters (131 feet) southeast of Mr. Zang's house. To reach from Chester, turn southeast onto first street southwest of Royal Hotel, proceed 0.9 mile to point southeast of Mr. Zang's house, turn in toward house, pass through gate on south side of barn, and proceed to station site in lane back of barn. Surface and underground marks are standard station disks in concrete, note 1 (a) and 7 (a). Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 50 meters (164 feet) east of barn, 7 meters (23 feet) south by east of tree line east of garden, and 63.28 meters (224.0 feet) from station in azimuth $241^{\circ}50'$. No. 2 is on fence line 20 meters (66 feet) northeast of house, 14 meters (46 feet) west of barn, and 42.70 meters (140.1 feet) from station in azimuth $169^{\circ}07'$.

Scheltgen (Randolph County, Ill., H. W. Hemple, 1931).—Six and one-half miles, airline, northwest of Chester, one-fourth mile southwest of Oak Ridge schoolhouse, 3 miles south-southeast of Ellis Grove, in northern part of section 33, Ellis Grove Township, on land owned by Nick Scheltgen, 10 meters (33 feet) south of the center line of dirt road, 4.5 meters (15 feet) east of fence-line corner and prolongation of fence line, and 20 meters (66 feet) north of barn. To reach from Chester, go northwest, about $6\frac{1}{2}$ miles on paved Route 3 to road on left marked "Fort Kaskaskia", follow this road about one-fourth mile, turn left about 300 yards, and turn right about 200 yards to station site, near house on south side of road. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in grounds of Oak Ridge schoolhouse, 10 meters (33 feet) west of northwest corner of school, and approximately three-eighths mile from station in azimuth $203^{\circ}43'16''$. No. 2 is at fence line on north side of road, 4 meters (13 feet) north of dirt road, and 41.51 meters (136.2 feet) from station in azimuth $87^{\circ}32'$.

Geiler (Ste. Genevieve County, H. W. Hemple, 1931).—About 4 miles, airline, south of Ste. Genevieve, in extreme southwest corner of section 9, Ste. Genevieve Township, on small knoll about 200 meters (656 feet) east-northeast of Shady Grove School, 3 meters (10 feet) north of wire fence and plowed field, and about 80 meters (262 feet) southeast of road. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in southwest corner of first T-road leading west, 0.7 mile south of Shady Grove School, 15 feet south of oak tree, 35 feet west of the center line of Ozaro-Ste. Genevieve Road, and three-fourths mile from station in azimuth $359^{\circ}37'37''$. No. 2 is 2 feet north of 16-inch stump, 1 foot east of wire fence at gate, 20 feet east of center line of road, and 89.67 meters (294.2 feet) from station in azimuth $72^{\circ}27'$. Azimuth from station to water tank at St. Marys Seminary, Perryville, is $326^{\circ}07'54''$.

Moore (Randolph County, Ill., H. W. Hemple, 1931).—About $4\frac{1}{2}$ miles, airline, southwest by west of Evansville, about 5 miles, airline, east-southeast of Prairie du Rocher, and about $1\frac{1}{4}$ miles south by west of Marigold schoolhouse, on land owned by W. Emmet Moore, in southeast corner of cultivated field, 5.6 meters (18 feet) north of dirt road leading to Mr. Moore's house, 9.3 meters (31 feet) west of main dirt road, 10.1 meters (33 feet) north by west of double cherry tree, and 25.5 meters (84 feet) west one-half mile south of large apple tree. To reach from Evansville, go northwest 1.7 miles on Route 3 to road on left marked "Ste. Genevieve Ferry", follow this road to cross roads at Marigold schoolhouse, proceed south 1.3 miles to point where ferry road turns right, and keep straight ahead 250 yards to farm road leading to Mr. Moore's house. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 6 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 6 meters (20 feet) south of Ste. Genevieve Ferry Road, 14 meters (46 feet) west of St. Leo's Road and about one-fourth mile from station in azimuth $49^{\circ}47'48''$. No. 2 is 4 meters (13 feet) east of main dirt road, 1 meter (3 feet) west of fence line, 18 meters (59 feet)

north of large red barn, and 27.48 meters (90.2 feet) from station in azimuth $200^{\circ}29'$.

Wildner (Ste. Genevieve County, H. W. Hemple, 1931).—On southeast end of partially wooded hill, about $5\frac{1}{2}$ miles, airline, west-northwest of Ste. Genevieve, about 4 miles, air line, east of Bloomsdale, in northwest corner of section 15, Ste. Genevieve Township, on land owned by Charles Wildner of Ste. Genevieve, 176 feet north of where road forks on top of hill, and 26 feet west of center line of north-and-south road. To reach from Ste. Genevieve, follow main road 1.2 miles up Gabourl Creek, turn right at forks, proceed 5.3 miles, turn right onto dim wagon road leading to top of hill, take left fork near top of hill, and continue north to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 16 feet west of center line of dim wagon road which follows top of ridge and 121.8 meters (400 feet) from station in azimuth $199^{\circ}05'27''$. No. 2 is at edge of grove of trees east of station, 63 feet east of center line of the north-and-south road, 95 feet north of east-and-west road, and 32.61 meters (107.0 feet) from station in azimuth $297^{\circ}12'$.

Renault (Monroe County, Ill., H. W. Hemple, 1931).—On open and flat-topped hill, about 0.6 mile, airline, north of Renault, in NE $\frac{1}{4}$ sec. 30, T. 4 S., R. 9 W., on land owned by P. H. Bickelhaupt, 5.1 meters (17 feet) west of road leading north from Renault, and 233 feet north of driveway leading to house of William H. Weihe. To reach from Renault, take second turn to left north of post office, proceed 0.1 mile to fork, and follow right fork about one-half mile to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is on top of small bank, 3 meters (10 feet) south of driveway leading to Weihe's house, 4.5 meters (15 feet) east of main road, and 75.60 meters (248.0 feet) from station in azimuth $351^{\circ}37'$. No. 2 is on fence line west of station, 30 meters (98 feet) north of highest part of hill, and 128.22 meters (420.7 feet) from station in azimuth $102^{\circ}24'01''$. Spire in Renault is one-half mile from station in azimuth $359^{\circ}42'40''$.

Holst (Ste. Genevieve County, H. W. Hemple, 1931).—On westward of two equally high points on wooded hill, about 10 miles, air line, south-southeast of Crystal City, about 6 miles north-northwest of Bloomsdale, about on section lines of secs. 20 and 21, T. 39 N., R. 7 E., on land owned by John Holst, on highest part of knoll, and 9.45 meters (31.0 feet) north of road. To reach from Bloomsdale, go north 5.4 miles on Route 25 to dirt road leading east opposite large parcel-post tank on west side of road, follow this road 0.9 mile to fork, follow right fork 0.4 mile, and take dim road leading north to top of knoll and station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 21.3 meters (70 feet) south of road, and 30.96 meters (101.6 feet) from station in azimuth $342^{\circ}16'$. No. 2 is 10.36 meters (34.0 feet) north of road, and 22.31 meters (73.2 feet) from station in azimuth $80^{\circ}15'$.

Schilling (Monroe County, Ill., H. W. Hemple, 1931).—About $7\frac{1}{2}$ miles south-southwest of Waterloo, about 2 miles, airline, northwest of Maeystown, in NW $\frac{1}{4}$ sec. 34, T. 3 S., R. 10 W., on land owned and occupied by Henry Schilling, 7 meters (23 feet) east of most easterly tree of south row of orchard and on prolongation of south row of orchard, 11.9 meters (39 feet) south of tool barn, 12 meters (39 feet) west of road leading to the watering pool for stock, and 23 meters (75 feet) north by west of gate to water pool. To reach from Waterloo, go south 3.4 miles on Route 3 to gravel road to west, follow this road 2 miles to Burksville, continue straight ahead to south at crossroads, proceed 3.2 miles to another crossroad, go west 1.0 mile to crossroad, keep straight ahead 0.9 mile, go southwest 0.5 mile, then north 1 mile to Mr. Schilling's house. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 6 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at fence line by large walnut tree, about 8 feet west of road, 4 feet northeast of walnut tree, and one-fourth mile from station in azimuth $278^{\circ}36'07''$. No. 2 is at fence line of vegetable garden, 9 feet west of southeast corner of garden, and 46.53 meters (152.7 feet) from station in azimuth $162^{\circ}10'$.

Crystal (Jefferson County, H. W. Hemple, 1931).—On steep bluff overlooking Mississippi River, on northeastern end of Buck Knob, about 100 feet lower than highest part of knob, about $1\frac{1}{2}$ miles, airline, southeast of Crystal City, in NE $\frac{1}{4}$ sec. 9, T. 40 N., R. 6 E., and 23.07 meters (77.7 feet) southeast of southeast leg of massive steel tower of Union Power & Light Co., which suspends high power electric transmission line across the Mississippi River. To reach from junction of routes 25 and 61, go south 0.3 mile on Route 25, turn east onto T-road, proceed 0.5 mile to fork just east of railroad track, follow south fork 0.5 mile to ford across Platten Creek, continue 1.0 mile, turn left 0.7 mile to dim road bearing left and farm road straight ahead through gate and up steep pitch in pasture. Follow farm road around north end of knob to bluffs overlooking river. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Azimuth from station to final of water tank at Herculeaneum is $160^{\circ}20'17''$. Station *Crystal* (M.R.C.) (see description thereof) is distant 20.753 meters (68.09 feet) in azimuth $159^{\circ}23'$.

Rehling (Monroe County, Ill., H. W. Hemple, 1931).—About 8 miles south of west from Waterloo, one-half mile north of Route 156, on land owned by Mr. Rehling, on center line of lane passing through field, 54 meters (177 feet) south of fence line, and 116.7 meters (383 feet) west of east side of fence line of field. To reach from Waterloo, follow Route 156 about 7 miles to crosswoods just before descending hill (tall two-story house in southwest angle), turn north (right), proceed about 300 meters (984 feet) to gate on left, enter gate, and proceed to station site in field north of Rehling's house. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 8 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at fence line on north side of field, 1.8 meters (6 feet) east of cherry tree, 30 meters (98 feet) east of highest point of field, and 54.09 meters (177.5 feet) from station in azimuth $188^{\circ}31'$. No. 2 is on fence line, between fourth and fifth telephone poles on Mr. Rehling's property, 190 meters (623 feet) west of high-power electric line, and three-eighths mile from station in azimuth $305^{\circ}55'34''$.

Engle (Jefferson County, H. W. Hemple, 1931).—On high wooded hill, about 8 miles, airline, north by west of Festus, one-fourth mile north of head of Engle Creek, 20.7 meters (68 feet) northwest of center line of wagon road, and 17.37 meters (57.0 feet) northwest of 18-inch oak tree with triangular blazes on east and south sides. To reach from Festus, go toward Crystal City to junction of routes 61 and 67, go north 8.2 miles to bridge over Engle Creek, turn west just after crossing bridge onto dirt road under railroad trestle, keep right at fork on west side of railroad, proceed 1.1 miles to another fork, take right fork one-fourth mile to another fork, keep right fork 0.6 mile to top of ridge and triangular-blazed tree, double back sharply to right on dim road along crest of ridge, and follow 0.4 mile to highest ground and station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 25.73 meters (84.4 feet) from station in azimuth $168^{\circ}44'$. No. 2 is 28.80 meters (94.5 feet) from station in azimuth $76^{\circ}46'$. Azimuths from station to top of stack at Herculeaneum are: North edge, $327^{\circ}42'22''$; and south edge, $327^{\circ}44'58''$.

Johanna (Monroe County, Ill., H. W. Hemple, 1931).—In yard of the Johanna Church, about $4\frac{1}{2}$ miles, airline, west of Waterloo, in W $\frac{1}{2}$ sec. 29, T. 2 S., R. 10 W., 14 meters (46 feet) south of southwest corner of church, 16 meters (52 feet) southwest of southeast corner, and 17 meters (56 feet) north of south fork in road which forms south angle of triangle. To reach from Waterloo, go west 2.5 miles on Route 156 to dirt road on right marked "Camp Vandeventer 2 mi.", follow this road one-fourth mile to fork, take left fork 0.3 mile to another fork, keep left, and continue 1.8 miles to Johanna Church. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 1 foot south of fence, 5 meters (16 feet) north of road, 11 meters (36 feet) west of southeast corner of cemetery near church, and approximately 400 meters (1,312 feet) from station in azimuth $237^{\circ}13'10''$. No. 2 is about 1 foot south of southwest corner of church, and 14.06 meters (46.1 feet) from station in azimuth $145^{\circ}46'$. United States Geological Survey bench mark, brass capped pipe stamped "ILL" and "653 ft", is 1 foot east

of southeast corner of church, and 16.83 meters (55.2 feet) from station in azimuth $195^{\circ}36'$.

Four Ridge (Jefferson County, H. W. Hemple, 1931).—About 3 miles, airline, south of Rock Creek, about 6 miles, airline, west-southwest of Maxville, about one-half mile northeast of Four Ridge School, in NE $\frac{1}{4}$ sec. 8, T. 42 N., R. E., in old abandoned peach orchard owned by Mrs. Hodge, 58 meters (190 feet) east of center line of road leading to Four Ridge School, and about 400 meters (1,312 feet) southeast of large house and red barn. Surface and underground marks are standard station disks in concrete, 1 (a) and 7 (a). Reference marks are standard disks in concrete, note 11 (a). No. 1 is 10 feet south of center line of road at curve, and approximately 300 meters (984 feet) from station in azimuth $318^{\circ}00'19''$. No. 2 is 10 feet east of center line of road on edge of peach orchard, and 48.43 meters (158.9 feet) from station in azimuth $55^{\circ}15'$.

Yosti (St. Louis County, H. W. Hemple, 1931).—About 3 miles southeast of St. Charles, on south bank of Missouri River, on farm known as the Yosti estate, about three-fourths mile southwest of Westlake Amusement Park and roller coaster on United States Route 40, in cultivated field on summit of highest knoll in vicinity, about 100 yards north by east of large lone tree in field, and 52 meters (171 feet) west of dirt road passing along field. To reach from St. Charles, follow United States Route 40 across bridge and southeast 2.6 miles to dirt lane on left at two filling stations, go south on lane one-third mile, and turn right 50 yards to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 8 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 2 meters (7 feet) east of road, 6 meters (20 feet) north of fork in road, and 52.88 meters (173.5 feet) from station in azimuth $286^{\circ}38'$. No. 2 is at top of bank at edge of road, 60 feet west of house, 45 feet north of abrupt turn in road, and about one-fourth mile from station in azimuth $8^{\circ}33'34''$.

Orf (St. Charles County, H. W. Hemple, 1931).—About 3 $\frac{1}{2}$ miles southwest of O'Fallon, one-half mile northeast of Dardenne Church; on land owned by Ben Orf, of Josephville, and occupied by his son, in hog yard and orchard, about 160 meters (492 feet) north-northwest of house, 40 meters (131 feet) northwest of cattle barn, and 10 meters (33 feet) west of small water hole. To reach from O'Fallon, go west 2 miles on United States Route 40 to narrow gravel road leading south at sign "Dardenne", proceed south 2 $\frac{1}{2}$ miles to T-road, turn right (west), continue 0.4 mile to Orf's gate on north side of road near small barn, and proceed to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 1 foot east of wire fence, 3 feet south of wooden gate leading into pasture, 8 meters (26 feet) east of old barn in farmyard, about 53 meters (174 feet) north of center line of traveled road, and one-fourth mile from station in azimuth $46^{\circ}49'09''$. No. 2 is in split-rail fence line between orchard and cultivated field, about 37 meters (121 feet) east of intersection of split-rail and wire fences, and 33.97 meters (111.4 feet) from station in azimuth $168^{\circ}47'$.

Sancamper (Jersey County, Ill., H. W. Hemple, 1931).—About 4 miles northwest of Grafton, on land owned and occupied by George Sancamper, in cultivated ground on summit of highest knoll in vicinity, 74 meters (243 feet) northwest of wooded circular depression in field, 271.5 feet southwest of southwest corner of garden at rear of house, 120 yards southwest of house, 100 yards south of road, and in dividing line between oats field and corn field to west. To reach from Grafton, go west 2.5 miles up foot of bluffs to mouth of Graham Hollow, turn right up hollow, proceed 2.25 miles to fork on top of ridge, and go right (east) 0.7 mile to Sancamper's house on south side of road. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is on range with station and gap in heavily wooded hedge along field, at top of high bank on south side of east-and-west road, 115 meters (377 feet) west of north-and-south road, and $\frac{1}{4}$ mile from station in azimuth $254^{\circ}22'08''$. No. 2 is at hedge row along east-and-west road, 8 meters (26 feet), south of center of road, about 100 feet northwest of northwest corner of cultivated field, and 148.86 meters (488.4 feet) from station in azimuth $142^{\circ}40'37''$.

Palmer (Lincoln County, H. W. Hemple, 1931).—About $4\frac{1}{2}$ miles southwest of Winfield and $3\frac{1}{2}$ miles northwest of Old Monroe, on land owned by Paul Palmer, in northwest corner of house lot, 22 meters (72 feet) east and 6 meters (20 feet) south of northwest fence corner of yard, 17 meters (56 feet) north of northwest corner of chicken house, and about 50 meters (164 feet) northwest of northwest corner of main house. To reach from Ethlyn, go north 1.0 mile on gravel road to white schoolhouse, thence east 0.9 mile on gravel road to narrow gravel road leading north, proceed north 0.2 mile to wire leading to first house on left and opposite old house on right, follow lane west 200 yards to barn lot, pass through gate into southwest corner of house lot, and continue north 100 yards to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in wire fence line, 6 meters (20 feet) south of center line of road leading to station, 6 meters (20) feet east of center line of main-traveled road, and 146.3 meters (480 feet) from station in azimuth $310^{\circ}02'44''$. No. 2 is in northeast corner of hog lot, 8 meters (26 feet) south of center line of east-and-west gravel road, about 100 meters (328 feet) west of large yellow house and three-fourths mile from station in azimuth $67^{\circ}05'19''$.

Snider (Calhoun County, Ill., H. W. Hemple, 1931).—About $2\frac{1}{2}$ miles southwest of Hardin, on land owned and occupied by A. B. Snider, 35 yards northeast of house, 3 feet south of fence which divides lane leading to barn from orchard on west, 29.6 feet north of south fence along lane, 14.7 feet north of center line of lane, and 23 meters (75 feet) east of sharp turn in road at Snider's house. To reach from courthouse at Hardin, go west 1.7 miles to top of steep hill, turn left (south), proceed 0.9 mile on dirt road to fork at yellow house, follow left fork 0.1 mile, and take right fork 0.2 mile to Snider's house. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in southeast corner of garden east of Snider's house, 1 foot northwest of southeast corner post, and 42.37 meters (139.0 feet) from station in azimuth $333^{\circ}24'$. No. 2 is 5 meters (16 feet) west of sharp turn in dirt road, and 155.84 meters (511.3 feet) from station in azimuth $86^{\circ}27'36''$.

Sealock (Lincoln County, H. W. Hemple, 1931).—On highest part of prominent ridge about 5 miles southwest of Elsberry on land owned and occupied by William Sealock, about 200 meters (656 feet) southwest of old dilapidated house (once used as a hunting lodge), in old brushy fence line dividing old orchard on south from abandoned field on north. To reach from Elsberry, follow Newhope Road 0.4 mile to point just west of small bridge where a road turns south, proceed south (keep straight ahead at 0.4 mile) 6.8 miles to point where main road swings west and dirt road continues straight ahead, follow dirt road southeast about three-fourths mile to Sealock's mail box and gate on left, pass through gate, follow wagon road to top of ridge, and go right about 200 meters (656 feet) along top of ridge to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is just off brushy fence line, and 27.13 meters (89.0 feet) from station in azimuth $267^{\circ}15'$. No. 2 is on high part of ridge, about 100 meters (328 feet) northwest of road where it turns east, and approximately one-fourth mile from station in azimuth $149^{\circ}27'16''$.

Gress (Calhoun County, Ill., H. W. Hemple, 1931).—About 4 miles northwest of Hardin, on land owned and occupied by Val Gress, 60 yards south of T-intersection of roads, 28 yards south of mail boxes, and 25 feet southeast of steep bank of north-and-south road, in fence line between orchard on northeast and apex of V-shaped pasture in ravine on southwest. To reach from Hardin, go north 2.75 miles to mouth of De Gerlia Hollow, follow gravel road west 2.9 miles up hollow to dirt road entering from south on top of ridge, go south 30 yards to three mail boxes, and continue south across corner of orchard to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at northeast corner of orchard, 28 feet south of center of triangle formed by three roads, on edge of road, on top of small bank, and 83.40 meters (273.6 feet) from station in azimuth $239^{\circ}56'$. No. 2 is 2 feet east of edge of bank, 15 feet east of center line of road, on point of inter-

section of west edges of roads to north and southwest, and one-fourth mile from station in azimuth $351^{\circ}52'25''$.

Annada (Pike County, H. W. Hemple, 1931).—On high and prominent rocky bluff overlooking river bottom known as "Saltpetrer Bluff", about 7 miles north of Elsberry, one-half mile south of Annada, on land owned by Mrs. Richards, on extreme end of bluff which is covered with hardwood about 50 feet in height. To reach from post office at Annada, go west 0.5 mile on gravel Paynesville road to crossroads, go south on dirt road one-fourth mile to ford, cross ford, turn left onto dirt lane, and continue east and south three-fourths mile to its end at A. E. Howdeshell's house, at end of truck travel. Follow farm road south about one-half mile up steep grade to field on top of ridge, and continue east along crest of ridge about one-half mile to station site. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Reference mark is standard reference disk in concrete, note 11 (a), 7 feet southwest of 12-inch maple tree, and 35.05 meters (115.0 feet) from station in azimuth $155^{\circ}22'$. Station *Saltpetrer* (M.R.C.) (see description thereof) is 39.46 meters (129.5 feet) from station in azimuth $274^{\circ}40'$.

Freesmeyer (Calhoun County, Ill., H. W. Hemple, 1931).—About 5 miles northwest of Kampsville, on land owned and occupied by R. Freesmeyer, 60 yards north of his house which stands on the highest ground in the vicinity, 4.7 meters (15 feet) southeast of southeast corner of small brick shop, 4.6 meters (15 feet) north of old windmill, 6.4 meters (21 feet) east of well, and 3.1 meters (10 feet) west of board fence, in northeast corner of barn lot. To reach from Kampsville, go west 2.9 miles on Boytown road to Bess Garage at top of grade, turn right and follow dirt road north 0.4 mile, turn left, proceed 2.1 miles to fork in creek bottom, keep right (northwest) 1.9 miles to T-road, proceed left 0.1 mile to gate on south opposite brown house, and follow lane southwest from gate 0.3 mile to Freesmeyer's house. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at southwest corner of chicken coop, 10 meters (33 feet) north of north orchard row, about 70 yards northwest of Mr. Freesmeyer's house, and 38.61 meters (126.7 feet) from station in azimuth $61^{\circ}20'$. No. 2 is in extreme northwest corner of cultivated field, 3 meters (10 feet) west of road passing along fence line, and 150.0 meters (492 feet) from station in azimuth $161^{\circ}59'03''$.

La Rue (Pike County, H. W. Hemple, 1931).—On highest point of high bluff overlooking Mississippi River known locally as "Pinnacle Peak", about 9 miles southeast of Louisiana, and 1 mile northwest of Clarksville, on land owned by H. C. La Rue, of Clarksville. Top of bluff is covered with brush and some small timber. To reach from Clarksville, go west 3 blocks from river front on Main Street, north 2 blocks, west one-third mile to board gate on north at foot of hill, pass through gate, follow old road 150 yards to small house occupied by Mr. Davis, continue through orchard, follow old quarry road to summit at saddle in ridge, and follow right up slope 150 yards to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference mark is standard reference disk in concrete, note 11 (a), 3 meters (10 feet) southeast of 30-inch oak tree which has dead broken-off limbs on lower section, and 21.27 meters (69.8 feet) from station in azimuth $113^{\circ}23'$.

Long (Pike County, Ill., H. W. Hemple, 1931).—On highest point of very steep hill which is thinly timbered and has been partly logged off, 2 miles east of north of Pleasant Hill, and on land owned by John Long and occupied by J. V. Harpole. To reach from Pleasant Hill, turn north at dummy and follow gravel and dirt road north 2.1 miles to crossroads just south of creek ford, turn east onto dirt road, follow 0.7 mile to Harpole's house (small white house on south side of road), pass south through gate 50 yards east of house into corner of pasture, and continue in southerly direction up steep slope 300 yards to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in fence line on south side of road, 9 meters (30 feet) south of center line of road, 60 yards southeast of George Gallaway's house, 40 yards south by west of concrete hog barn, and

three-fourths mile from station in azimuth $201^{\circ}24'25''$. No. 2 is on top of ridge, on north edge of lane passing along ridge, and 37.75 meters (123.9 feet) from station in azimuth $291^{\circ}17'$.

Louisiana (Pike County, H. W. Hemple, 1931).—About $1\frac{1}{2}$ miles northwest of Louisiana, on south side of Frankford Pike, on land owned by Mrs. Nora Henderson of Louisiana, on hill about one-half mile directly west of Keller limestone quarries, 116 meters (381 feet) north of gas pipe-line where this line crosses road on top of this hill, 20 meters (66 feet) northwest of tree with triple trunk which is directly west of the road, and 21 meters (69 feet) west of center line of road. Surface and underground marks are standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Reference marks are standard reference disks in concrete, note 11 (*a*). No. 1 is at edge of cluster of trees, 54.8 meters (180 feet) from station in azimuth $198^{\circ}02'$. No. 2 is at fence line on east side of Frankford Pike, 50 meters (164 feet) south of where gas pipe-line crosses pike, 5 meters (16 feet) south of wooden gate, 10 meters (33 feet) east of center line of pike, and approximately three-eighths mile from station in azimuth $300^{\circ}07'59''$. Finial of lookout tower on hill near Keller quarries is one-half mile from station in azimuth $282^{\circ}50'25''$.

Shinn (Pike County, Ill., H. W. Hemple, 1931).—About 11 miles northeast of Louisiana, Mo., 1 mile north of Summer Hill, on land owned and occupied by Charles Shinn, 3.1 meters (10 feet) south of south fence, 10.8 meters (35 feet) south of center of road, 30 yards south of Mr. Walker's house, 19.8 meters (65 feet) south by east of large tree in southwest corner of Walker's yard, and 6 feet east of prolongation of west side of house, in cleared, uncultivated field. To reach from Carlton's store in Summer Hill, go north 1.2 miles on route 54 to gravel road leading west, and go west 0.2 mile to Walker's small white house on north and station site on south side of road. Surface and underground marks are standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Upper mark is 8 inches below surface. Reference marks are standard reference disks in concrete, note 11 (*a*). No. 1 is on fence line, on east side of route 54, about 15 paces south of road which leads from pavement to the station, and one-fourth mile from station in azimuth $274^{\circ}34'19''$. No. 2 is in fence line, 8 meters (26 feet) north of road, 6 meters (20 feet) west of driveway leading to Walker's house, about 2 feet west of southeast corner of his orchard, and 23.70 meters (77.8 feet) from station in azimuth $141^{\circ}37'$.

Ashburn (Pike County, H. W. Hemple, 1931).—On high and prominent bluff, about 8 miles north-northwest of Louisiana, about one-fourth mile southwest of Ashburn, on land owned by Marion Williams, in woods and brush on highest point of bluff, 3 meters (10 feet) west of north-and-south wire fence running over hill between woods and cleared field used as pasture, and 9 meters (30 feet) west of 16-inch black walnut tree on top of ridge in pasture. To reach from Louisiana, follow Frankford Pike 6.4 miles to Fairview Church, go north 2.3 miles on gravel road (keep straight ahead 1.2 miles) to fork. keep right on gravel road 3.5 miles to board gate on right (north) side of road, which is 0.1 mile beyond right-angle turn to left, follow dirt lane north from gatepost house, through gates and up bluff along old wagon road to top of ridge in open pasture, and continue west and south on old road through pasture to west end of clearing and station site. Surface and underground marks are standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Reference marks are standard reference disks in concrete, note 11 (*a*). No. 1 is in pasture, 1 meter (3 feet) east of north-and-south wire fence, and 72.70 meters (238.5 feet) from station in azimuth $264^{\circ}58'$. No. 2 is in pasture, on small rocky mound with scattered trees, and 27.90 meters (91.5 feet) from station in azimuth $352^{\circ}46'$.

El Dara (Pike County, Ill., H. W. Hemple, 1931).—Five miles south of Barry, 1.8 miles west of El Dara, on land owned by Denny Lyons, on highest point in barnyard, 24.5 feet south of north fence of barnyard, 73.5 feet north of large barn, 28.0 feet southwest of gate leading to lane and fields, and 32.0 feet west of corncrib. To reach from El Dara, go west via Main Street 1.8 miles to farmhouse, turn north into entrance and continue to station site in barnyard. Surface and underground marks are standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Upper mark is flush with ground. Reference marks are standard reference disks in concrete, note 11 (*a*). No. 1 is on top of small bank on north side of road, on tree line and 21 meters (69 feet) west of two large trees, 7 meters (23 feet) north of gravel road, 39 meters (128 feet) west

of west fence of hog yard, 3 meters (10 feet) south of cultivated field, and one-half mile from station in azimuth $287^{\circ}52'34''$. No. 2 is in northwest corner of cultivated patch 41 meters (135 feet) west of large barn, and 53.61 meters (175.9 feet) from station in azimuth $66^{\circ}16'$.

Gibbs (Ralls County, H. W. Hemple, 1931).—About 3 miles west of Busch, 4 miles southeast of Saverton, on land owned by Mrs. H. C. Gibbs of Curryville, in woods on highest point of hill, 8 meters (26 feet) east of old cart road leading to station, and 40 meters (131 feet) north of gate with two large gateposts which is in fence line between pasture and woods. To reach from Busch, go west about 2.7 miles to gate on right which is about 200 meters (656 feet) beyond small concrete bridge and continue up hill, go through gate and pass Mr. Snell's house on right, continue through pasture on old wagon road around hill to top, and proceed north to gate on right side of road. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is on slight knoll in pasture, 70 meters (230 feet) west of and in Y-intersection of roads, 20 meters (66 feet) north of south road, 20 meters (66 feet) south of north road, and one-fourth mile from station in azimuth $26^{\circ}51'22''$. No. 2 is in woods about 15 meters (49 feet) north of old wagon road, and 27.34 meters (89.7 feet) from station in azimuth $165^{\circ}09'$.

Kuhlman (Pike County, Ill., H. W. Hemple, 1931).—Five miles northwest of Barry, 3 miles northeast of Kinderhook, on land owned and occupied by Mr. Harry Kuhlman, in southwest corner of barnyard, 20.0 feet east of large barn, 23.0 feet west of corner, 12.7 feet north of fence, and 14 yards south of road passing through barnyard. To reach from Barry, go 4.6 miles toward Kinderhook on U.S. Route 36 to gravel road on right, follow this road 0.3 mile to fork, keep left 1.5 miles to Mr. Kuhlman's house, and turn right to barnyard and station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in southwest corner of garden, 1 foot from corner fence post, and 69.95 meters (229.5 feet) from station in azimuth $43^{\circ}02'$. No. 2 is at fence line, 6 meters (20 feet) west of center line of gravel road, 115 yards south of T-intersection in roads, and one-half mile from station in azimuth $173^{\circ}05'27''$.

Hannibal (Marion County, H. W. Hemple, 1931).—About $1\frac{1}{2}$ miles northwest of business district of Hannibal, in the rough just off links in northeast part of Hannibal Country Club golf course, 8.8 meters (29 feet) south of south curb of Palmyra Road, and 57 meters (187 feet) west of intersection of Country Club Drive and Palmyra Road. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in curb on north side of Palmyra Road, 19.5 meters (64 feet) west of Country Club Drive, and 36.58 meters (120.0 feet) from station in azimuth $275^{\circ}30'$. No. 2 is in curb on north side of Palmyra Road, 9 meters (30 feet) east of east side of gate into V. V. Jones' place, and 28.04 meters (92.0 feet) from station in azimuth $157^{\circ}22'$.

Payson (Adams County, Ill., H. W. Hemple, 1931).—About 1 mile northwest of Payson, on land owned and occupied by C. A. Scott, in southeast corner of house lot, in north-and-south fence line, 8 meters (26 feet) north of corner of wire fence, 6 meters (20 feet) west of center line of lane leading to house, 17 meters (56 feet) north of dirt road leading from State Route 36, and about 75 meters (246 feet) southeast of Mr. Scott's house. To reach from Payson, go 1.3 miles on Route 36 to point where dirt road turns out on right and doubles back toward Payson, follow this road 0.3 mile to lane on left, and follow to large 2-story house with large lawn and grove of trees. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in northwest corner of cultivated field, 10 meters (33 feet) southwest of center line of dirt road, 7 meters (23 feet) east of dim road running between dirt road and Route 36, and 43.89 meters (144.0 feet) from station in azimuth $344^{\circ}07'$. No. 2 is 8 meters (26 feet) north of center line of Route 36, 1 foot east of State right-of-way post, 3 meters (10 feet) west of telephone post, 20 meters (66 feet) north of "Curve" sign on south side of highway, and one-fourth mile from station in azimuth $101^{\circ}46'57''$. Azimuth from station to church spire at Payson is $321^{\circ}00'03''$.

Heather (Marion County, H. W. Hemple, 1931).—About 5 miles east of Palmyra, 6 miles northwest of Hannibal, on land owned by the Bier estate, on highest part of ridge just north of fork in meadow land (part running east and part running southeast). To reach from Hannibal, follow bluff road northwest to fork which is 0.9 mile beyond Helton station on Chicago, Burlington & Quincy Railroad, follow fork up hollow 0.6 mile, continue on old wagon road which leads up draw to north, and continue to top of ridge and station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 9 inches below surface. Station *Heather* (*M.R.C.*) (see description thereof) is 111.454 meters (365.66 feet) from station in azimuth $274^{\circ}07'02''$. Azimuth from station to finial on dome of courthouse in Quincy is $189^{\circ}20'30''$.

St. Michael (Adams County, Ill., H. W. Hemple, 1931).—Four miles northeast of Quincy, on grounds of St. Michael School, in southeast corner of school yard, 19 feet west of east fence, 19 feet north of toilet, 21 feet south of garage, and about 50 yards south of schoolhouse. To reach from courthouse at Quincy, go east on Broadway to intersection with route 105, continue straight ahead 2.1 miles, follow gravel road on left 0.3 mile, turn right, and continue 1.9 miles to right turn at school. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in northeast corner of school yard, 21 meters (69 feet) northeast of northeast corner of school, 5 meters (16 feet) south of hedge, 16 meters (52 feet) south of east-and-west dirt road in front of school, and 61.417 meters (201.50 feet) from station in azimuth $185^{\circ}16'$. No. 2 is near corner of wire fence, 17 meters (56 feet) southwest of intersection of two gravel roads, and one-fourth mile from station in azimuth $107^{\circ}05'19''$. Azimuth from station to Catholic Church spire in Quincy is $74^{\circ}08'04''$; and to municipal water tank in Quincy is $76^{\circ}27'49''$.

Schroeder (Marion County, H. W. Hemple, 1931).—Eight and one-half miles north of Palmyra, $1\frac{1}{2}$ miles southwest of Taylor, on land owned by B. W. Schroeder, 9 meters (30 feet) east of center line of north-and-south dirt road which passes station, and 140 meters (459 feet) north of intersection of dirt road with route 6. To reach from Taylor, turn west off route 61 onto gravel road just south of bridge, proceed 2.0 miles to dirt road on left, and follow this road 0.6 mile to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 9 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at fence line, 14 meters (46 feet) south of center line of route 6, 13 meters (43 feet) west of center line of dirt road leading south from main highway, and approximately one-half mile from station in azimuth $101^{\circ}13'59''$. No. 2 is 15 meters (49 feet) south of the center line of route 6, 18 meters (59 feet) east-southeast of intersection of route 6 and dirt road which passes station, and 159.0 meters (522 feet) from station in azimuth $351^{\circ}10'26''$. Azimuth from station to courthouse at Quincy, Ill., is $261^{\circ}29'27''$.

Miller (Adams County, Ill., H. W. Hemple, 1931; 1933).—Twelve miles northeast of Quincy, 3 miles northeast of Ursa, on land owned and occupied by Henry J. Miller, 50 yards south of house, 6.6 meters (22 feet) east of road leading to house, 12.7 meters (42 feet) east of west fence, 26.9 meters (88 feet) west of east fence, and 23.30 meters (76.4 feet) south of 16-inch pine tree outside lawn. To reach from Ursa, go northeast 3.0 miles on Route 36 to lane leading north which is 0.4 mile east of school at crossroads, and follow lane north across railroad about 200 yards to house and large barns on top of hill. Tall pointed pine tree is conspicuous object in front of house. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 8 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in northwest corner of school yard, 8 meters (26 feet) south of concrete pavement, 8 meters (26 feet) east of north-south gravel road, 60 meters (197 feet) northwest of schoolhouse and one-half mile from station in azimuth $74^{\circ}06'48''$. No. 2 is in southwest corner of lawn in front of house, 4 meters (13 feet) east of road, 17 meters (56 feet) southwest of southwest corner of house, 2 meters (7 feet) south of 16-inch maple tree, 18 meters (59 feet) west of large fir tree, and 30.52 meters (100.1 feet) from station is azimuth $168^{\circ}58'$. Chimney of brick school at Mendon is 1 mile from station in azimuth $274^{\circ}34'40'$.

La Grange (Lewis County, H. W. Hemple, 1931; 1933).—On gravel road which runs east and west and which if continued east would pass the bell tower of La Grange College, 0.3 mile northwest of La Grange, on land owned by C. O. Crouch, in barnyard of Crouch's farm, 15 meters (49 feet) north of center line of gravel road, 20 meters (66 feet) southwest of southwest corner of large red barn, 13 meters (43 feet) west of west side of gate leading into barnyard, and 12 meters (39 feet) east of pump in barnyard. To reach from La Grange, go west 0.35 mile from Route 61 at post-office corner, turn north 0.35 mile and west 0.5 mile to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in fence line between barnyard and lawn about house, 16.6 meters (54 feet) north of south fence line, 15.8 meters (52 feet) east of southeast corner of brick farmhouse, and 22.34 meters (73.3 feet) from station in azimuth 122°19'. No. 2 is in southeast corner of barnyard, 13.4 meters (44 feet) north of center line of road, 12.8 meters (42 feet) east of gate leading into farmyard, and 28.46 meters (93.4 feet) from station in azimuth 230°12'. Municipal standpipe at La Grange is 558.2 meters (1,831 feet) from station in azimuth 303°04'59''.

Hufendick (Hancock County, Ill., H. W. Hemple, 1931, 1933).—About 4½ miles northeast of Lima, 2 miles north of Tloga, on land owned by August Hufendick, 80 meters (262 feet) north of John Hufendick's house, 47 feet south of north apex of small triangular pasture west of road, 28 feet west of road, and 8 meters (26 feet) north of 24-inch elm tree, on east side of fence between pasture and woods on west belonging to the Ewing estate. To reach from Tloga, follow dirt road north 2.0 miles direct to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 14 meters (46 feet) east of dirt road, 5 meters (16 feet) east of fence corner, 1 foot south of east-west fence, and 22.92 meters (75.2 feet) from station in azimuth 226°07'. No. 2 is in extreme southwest corner of triangular pasture, 1 foot east of fence corner post, 6 meters (20 feet) north of driveway leading to house, 47 meters (154 feet) west of main dirt road, and 55.01 meters (180.5 feet) from station in azimuth 4°38'.

Finway (Lewis County, H. W. Hemple, 1931).—About 3 miles north-northwest of Canton, on land owned by Mrs. H. M. Long who lives on Route 61 about opposite station, at second fence line beyond farmhouse, just west of sink hole, north of wagon road, 4.1 meters (13 feet) east of fence line, and 9¼ meters (32 feet) north of gate in this fence. To reach from Canton, go north on Route 61, 5.8 miles from where highway turns north from main street of town, to dirt road up hill to west, proceed west 1.3 miles to gate of farmyard, pass through yard, and continue west along wagon road to second fence line beyond farmhouse. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 12 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at fence line leading north and south past west edge of farmyard, 30 meters (98 feet) north of southeast corner of field, 25 meters (82 feet) south of wooden gate, and 0.3 mile from station in azimuth 315°52'02''. No. 2 is at fence line, 13 meters (43 feet) south of gate, and 207 meters (679 feet) from station in azimuth 86°06'. Obelisk-shaped tombstone of John White, in cemetery northeast of farmhouse, is approximately 0.3 mile from station in azimuth 233°19'56''.

Wilcox (Hancock County, Ill., H. W. Hemple, 1931).—At Wilcox town hall, about 3 miles southeast of Warsaw, in northeast corner of yard in front of hall, 14.7 meters (48 feet) east of hall, 14.7 meters (48 feet) west of main dirt road, 6 meters (20 feet) south of fence, 3.3 meters (11 feet) west of hedge, and 6.55 meters (21.5 feet) southwest of northeast corner post of fence. To reach from Warsaw, follow Route 96 east to second street east of water tank, turn south, and follow main traveled road southeast 3.2 miles to station site. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is flush with surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in line with telephone poles, 1 foot west of fence, 2 feet north of corner post of field, 11 meters (36 feet) east of main dirt road, and 33.68 meters (110.5 feet) from station in azimuth 211°18'. No. 2 is in fence line on north side of east-west road, 10 meters (33 feet) north of road, 49 meters (161 feet) west of driveway leading to Mr. Mitze's farm, and one-fourth mile from station in azimuth 299°54'41''.

Dukes (Clarke County, Iowa, H. W. Hemple, 1931).—About 13 miles southwest of Keokuk, Iowa, 5 miles south of Wayland, on land owned and occupied by Mrs. Dorothy Dukes, in small odd lot directly east of old house now used as chicken house, 12 meters (39 feet) west of center line of dirt road, and $16\frac{3}{4}$ meters (55 feet) south-southwest of red gate leading into Dukes farmyard. To reach from Wayland, go south 3.3 miles on route 61 or 0.3 mile beyond Sugar Creek bridge, turn west 1.8 miles on dirt road, and south one-third mile to station site. Surface and underground marks are standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Reference marks are standard reference disks in concrete, note 11 (*a*). No. 1 is about 2 feet southwest of northeast corner of hedge line, 10 meters (33 feet) southwest of intersection of center lines of crossroads, and approximately one-third mile from station in azimuth $180^{\circ}58'20''$. No. 2 is at fence line, 7 meters (23 feet) east of center line of road, and 25.02 meters (82.1 feet) from station in azimuth $315^{\circ}17'$.

Hamilton (Hancock County, Ill., H. W. Hemple, 1931).—About $1\frac{1}{2}$ miles east of bridge, in Hamilton, on grounds of Oakwood School, in west side of schoolyard, 39.1 meters (128 feet) east-northeast of southeast corner of schoolhouse, 12.2 meters (40 feet) west of center line of north-and-south gravel road, 38 meters (125 feet) north of center line of east-and-west gravel road, and 30.5 meters (100 feet) north of hydrant on west side of road, in northwest corner of T-intersection of roads. Surface and underground marks are standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Reference marks are standard reference disks in concrete, note 11 (*a*). No. 1 is about 35 meters (115 feet) west of northwest corner of stone house, 1 foot west of wire fence at southwest corner of pasture, 1 meter (3 feet) east of electric line pole, 7 meters (23 feet) east of center line of main gravel road, about 4 meters (13 feet) north of road leading to stone house, and one-third mile from station in azimuth $185^{\circ}44'16''$. No. 2 is in concrete walk at southeast corner of Oakwood School, 8 inches north and 4 inches east of corner, and 39.04 meters (128.1 feet) from station in azimuth $69^{\circ}15'$. Water tank at Hamilton is one-third mile from station in azimuth $51^{\circ}29'00''$.

Montrose (Lee County, Iowa, H. W. Hemple, 1931).—In triangular park formed by intersections of Routes 61 and 161, $8\frac{1}{2}$ miles north-northwest of Keokuk, $1\frac{1}{2}$ miles southwest of Montrose, on property owned by State highway department, 14.9 meters (49 feet) southeast of center line of pavement on northwest side of triangle, 14.8 meters (49 feet) west of center line of Route 61, and 37.8 meters (124 feet) south of intersection of highways at northeast corner of triangle. Surface and underground marks are standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Reference marks are standard reference disks in concrete, note 11 (*a*). No. 1 is in southwest corner of field, 10 meters (33 feet) east of center line of Route 61, 15 meters (49 feet) north of center line of east-and-west road, and approximately one-half mile from station in azimuth $345^{\circ}37'43''$. No. 2 is in western corner of triangular park, 13.7 meters (45 feet) north of center line of pavement forming southwest side of triangle, 11.3 meters (37 feet) south of pavement forming northwest side of triangle, 37.5 meters (123 feet) east of intersection of pavements, and 78.42 meters (257.3 feet) from station in azimuth $86^{\circ}42'$. Azimuth from station to spire of Catholic Church at Nauvoo, Ill., is $230^{\circ}43'40''$.

Hosford (Hancock County, Ill., H. W. Hemple, 1931).—Four miles east and $4\frac{1}{2}$ miles north of Hamilton, on estate in charge of Ed. Hosford of Hamilton, 30 meters (98 feet) north of vacant house, 11 meters (36 feet) west of grape arbor, 23 meters (75 feet) west of north of clump of walnut trees in front yard, east of row of pine trees, 19.8 meters (65 feet) west of lane to house, 20.4 meters (67 feet) south of hedge on south side of road, and 26 meters (85 feet) south of dirt road. To reach from Hamilton, go east 3.0 miles on route 96 from water tank to section crossroads, turn north 4.5 miles on dirt road to another crossroads, and west 0.2 mile to station site. Surface and underground marks are standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Reference marks are standard reference disks in concrete, note 11 (*a*). No. 1 is at hedge fence 12 meters (39 feet) south of northeast corner post of field, 21 meters (69 feet) south of east-west section-line road, 12 meters (39 feet) west of north-south section-line road, and one-fourth mile from station in azimuth $289^{\circ}53'42''$. No. 2 is at hedge fence line, 34 meters (112 feet) west of lane

leading to house, 7 meters (23 feet) south of section-line road, 2 meters (7 feet) west of prolongation of row of pine trees, and 27.91 meters (91.6 feet) from station in azimuth $136^{\circ}23'$.

Supplementary point

Ste. Genevieve Catholic Church spire (M.R.C.) (Ste. Genevieve County, Mississippi River Commission, 1899; H. W. Hemple, 1931).—Center of spire and cross of the cathedral at Ste. Genevieve, Mo.

MISSISSIPPI RIVER ARC, SECOND-ORDER TRIANGULATION

Principal points

P.B.M. Wickliffe (M.R.C.) (Ballard County, Ky., Mississippi River Commission, 1906, H. W. Hemple, 1929).—Located in town of Wickliffe, in northwest corner of yard of J. C. Du Poyster, one block west of corner of Second and Cumberland Streets, 80 meters (262 feet) northwest of house, near end of spur ridge extending west from main bluff, and 30 meters (98 feet) east of top of Illinois Central Railroad cut through ridge. Cut is about 30 feet deep, is first one north of the railroad station, and is about 150 yards south of block signal no. 3692. Marked by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper bolt in tile below, as described in note 16. Pipe projects 18 inches above surface of ground. Station *Wickliffe* (see description thereof) is 451.55 meters (1,481.5 feet) from station in azimuth $236^{\circ}47'14''$.

Bird Point (Mississippi County, H. W. Hemple, 1929).—On west bank of Mississippi River, on Birds Point. Station mark was standard disk station mark in concrete, note 1 (a). Station *Birds Point School (M.R.C.)* (see description thereof) was 6.79 meters (22.3 feet) from station in azimuth $147^{\circ}54'$. Station destroyed in 1931 by levee construction. Station *B.M. Bird Point 2 (U.S.E.)* (see description thereof) was established within one-tenth foot of original position after completion of new levee.

Birds Point School (M.R.C.) (Mississippi County, Mississippi River Commission, 1906, H. W. Hemple, 1929).—On right bank (west) of Mississippi River, in northwest corner of Birds Point School yard, 2 meters (7 feet) below dirt road alongside school yard, 2.7 meters (9 feet) east of west fence, 2.9 meters (10 feet) south of north fence, and about 33 meters (108 feet) northwest of cistern in northeast corner of yard. School is white frame structure about one-fourth mile east of where United States Route 60 crosses levee at Birds Point Landing. Marked by standard mark of Mississippi River Commission, a brass cap on steel pipe above and copper bolt in tile below, as described in note 16. Pipe projects 12 inches above surface of ground. Station *Bird Point* (see description thereof) is 6.79 meters (22.3 feet) from station in azimuth $327^{\circ}54'$.

B. M. Bird Point 2 (U.S.E.) (Mississippi County, U.S. Engineers, 1931).—On right bank of Mississippi River, on Birds Point, three-fourths mile southwest of Missouri end of highway bridge over Mississippi River at Cairo, Ill., 250 feet east of intersection of combined Routes 51 and 60, on bridge-approach fill, and Kentucky ferry road, about 150 feet south of Kentucky ferry road, and on projecting point which juts out into levee borrow pit. Station is within one-tenth foot of position of station *Bird Point* (see description thereof) which was destroyed by levee construction. Marked by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper bolt in tile below, as described in note 16. *B.M. B.P. 36 (U.S.E.)* is standard mark of Mississippi River Commission, note 16, about 25 feet north of center line of Kentucky ferry road, 500 feet east of intersection of this road and Route 60 where Route 60 leaves bridge-approach fill, 4 feet north of east-and-west fence, 8 feet east of fence corner, approximately 40 feet south of old gravel road which parallels Kentucky ferry road, 8 feet east of 14-inch ash, and 244.15 feet from station in azimuth $73^{\circ}04'$. In 1934 top of pipe projected 6 inches above ground. *B.M. B.P. 37 (U.S.E.)*, a standard mark of Mississippi River Commission, note 16, is about one-half mile southwest of Cairo bridge, 40 feet north of center line of old gravel road, 10 feet west of north-and-south fence, about 300 feet northwest of white house, about 500 feet west of barn back of house, about 600 feet back of new levee, and 840.95 feet from station in azimuth $260^{\circ}21'17''$.

P.B.M. 10 = 4/2 (M.R.C.) (Hickman County, Ky., Mississippi River Commission, 1906, C. M. Thomas, 1930).—On left bank of Mississippi River, on Chalk Bluff, $2\frac{1}{2}$ miles below Columbus, on slope of bluff between road and river, on south slope of prominent ravine, 46 meters (151 feet) west of road, 150 meters (492 feet) from river, and 6 meters (20 feet) north of old east-and-west fence line of which only a few posts remain. Marked by stone post which is chipped around top, and stands 8 inches above surface of ground. Distances and azimuths from station to various blazed trees are as follows: 2-inch elm, 7 meters (23 feet), 45° ; 20-inch walnut, 8 meters (26 feet), 142° ; 30-inch elm, about 8 meters (26 feet) north; and 4-inch thorn, 5 meters (16 feet), 249° .

P.B.M. 17/4 (M.R.C.) (New Madrid County, Mississippi River Commission, 1906, H. W. Hemple, 1929).—About 0.60 mile west of railroad station at New Madrid, 950 meters (3,117 feet) back from river bank, 44 paces west of center line of United States Route 61, on track of St. Louis Southwestern Railway, between rails, 12 inches north of south rail, and 86 rail-lengths west of first cattle-guard west of New Madrid railway station. Marked by a stone post with top partly broken off. Station *Madrid* (see description thereof) is 1,185.44 meters (3,889.2 feet) from station in azimuth $40^\circ 33' 04''$.

P.B.M. 21/1 (M.R.C.) (Lake County, Tenn., Mississippi River Commission, 1906, H. W. Hemple, 1929).—In cultivated field owned by Harry Tipton, about one-fourth mile north of Tiptonville, about 350 meters (1,148 feet) back of river bank, 36 meters (118 feet) east of gravel road leading due north from Tiptonville toward Slough Landing, 50 meters (164 feet) south of drain ditch crossing this road at right angles, 60 meters (197 feet) southeast of concrete bridge over ditch, 50.5 meters (166 feet) south of center of old road which leads east past schoolhouse and was former location of old tramway to Keystone Mill on Reelfoot Lake, and 90 meters (295 feet) southwest of former junction of roads where line of telegraph poles turns north from west. This junction is 111 meters (364 feet) east of center of new gravel road. Drain tile crosses gravel road at junction of old and new roads. Marked by bolt in 6-inch square stone post, projecting about 15 inches above ground and leaning slightly to south.

B.M. Caruthersville (M.R.C.) (Pemiscot County, Mississippi River Commission, 1906, H. W. Hemple, 1929).—In upper part of Caruthersville, about one-half mile above post office, about 500 meters (1,640 feet) from river bank (in 1912), 187 meters (614 feet) back of levee, on fence line between property of Joe Fisher and St. Louis-San Francisco Railway, 120 meters (394 feet) west of cattle guard, 36 meters (118 feet) from southwest corner of lumberyard, on the northwest corner of Fisher's garden plot, 78 feet south of center line of Fourth Street, 30.3 feet south of south rail of railway, 46.6 feet east of northwest corner of fence line surrounding Fisher's property, and 126.5 feet west of center line of Lower End Street. Marked by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper bolt in tile below, as described in note 16. Station *Caruthers* (see description thereof) is 239.33 meters (785.2 feet) from station in azimuth $124^\circ 16' 59''$.

Cottonwood south base (P.B.M. south base (M.R.C.)) (Pemiscot County, C. H. Boyd, 1879; H. W. Hemple, 1929).—On west bank of Mississippi River, about 8 miles south of Caruthersville, about one-fourth mile east of main part of town of Cottonwood Point, directly east of Cottonwood Gin Mill, 198 feet south of center line of river road running back from landing, 270 meters (886 feet) back of river bank, 93 feet east of angle in top of levee, in borrow pit, 90 meters (295 feet) back of Dr. Gay's house. Mark is $\frac{1}{2}$ -inch copper bolt, with cross in center, in top of stone post about 10 inches square on top, projecting about 10 inches above surface of ground, and with year "1879" outlined on north face. Station *Cotton* (see description thereof) is 116.51 meters (382.2 feet) distant in azimuth $306^\circ 41' 16''$.

Hofner = B.M. 9/4 (M.R.C.) (Scott County, Mississippi River Commission, 1881, P. A. Smith, 1930).—On right bank of the Mississippi River, about $1\frac{1}{2}$ miles northwest of Commerce, at east edge of cultivated field on top of hill, directly back from chain of large boulders jutting out into river, 35 feet west of small oak with top branches trimmed off, 27 feet north of another small oak, and about 50 meters (164 feet) northeast of M. R. Thomas' house. To reach from railroad station at Commerce, proceed 0.4 mile to cinder fork, fol-

low right fork 0.5 mile to left fork beyond left side of 2-story barn, proceed 0.6 mile on left fork to right fork, and follow about 0.3 mile through gate and to station site. Marked by standard station disk in top of old limestone post. Reference marks are standard reference disks. Magnetic bearing from reference mark no. 1 to station, approximately 75 paces distant, is $39^{\circ}30'$, and from reference mark no. 2 to station, approximately 350 paces distant, is $103^{\circ}30'$. In 1932 stone was found leaning.

Beef Bluff (M.R.C.) (Cape Girardeau County, Mississippi River Commission, 1881, P. A. Smith, 1930).—About 10 miles north-northeast of Cape Girardeau, 3 miles north of Egypt Mills, one-half mile southeast of old Green's ferry landing at Moccasin Springs, on high bluff overlooking Mississippi River and immediately back of St. Louis-San Francisco Railway. To reach from Egypt Mills, follow gravel road north $2\frac{1}{2}$ miles to Green ferry road leading east across small ford, and follow northeast 2 miles to river at Moccasin Springs, now only a farmhouse. Proceed on foot southeast about one-third mile along track of St. Louis-San Francisco Railway to bridge, cross bridge, enter field on west side of track, follow up ridge to southeast corner of field, and take dim trail leading south (up first ridge back of railway) about 150 yards to station site. Marked by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper bolt in tile below, as described in note 16.

O'Harrach (M.R.C.) (Jackson County, Ill., Mississippi River Commission, 1880; 1932; H. W. Hemple, 1931).—On second high point of bluffs $1\frac{1}{2}$ miles, air line, east of Cora City, in north central part of section 22, Degonia Township, on land owned by C. H. Tlerson, and 22 feet northeast by east from only tree on top of ridge. To reach from Cora City, turn east onto right fork before reaching bridge, proceed 0.8 mile, turn left up hill, proceed 1.4 miles to unpainted house on right side of road, keep right along south side of house on farm road, and follow top of ridge through saddle to station site. Marked by 6-inch square stone post, projecting 4 inches above surface of ground with letters "US" and center hole in top. Reference mark is standard reference disk in concrete, note 11 (a), 7.0 meters (23 feet) northeast of ridge road, 28 meters (92 feet) west of northwest corner of Charles Young's house, 4 meters (13 feet) northwest of double oak tree, and approximately three-fourths mile from station in azimuth $106^{\circ}32'20''$.

Killion (M.R.C.) (Perry County, Mississippi River Commission, 1880; 1932; H. W. Hemple, 1931).—On high and wooded point of Missouri bluffs, about $6\frac{1}{2}$ miles, air line, northeast of Perryville, on land owned by John Christianson. To reach from northeast corner of courthouse yard at Perryville, go north 1.3 miles on Chester road, take dirt road on right 1.6 miles, take left fork to north 0.7 mile, follow main road to right 0.8 mile, follow main road to left 0.5 mile, go up hill to right, continue 1.5 miles, keep to right (dim road on left goes up Streile Branch), and proceed 1.0 mile to white house with tin roof, double back sharply to right onto farm road on south side of house, proceed 0.4 mile to large lone tree in cultivated field on left side of road, follow farm road down hill to eastward and up ridge through woods into orchard, follow crest of ridge through orchard, pass through fence on east side of orchard, and follow dim road up ridge and through woods to station site. Marked by 6-inch square granite post, projecting about 4 inches above surface of ground, with letters "US" and center hole in surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in woods, about 4 feet north of square-blazed oak tree, and 20.91 meters (68.6 feet) from station in azimuth $355^{\circ}06'$. No. 2 is in woods, about 2 feet southeast of 12-inch triangular-blazed oak tree, and 21.86 meters (71.7 feet) from station in approximate azimuth $128^{\circ}17'$.

Kaskaskia (U.S.E.) (Randolph County, Ill., United States Engineers, H. W. Hemple, 1931).—On southwestern earthworks of old Fort Kaskaskia in Fort Kaskaskia State Park, on first bluff 350 yards north of village of Fort Gage, and about 6 miles, airline, northwest of Chester. To reach from Chester, go northwest 6 miles along foot of bluffs to Fort Gage schoolhouse, and follow road sign on right to Fort Kaskaskia. Marked by capped iron pipe projecting 10 inches above surface of ground. Station *Kaskaskia* (M.R.C.) (see description thereof) is 11.837 meters (38.84 feet) from station in azimuth $84^{\circ}32'$.

Kaskaskia (M.R.C.) (Randolph County, Ill., Mississippi River Commission, 1880; 1932; H. W. Hemple, 1931).—On southwestern earthworks of old Fort Kaskaskia in Fort Kaskaskia State Park, on first bluff 350 yards north of village of Fort Gage, about 6 miles, airline, northwest of Chester, and 20 feet

northeast of tombstone which is on west property-line fence. To reach from Chester, go northwest 6 miles along foot of bluffs to Fort Gage schoolhouse, and follow road signs on right to Fort Kaskaskia Park. Marked by stone post flush with surface of ground. Station *Kaskaskia* (U.S.E.) (see description thereof) is 10 feet lower in elevation, and 11.837 meters (38.84 feet) from station in azimuth $264^{\circ}32'$.

Crystal (M.R.C.) (Jefferson County, Mississippi River Commission, 1880, H. W. Hemple, 1931).—About $1\frac{1}{2}$ miles, airline, southeast of Crystal City, on northeast end of Buck Knob, in NE $\frac{1}{4}$ sec. 9, T. 40 N., R. 6 E., and about 75 feet east of center of massive steel tower of Union Power & Light Co., which suspends high-power electric transmission line across Mississippi River. Marked by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper bolt in tile below, as described in note 16, projecting 10 inches above ground. Station *Crystal* (see description thereof) is 20.753 meters (68.09 feet) distant in azimuth $339^{\circ}23'$.

Correll (M.R.C.) (Ste. Genevieve County, Mississippi River Commission, 1880; 1932; H. W. Hemple, 1931).—About 2.5 miles, airline, northwest of Ste. Genevieve, on land belonging to Joe Fallert, in cultivated field on ridge about 250 meters (820 feet) southeast of his house and about 50 meters (164 feet) south of fence across ridge. Marked by capped iron pipe projecting about 8 inches above surface of ground. Azimuth from station to spire of Ste. Genevieve Catholic Church at Ste. Genevieve is $315^{\circ}33'23''$.

Kidd (Monroe County, Ill., H. W. Hemple, 1931).—On first bluff about one-half mile, airline, north of Fults, in western part of sec. 21 T. 4 S., R. 10 W., and on land owned by Commercial and State Bank of Waterloo. Marked by nail in surface of hub driven into ground. Station *Kidd* (M.R.C.) (see description thereof) is 8.723 meters (28.62 feet) from station in azimuth $196^{\circ}38'$.

Kidd (M.R.C.) (Monroe County, Ill., Mississippi River Commission, 1880; 1932; H. W. Hemple, 1931).—On first bluff about one-half mile, airline, north of Fults, in western part of sec. 21, T. 4 S., R. 10 W., on land owned by Commercial and State Bank of Waterloo. To reach from Fults, go to southern end of town and follow road northeast toward bluffs, at bluffs turn left and proceed about 0.3 mile to first house on left, continue on foot through barn lot to northeast, bear left and follow up ridge and hogback to northwest, and continue to station site on highest point, a distance of about one-fourth mile and about a 300-foot climb. Marked by stone post extending about 8 inches above surface of ground, and with letters "US" and center hole in its top. Azimuth mark is standard reference disk in concrete, note 11 (a), in southeast corner of yard, about three-fourths mile from station in azimuth $33^{\circ}17'31''$. Station *Kidd* (see description thereof) is 8.723 meters (28.62 feet) from station in azimuth $16^{\circ}38'$.

Brickey (M.R.C.) (Ste. Genevieve County, Mississippi River Commission, 1880; 1932; H. W. Hemple, 1931).—On second bluff upstream from Brickeys post office, about one-fourth mile northwest of Brickeys, on land owned and occupied by Rombauer sisters. To reach from Brickeys, follow road upstream on river side of post office to north end of railroad siding. Proceed on foot across tracks into yard where house has burned, and follow ridge to northwest about 200 meters (656 feet) to top of bluff. Marked by stone post projecting about 4 inches above surface of ground, the corners of which have been broken off. High-power transmission line tower on west side of river, just southeast of Crystal City and on edge of high bluff at Buck Knob, is about 6 miles from station in azimuth $137^{\circ}42'19''$.

Twin Hollow (St. Louis County, H. W. Hemple, 1931).—On point of bluff overlooking Mississippi River, about $1\frac{1}{2}$ miles, airline, southeast of Oakville, five-eighths mile south of Cliff Cave, and about 500 feet above upper Twin Hollow. To reach from Oakville, go south 1.2 miles on telegraph road from its intersection with Baungarten Road, proceed east 0.6 mile to large stone fence post on right side of road, turn east on north side of post and follow rock road to river bluff, keeping north fork at point about 100 meters (328 feet) east of stone post. Marked by cross scratched in rock outcrop. Station *Twin Hollow* (U.S.E.) (see description thereof) is 1.030 meters (3.38 feet) from station in azimuth $276^{\circ}06'$. Station *Twin Hollow* (M.R.C.) (see description thereof) is 5.529 meters (18.14 feet) from station in azimuth $127^{\circ}30'$. Azimuth from station to black water tank of sulphur company at Montesano is $222^{\circ}07'55''$.

Twin Hollow (M.R.C.) (St. Louis County, Mississippi River Commission, 1880, H. W. Hemple, 1931).—On point of bluff overlooking Mississippi River about $1\frac{1}{2}$ miles, airline, southeast of Oakville, and five-eighths mile south of Cliff Cave. Marked by somewhat shattered stone post. Station *Twin Hollow* (see description thereof) is 5.529 meters (18.14 feet) from station in azimuth $307^{\circ}30'$. Station *Twin Hollow (U.S.E.)* (see description thereof) is 6.434 meters (21.11 feet) from station in azimuth $302^{\circ}42'$.

Twin Hollow (U.S.E.) (St. Louis County, United States Engineers, H. W. Hemple, 1931).—On point of bluff overlooking Mississippi River, about $1\frac{1}{2}$ miles, airline, southeast of Oakville, and five-eighths mile south of Cliff Cave. Marked by large hole in rock outcrop, surrounded by triangle with letters "U.S." Station *Twin Hollow* (see description thereof) is 1.030 meters (3.38 feet) from station in azimuth $96^{\circ}06'$. Station *Twin Hollow (M.R.C.)* (see description thereof) is 6.434 meters (21.11 feet) from station in azimuth $122^{\circ}42'$.

Salt Bluff (Monroe County, Ill., H. W. Hemple, 1931).—On highest point of Saltlake Bluff, about $8\frac{1}{2}$ miles west-southwest of Waterloo, about $1\frac{1}{2}$ miles northeast of Valmeyer, in $NW\frac{1}{4}NE\frac{1}{4}$ sec. 3, T. 3 S., R. 11 W., and on land owned by Columbia Quarry Co. To reach from Valmeyer, go east on Route 156 to first road leading north after crossing railroad, proceed north to quarry, take road up draw around south end of bluff and stripped ground to red building on right side of road, and continue straight ahead to hogback above more stripped ground. Marked by standard station disk in concrete in iron pipe projecting 8 inches above ground. Azimuth from station to smokestack at Herculaneum, Mo., is $50^{\circ}03'08''$. Station *Salt Bluff (M.R.C.)* (see description thereof) is 10.780 meters (35.37 feet) from station in azimuth $168^{\circ}45'$.

Salt Bluff (M.R.C.) (Monroe County, Ill., Mississippi River Commission, 1880; 1908; H. W. Hemple, 1931).—On highest point of Saltlake Bluff, about $8\frac{1}{2}$ miles west-southwest of Waterloo, about $1\frac{1}{2}$ miles northeast of Valmeyer, in $NW\frac{1}{4}NE\frac{1}{4}$ sec. 3, T. 3 S., R. 11 W., on land owned by Columbia Quarry Co. Marked by capped iron pipe, projecting about 8 inches above ground, and with letters "US" on surface. Station *Salt Bluff* (see description thereof) is 10.780 meters (35.37 feet) from station in azimuth $348^{\circ}45'$.

Howard (Mo.R.C.) (St. Louis County, Missouri River Commission, 1887, H. W. Hemple, 1931).—On bluff south of Missouri River, about $2\frac{1}{2}$ miles northeast of Bellefontaine, $2\frac{1}{2}$ miles southwest of Creve Coeur Lake, and about 40 meters (131 feet) north of old cistern near fallen-down house. To reach from Bellefontaine, go east 1.8 miles on Pattonville Road to top of hill with large Standard Oil Co. signboard on left, turn left onto dirt lane through cut, and follow northwest 200 yards to station site. Mark is Missouri River Commission iron pipe and cap projecting about 8 inches above surface of ground. Azimuths from station are: Standpipe at Morgan, $271^{\circ}32'46''$; standpipe at Kirkwood, $309^{\circ}47'20''$; and courthouse at St. Charles, $199^{\circ}54'06''$. Missouri River Commission station *St. Charles* at St. Charles is in azimuth $192^{\circ}34'10''$.

Commerce (Mo.R.C.) (St. Louis County, Missouri River Commission, 1887, H. W. Hemple, 1931).—On high bluff south of Missouri River, about 8 miles north of Florissant, on land owned by J. F. O'Reller, 3525 North Broadway, St. Louis, about 75 meters (246 feet) north of main highway, about 40 meters (131 feet) east of road running through field and leading off highway, and about one-third mile northwest of white house set back on south side of highway. To reach from Florissant, go through town straight across crossroad 0.1 mile, northwest 0.2 mile, northeast 0.8 mile, northwest 1.0 mile along transmission line, northeast 2.0 miles to crossroads, straight ahead (northeast) 1.1 miles, northwest 0.8 mile to top of grade, turn right just beyond top of hill, and follow wagon track to station site. Marked by Missouri River Commission iron pipe and cap, flush with surface of ground. Azimuths from station to tallest smoke stack at Alton, Ill., is $263^{\circ}29'29''$; and to lookout tower at Creve Coeur is $39^{\circ}37'10''$.

Thompson (M.R.C.) (Jersey County, Ill., Mississippi River Commission, 1881, H. W. Hemple, 1931).—About opposite foot of Six Mile Island, about one-half mile from river bank on bluff overlooking Illinois River, about 6 miles north of west of Grafton, one-fourth mile east of gray house owned by Mr. Simpson, on highest point of knob which is bare to south and timbered to north, and 30 yards south of east-and-west fence. To reach from Grafton, go west 6.0 miles on road along foot of bluffs or about one-half mile beyond church and graveyard to gray house on right with bare knob in rear and slope covered with a

few cedars. Ascend knob to station site, keeping north and east up ridge 500 yards. Marked by drill hole in stone post, which leans 1 foot off center to north. Brass capped iron pipe, marked "Illinois River Survey, US" is on first knob above river, and one-fourth mile from station in azimuth $23^{\circ}22'14''$.

Knox (M.R.C.) (Lincoln County, Mississippi River Commission, 1881, H. W. Hemple, 1931).—About $5\frac{1}{2}$ miles, air line, south by east of Elsberry, about 3.7 miles north of Foley, 2 miles above Kings Lake station, on land owned by Mr. Knox, on slope about 150 meters (492 feet) east of high knoll, about 50 feet lower in elevation and about 200 meters (656 feet) north by west of Mr. Knox's house, about 950 meters (3,117 feet) west of Chicago, Burlington & Quincy Railroad, and 14 meters (46 feet) in front of line of telephone poles. To reach from Elsberry, go south about 6 miles on county road to lane leading to Knox's house, turn west across railroad, and continue up hill to station site. Marked by standard Mississippi River Commission limestone post projecting about 6 inches above ground. Mark is broken off at top but enough remains to determine center. Azimuth from station to railroad water tank at Elsberry is $166^{\circ}46'56''$.

Saltpeter (M.R.C.) (Pike County, Mississippi River Commission, 1881, H. W. Hemple, 1931).—On high and prominent rocky bluff overlooking river bottom known as Saltpeter Bluff, about 7 miles north of Elsberry, one-half mile south of Annada, on land owned by Mrs. Richards, 10 meters (31 feet) back from crest of perpendicular bluff which is covered with hardwood about 50 feet in height, 5 feet east of 12-inch oak, 1.9 meters (6 feet) north of 10-inch blazed white oak, and 7.7 meters (25 feet) northeast of another 10-inch blazed white oak. Marked by stone post projecting 8 inches above ground. Station *Annada* (see description thereof) is 39.46 meters (129.5 feet) from station in azimuth $94^{\circ}40'$.

Clarksville (M.R.C.) (Pike County, Mississippi River Commission, 1881, H. W. Hemple, 1931).—On highest point of east end of high bluff overlooking Mississippi River, about 9 miles southeast of Louisiana, one-half mile north-northwest of Clarksville, on land owned by H. C. La Rue, about 300 meters (984 feet) below point opposite stone dike extending out from Illinois shore, about 275 meters (902 feet) from river bank, 12.8 meters (42 feet) southeast of 16-inch blazed locust, 10.4 meters (34 feet) north of 30-inch blazed white oak, and about 10 meters (33 feet) northwest of 20-inch triangle-blazed chestnut. To reach from Clarksville, follow main street 3 blocks from river front, turn north 2 blocks and west one-third mile to board gate on north at foot of hill. Enter gate and follow old road 150 meters (492 feet) to house occupied by Mr. Davis, continue about 150 meters (492 feet) on old road to orchard, turn right and follow dim wagon road and trail to top of ridge, and follow east along ridge about one-fourth mile to station site. Marked by stone post with top broken off, about 8 inches below surface of ground. Brick silo on Illinois side of river is about 2 miles from station in azimuth $197^{\circ}46'33''$.

Rockport (M.R.C.) (Pike County, Ill., Mississippi River Commission, 1881, H. W. Hemple, 1931).—About one-half mile above Rockport, on left bank of Mississippi River, in clearing on second point above church, 10 meters (33 feet) riverward from crest of bluff, just above small valley covered with second-growth timber which lies between two cleared points, on land owned by Isaac McMullen, and almost directly opposite small red frame house which stands across road at foot of bluff. To reach from elevator at Rockport, go north 0.6 mile on bluff road to two white houses on north side of road. Continue on foot on dim path along fence line between houses to top of ridge, and continue north along ridge to clearing and station site. Marked by center hole in stone post which is flush with surface of ground. Top of post is marked "US." Azimuth from station to spire of Christian Church at Rockport is $328^{\circ}26'50''$.

Gard (M.R.C.) (Pike County, Ill., Mississippi River Commission, 1881, H. W. Hemple, 1931).—On bare, prominent point about 50 feet lower than summit of bluff, about 250 meters (820 feet) above second bare, prominent point which is just above very large ravine, on left bank of Mississippi River, about 4 miles below Kinderhook, about 30 meters (98 feet) above prolongation of north-and-south road, about 250 meters (820 feet) above prolongation of north-and-south hedge which runs toward river from near foot of bluffs, and about 50 meters (164 feet) east of east-and-west road which runs out across bottom 10 meters (33 feet) toward river from edge of timber. To reach from New Canton, go north 1.7 miles on road at base of bluffs to point opposite red barn,

and ascend bluff from this point. Marked by center hole in stone post which projects 8 inches above ground. Azimuths from station to following points are: Spire of Methodist Church at New Canton, distant $1\frac{1}{2}$ miles, $321^{\circ}38'24''$; south water tank at Hannibal, Mo., distant 12 miles, $104^{\circ}57'56''$; and black steel stack at Busch, Mo., $29^{\circ}39'34''$.

Heather (M.R.C.) (Marion County, Mississippi River Commission, 1881, H. W. Hemple, 1931).—About 5 miles east of Palmyra, 6 miles northwest of Hannibal, on land owned by the Bier Estate, about 5 feet lower than summit of hill, about in center of ridge which slopes toward north and south, about 40 meters (131 feet) west of tree line which marks east edge of ridge, about 400 meters (1,312 feet) downstream from house on crest of bluff, opposite point 550 meters (1,804 feet) below lower end of curve in railroad track, and exactly on prolongation of center line of wide, deep drainage ditch which extends from foot of bluff out past railroad. Marked by center hole in stone post which projects 3 inches above ground. Station *Heather* (see description thereof) is 111.454 meters (365.66 feet) from station in azimuth $94^{\circ}07'05''$.

Marblehead 2 (Adams County, Ill., H. W. Hemple, 1931).—On extreme top and about in center of small natural clay mound (highest point in the vicinity), on left bank of Mississippi River, about 500 meters (1,640 feet) above Marblehead, on land owned by Mrs. Brickman, in pasture, 7 meters (23 feet) south-west of wire fence between pasture and cultivated field, 7 meters (23 feet) north of 16-inch black oak with old blaze, about 150 meters (492 feet) southeast of Mrs. Brickman's house, and about 100 meters (328 feet) north of main gravel road leading to Marblehead. Marked by stone post projecting 1 foot above ground, with "US" and center hole in top. Station was occupied eccentrically in 1931, as lines were obstructed from true station. Eccentric station is wooden hub with nail in center, 2.227 meters (7.31 feet) west of true station. Azimuth from station to water tank at corner of Hayden and Pleasant Streets, Hannibal, Mo., is $1^{\circ}51'43''$.

Quincy Courthouse (M.R.C.) (Adams County, Ill., Mississippi River Commission, 1881, H. W. Hemple, 1931).—Finial on top of dome of Adams County Courthouse, North Sixth and Broadway Streets, Quincy, Ill.

La Grange College (Lewis County, H. W. Hemple, 1931).—Southwest corner of Bell Tower at old La Grange College (now abandoned). Building is at north end of town on top of bluff. Brickwork at southwest corner of tower is higher than at other corners, and finial is weather vane.

Lima Lake (M.R.C.) (Adams County, Ill., Mississippi River Commission, 1881, H. W. Hemple, 1931).—About 16 miles north of Quincy, 2 miles west of Lima, about $4\frac{1}{4}$ miles from river bank, about 4,700 meters (15,420 feet) north of point where Hunt and Lima Lake levee begins near foot of bluff, on land owned by Perry Spencer, a little south of highest point on narrow north-and-south ridge, almost on line with road running west to clubhouse and also with slough across bottom, 87 meters (285 feet) east of road at foot of bluff, 30 meters (98 feet) north of east-and-west wire fence over ridge, 5.4 meters (18 feet) north of 24-inch maple tree with old blaze, and 7.4 meters (24 feet) southwest of 16-inch oak tree with old blaze. To reach from south end of Lima, go west 2.0 miles on gravel road, turn left (south) onto dirt road across iron bridge, proceed south 0.4 mile to fence corner in brush at foot of bluff on left (60 yards north of concrete bridge), go east 100 yards along north side of east-and-west wire fence to top of first ridge, and continue to left along ridge 30 yards to station site. Marked by 6-inch square stone post flush with surface of ground, with "US" and center hole in top. Reference mark (not described) is in north-and-south fence line, 6.5 meters (21 feet) east of center line of dirt road, about 90 meters (295 feet) north of concrete bridge, about 20 meters (66 feet) north of corner of wire fence, and 80.6 meters (264 feet) from station in azimuth $82^{\circ}02'$. Azimuth from station to standpipe at La Grange, Mo., is $29^{\circ}49'16''$.

Gillham (M.R.C.) (Hancock County, Ill., Mississippi River Commission, 1881, H. W. Hemple, 1931).—About 3 miles south of Warsaw, 2 miles from river bank, about 3 miles above Rocky Run Creek, on bluff back of Hunt and Lima Lake Levee District, on first hill north of creek and road leading into bottom, on narrow ridge running out toward river, on bald knob with almost perpendicular sides, 16.5 meters (54 feet) northwest of blazed 24-inch black oak, and 12.2 meters (40 feet) southwest of blazed 20-inch black oak. To reach from main corner at Warsaw, go south 3.7 miles on main gravel road to gap in fence

on left. Gap is about 100 yards south of dirt road up hollow to east, 150 yards north of road into bottom to right, and 200 yards south of 2-story brick house on west side of road. Follow trail southeast 100 yards up knob to station site. Marked by center hole in 6-inch square stone post. Reference mark (not described) is in south end of culvert which is 200 meters (656 feet) west of intersection of east-and-west road and Tri-State Route, and approximately one-fourth mile from station in azimuth $69^{\circ}07'07''$. Azimuth from station to standpoint of Culver-Stockton College at Canton, Mo., is $22^{\circ}05'12''$.

Swallow Rock (M.R.C.) (Jackson County, Ill., Mississippi River Commission, 1880).—On top of high bluff known as "Swallow Rock", nearly east and 4 miles from upper end of Fountain Bluff, and $1\frac{1}{2}$ miles north of Cedar Creek flowing into Big Muddy River. To reach, cross Big Muddy River near lower end of Swallow Rock Cliff, go up valley of Big Run Creek to point where stream leaves cliff, and follow cliff to highest point of hill and station site. Marked by center of stone post, top of which is broken off.

Big Muddy (M.R.C.) (Union County, Ill., Mississippi River Commission, 1880; 1908).—On high bluff about 5 miles southeast of Grand Tower, due east from bridge of St. Louis, Iron Mountain & Southern Railway over Big Muddy River, and about $1\frac{1}{2}$ miles down bluffs from Kings Ferry. To reach from Mississippi River, go via Big Muddy River to ferry and road about one-half mile above railroad bridge, take road to bluffs, proceed south one-half mile to point where road turns into valley, just above white frame house, and continue southeast up northwest slope of bluff to station site which is on prominent point of highest ridge. Marked by stone post.

Silica (M.R.C.) (Perry County, Mississippi River Commission, 1880; 1932).—On prominent peak on bluffs, about one-fourth mile below head of Grand Tower Island, one-fourth mile below railroad trestle over Pattons Creek, and directly back of silica banks. Marked by stone post.

Indian Creek (M.R.C.) (Cape Girardeau County, Mississippi River Commission, 1880; 1932).—On top of prominent bluff $1\frac{1}{2}$ miles above Neely Landing, one-half mile below Hanging Dog Creek, and 60 meters (197 feet) west of St. Louis-San Francisco Railway. Marked by stone post.

Rich (M.R.C.) (Union County, Ill., Mississippi River Commission, 1880; 1908).—On edge and about halfway from top on slope of prominent western spur of bluffs, due east from point on St. Louis, Iron Mountain & Southern Railway that is one-fourth mile above Wolf Lake, and about 1,800 feet northwest of house belonging to Carl Rich. Marked by 6-inch square stone projecting 12 inches.

Moccasin Springs (M.R.C.) (Cape Girardeau County, Mississippi River Commission, 1880; 1927).—On highest point of bluffs, about seven-eighths mile below Moccasin Springs, about $2\frac{1}{2}$ miles above Bainbridge, and 1,000 feet from river. Main ridge from small waterfall leads direct to station site. Scattered timber is in vicinity of station. Marked by stone post, top of which is broken off.

Bluff Lake (M.R.C.) (Union County, Ill., Mississippi River Commission, 1880; 1908).—On grassy knob, about halfway down slope from long narrow orchard on top of high bluff, and 1,300 meters (4,265 feet) from Hamburg and Jonesboro Road. Marked by 6-inch square stone post broken off 2 inches below ground and with small hole drilled in center. Distances and bearings from station are: Old burnt stump, $8\frac{1}{2}$ feet, N. 11° E.; 18-inch white oak blazed with triangle, $24\frac{1}{2}$ feet, N. 88° E.; blazed 12-inch hickory, 34 feet, S. $25\frac{1}{2}^{\circ}$ W.; and black oak, 20.4 feet north.

Vancill (M.R.C.) (Cape Girardeau County, Mississippi River Commission, 1897).—On top of prominent stone-faced bluff, 1,400 meters (4,593 feet) above Vancill Landing, 300 meters (984 feet) above hollow above Sublett Hollow, 1,300 meters (4,265 feet) below Indian Creek, 50 feet west of face of bluff, and 25 feet east of 14-inch oak blazed with triangle. Marked by iron pipe.

Clear Creek (M.R.C.) (Alexander County, Ill., Mississippi River Commission, 1880; 1908).—On bluffs about east from village of Clear Creek, on land owned by Mr. Cox. To reach from Clear Creek village, take road leading up Clear Creek about three-fourths mile beyond where road comes to bluffs, and station site is on high point just above this road. Marked by stone post.

Floral (M.R.C.) (Cape Girardeau County, Mississippi River Commission, 1880; 1932).—About 4 miles above Cape Girardeau, on top of highest bluff directly back from mouth of Flora Creek, on land owned by Doyle brothers, in

heavy timber, close to river face of bluff. Timber road passes along ridge 4 meters (13 feet) back of station. Marked by stone post. A 30-inch white oak tree blazed with triangle facing station is 4 meters (13 feet) distant in azimuth 125° .

Sextons (M.R.C.) (Alexander County, Ill., Mississippi River Commission, 1880; 1932).—On second high point of first high bluff above mouth of Sexton Creek, east of Illinois Central Railroad station at Gale, on land owned by J. N. Gale, and 2 meters (7 feet) east of woods road. To reach take road leading back from river bank near head of Rock Island, follow across creek and both railroads to signboard "Robinson Spur", turn left, and follow woods road up bluff to station site. Marked by hole in center of stone post.

Cape Lacroix=B.M. 11/3 (M.R.C.) (Scott County, Mississippi River Commission, 1880; 1932).—On bluffs just above Grays Point, on land of Capt. Edw. Gray, and 1,000 feet from river bank. To reach, land at first little ravine above Grays Point and climb bluff to left. Station is on point of ridge, and small cemetery is on low ridge toward river. Marked by stone post.

Day (M.R.C.) (Alexander County, Ill., Mississippi River Commission, 1880; 1933).—In cleared spot on bluffs, about three-fourths mile above Thebes, 1,000 feet from river, on land owned by Mr. Day, and directly back from prominent point where rock, exposed at low water, projects out into the river. Small house close to river stands at upper end of bluff. Marked by stone post.

Thebes north base (M.R.C.) (Scott County, Mississippi River Commission, 1880).—At upper end of Graysboro, 1,400 meters (4,593 feet) above mouth of Dorrity Creek, 150 meters (492 feet) northeast of railroad roundhouse, between track to incline and track to roundhouse, on land of Capt. Edw. Gray, and 500 feet above line fence between Gray and Houck. Surface mark is black-walnut post, 6 inches square, branded "US", with mound built around it. Underground mark is cross on copper bolt in a stone post 1 foot below surface of ground. Dome of courthouse at Thebes, Ill., is in magnetic bearing S. 13° E.

Thebes south base (M.R.C.) (Scott County, Mississippi River Commission, 1880; 1933).—Near top of river bank, on center line prolonged of road leading to bluffs from lower end of Graysboro, on land owned by Lawyer Houck, and about 100 feet above line-fence between Houck and Hinman. Surface mark is black-locust post, 6 inches square, branded "U.S.", with mound built around it. Underground mark is cross on copper bolt in stone post 1 foot under surface of ground. In 1933, it was reported that stone post was 3 feet below surface of ground, with iron pipe set over stone. Dome of courthouse at Thebes, Ill., is in magnetic bearing S. $39\frac{1}{2}^{\circ}$ E., and dome of schoolhouse at Thebes, Ill., is in magnetic bearing S. 48° E.

Grand Chain=B.M. 10/4 (M.R.C.) (Scott County, Mississippi River Commission, 1880; 1884).—On bluffs, about 300 feet north of point of curve of west approach of Thebes Bridge, on edge of cleared field. Original mark was stone post which was replaced by tile and iron pipe.

Thebes (M.R.C.) (Alexander County, Ill., Mississippi River Commission, 1880; 1933).—On highest point of bluffs, 1 mile below village of Thebes, one-third mile from river bank, on land owned by Rowling and Marchildon, near center of cultivated field with orchard in northwest corner, and back of timber belt on slope along river. Road in first ravine below Thebes leads to top of bluff. Marked by stone post.

Uncle Joe (M.R.C.) (Scott County, Mississippi River Commission, 1880).—About 3 miles above Commerce, about 1,000 feet from river bank, a little above Government light near Uncle Joe Landing, on summit of partly cleared bluff on land owned by Samuel Wray. Marked by stone post, which was found dug up in 1932.

Lassar (M.R.C.) (Alexander County, Ill., Mississippi River Commission, 1880).—About $1\frac{1}{2}$ miles above Fayville (Santa Fe), 750 meters (2,461 feet) back from river, on land owned by Mrs. Lassar, in timber and close to a woods road that leaves county road (running along river bank) near old shanty. Marked by stone post, which was found broken in 1932.

Commerce (M.R.C.) (Scott County, Mississippi River Commission, 1880; 1907).—In field near center of Commerce Island, 1 mile below Commerce, and 60 feet west of top of ridge. Marked by stone post with corners chipped off. Distances and azimuths from station are: Large burned pecan stump, 225 feet, $353^{\circ}53'$; 24-inch blazed pecan tree, 274 feet, $11^{\circ}45'$; and 18-inch blazed pecan tree on east side of field near top of bank, 490 feet, $193^{\circ}13'$.

Santa Fe (M.R.C.) (Alexander County, Ill., Mississippi River Commission, 1880).—On top of bluffs, directly back of Fayville (Santa Fe), about 550 meters (1,804 feet) from river bank, on land of J. H. Story, on highest peak in vicinity. Marked by iron pipe projecting 3 inches, which was found dug up in 1932.

Powers Island (M.R.C.) (Scott County, Mississippi River Commission, 1880; 1903).—On northeast bank or shoulder of Powers Island (right bank of river), in cultivated field of Dr. Coffman, 130 feet from river bank, opposite lower end of Allen Towhead, just inside limit line of large cottonwood stumps, and 280 feet outside of abrupt rise. Marked by stone post, which was found broken off in 1903 and was reset 29 inches below surface of ground, and by flanged iron pipe with cap set over it. Distances and azimuths from station are: Gable of small frame building, 1,378 feet, $318^{\circ}35'$; and two blazed cottonwood trees at top of bank, 258 feet, $147^{\circ}44'$. In 1932 iron pipe could not be found.

Atherton (M.R.C.) (Alexander County, Ill., Mississippi River Commission, 1880; 1884).—About three-fourths mile east of Atherton Landing, on land owned by estate of F. D. Atherton, near middle of section 18, Goose Island Township, and just on edge of swamp and cultivated field. Marked by stone post.

Missouri Sister (M.R.C.) (Mississippi County, Mississippi River Commission, 1880; 1926).—On north side of Missouri Sister Island, on right bank of river, nearly opposite Grand Lake Landing, Ill., in timber, and 300 meters (984 feet) from river bank. Marked by stone post. Stone was occupied in 1926, but was apparently buried during high water of 1927 and 1928 and could not be located in 1932.

Rouse (M.R.C.) (Mississippi County, Mississippi River Commission, 1880; 1932).—About 900 feet below mouth of old chute behind Missouri Sister Island, 1,400 meters (4,593 feet) above Hurricane Field, about 500 feet from river bank, in heavy timber on land owned by Mrs. Rouse, and 400 feet below small clearing that comes up to road along chute. Marked by stone post flush with surface of ground. Distances and azimuths from station are: 3-foot blazed ash tree, 12.5 feet, $27^{\circ}40'$; 3-foot blazed elm tree, 39 feet, $41^{\circ}35'$; and 14-inch blazed sycamore tree, 29 feet, $308^{\circ}50'$.

Dickey (M.R.C.) (Alexander County, Ill., Mississippi River Commission, 1880; 1932).—On high bank, back from and short distance above head of Dickey Island, 1,000 feet from left bank of river, in cultivated field east of fence on east side of old Cairo road, and short distance below small wagon bridge. Marked by stone post projecting 1 foot.

Nimbus (M.R.C.) (Alexander County, Ill., Mississippi River Commission, 1880).—About $2\frac{3}{4}$ miles above Cairo Bridge, back of Dickey Island, about 225 meters (738 feet) east of Mobile and Ohio Railroad, about 330 meters (1,083 feet) south of east-and-west road, 300 meters (984 feet) west of north-and-south road, and about 200 feet southeast of small house occupied by Thomas Brown. Marked by stone post.

Defiance (Cairo) (U.S.L.S.) (Alexander County, Ill., United States Lake Survey, 1876).—This station was a triangulation station of the Mississippi River Survey made by the United States Lake Survey in 1876-77, and was the station on which the geodetic positions of the Mississippi River Commission triangulation are based. It is situated on the site of Fort Defiance in the extreme southeastern part of Cairo, and although it has been destroyed for many years, it is described and plotted on account of its historical importance.

Price (U.S.L.S.) (Mississippi County, United States Lake Survey, 1876, Mississippi River Commission, 1880; 1891).—In timber, about one-half mile below Bird Point, about 300 meters (984 feet) back of high right bank, and about one-third mile above point opposite Wickliffe, Ky. Marked by stone post covered with about 3 feet of earth and an iron pipe (marked 1891) over it. Distances and azimuths from station are: Blazed 8-inch sycamore, 4.2 meters (14 feet), 321° ; blazed 7-inch sycamore, 5.1 meters (17 feet), 23° ; blazed 6-inch sycamore, 3 meters (10 feet), 242° ; and blazed 10-inch sycamore, 6.4 meters (21 feet), 313° .

Thorn (M.R.C.) (Hickman County, Ky., Mississippi River Commission, 1880).—About 1 mile below Columbus, about 1 mile above Chalk Bluff, on slope of river bank, on river edge of cultivated field, and 36 meters (118 feet) below fence. Fringe of willows are at foot of river bank. Marked by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper

bolt in tile below, as described in note 16. Station reported destroyed in 1927 by caving into river.

Little Obion=P.B.M. 6/2 (M.R.C.) (Fulton County, Ky., Mississippi River Commission, 1880; 1926).—About 1 mile above head of Island 6, 1½ miles above mouth of Little Obion River, about 1 mile back from river bank, about 345 meters (1,132 feet) east of house in cultivated field on old main bank, in field on prominent ridge about 200 meters (656 feet) south of east-and-west wire fence, and about 80 meters (98 feet) east of bank of slough, in fence line 3 meters (10 feet) west of road. Marked by stone post surmounted by iron pipe. Distances from station and azimuths to blazed trees are: 14-inch ash, 12 meters (39 feet), 7°; 16-inch locust, 4 meters (13 feet), 120°; 12-inch ash, 8 meters (26 feet), 181°; and 14-inch boxelder, 2 meters (7 feet), 251°.

Mitcham (M.R.C.) (Fulton County, Ky., Mississippi River Commission, 1880).—In grove of small sycamore trees in woods, 200 meters (656 feet) from river bank, 95 meters (312 feet) in front of levee at point 300 meters (984 feet) below angle in levee, 450 meters (1,476 feet) below levee milestone 11/12, and 77 meters (253 feet) below rail fence separating timber from cultivated field. Marked by stone post, surmounted by iron pipe without cap, projecting 6 inches. Distances from station and azimuth to blazed trees are: 8-inch sycamore, 4 meters (13 feet), 50°; 8-inch sycamore, 4 meters (13 feet), 145°; and 8-inch sycamore, 4 meters (13 feet), 260°.

Tennessee (M.R.C.) (Lake County, Tenn., Mississippi River Commission, 1880).—One and one-half miles above Slough Landing, 413 meters (1,355 feet) above levee milestone 21 at end of levee, 610 meters (2,001 feet) from river bank back of towhead, on small hillock in borrow pit in front of levee, 32 meters (105 feet) from center of levee, and 63 meters (207 feet) below white house just inside of levee. Marked by stone post. Distances from station and azimuths to blazed trees are: 14-inch cottonwood, 17.4 meters (57 feet), 70°; 16-inch cottonwood, 19.4 meters (64 feet), 80°; and 14-inch cottonwood, 5.3 meters (17 feet), 160°. Station reported destroyed in 1927 by moving of levee.

State Line (M.R.C.) (Lake County, Tenn.; Fulton County, Ky., Mississippi River Commission, 1880).—About 7 miles above New Madrid, Mo., three-fourths mile below Bessie Landing, on State line between Lake County, Tenn., and Fulton County, Ky., on east side of peninsula extending northward toward New Madrid, Mo., 4 meters (13 feet) west of old high bank, 3 meters (10 feet) south of south line fence of Alexander Adams, and 83.5 meters (274 feet) east of large State-line boundary stone. Marked by stone post, top of which is broken off. A 12-inch blazed elm tree is 11 meters (36 feet) from station in azimuth 170°. Station reported destroyed in 1927 by caving into river.

Mott (M.R.C.) (Pemiscot County, Mississippi River Commission, 1880; 1927).—Two and one-half miles above Gayoso, on south side of cultivated field, back of willow bar, about 45 meters (148 feet) back of river bank, about 270 meters (886 feet) southwest of bank of Robinson Bayou, and 40 meters (131 feet) back of center line of road along bayou. Marked by stone post, top of which is broken off about 3 inches above surface of ground.

Myers (M.R.C.) (Lake County, Tenn., Mississippi River Commission, 1880).—Two miles above Caruthersville, Mo., in woods, near center of and on eastern side of Island 15, 760 meters (2,493 feet) east from river bank in 1912, 330 meters (1,083 feet) back of wide slough, 250 meters (820 feet) west of old chute of Island 15, and 33 meters (108 feet) south of east-and-west fence at lower edge of field and upper side of timber, on land owned by Rose Powell. Marked by stone post projecting 3 inches. Distances and azimuths from station to blazed trees are: 6-inch boxelder, 9 meters (30 feet), 45°; 6-inch hackberry, 7 meters (23 feet), 195°; 14-inch forked locust, 12 meters (39 feet), 240°; and 5-inch persimmon, 8 meters (26 feet), 345°.

Cottonwood north base (P.B.M. north base (M.R.C.)) (Pemiscot County, C. H. Boyd, 1879).—About three-fourths mile above town of Cottonwood Point, 300 meters (984 feet) below point opposite foot of Island 18, at base of west slope of levee, 40 meters (131 feet) below angle in levee, 70 meters (230 feet) back of river bank, 25 meters (82 feet) south of house of James Garrett, and 11 meters (36 feet) south of yard fence. Marked by copper bolt in stone post marked "1879." Top of stone is about 6 inches below surface. Pipe

For notes in regard to marking of stations see p. 80.

marked with triangle has been placed at side of stone. A 60-inch blazed cottonwood tree is 48 meters (157 feet) from station in azimuth 10° . Station reported destroyed in 1927.

Slater (M.R.C.) (Dyer County, Tenn., Mississippi River Commission, 1880).—Three hundred meters (984 feet) below point opposite foot of timber on foot of Island 21, 86 meters (282 feet) from river bank, at edge of timber on west side of cultivated field, 13 meters (43 feet) northwest of corner of field, and about 40 meters (131 feet) below farm road leading back from river. Marked by stone post, top of which is flush with surface of ground. Distances and azimuths from station are: Blazed 36-inch cottonwood tree, 3 meters (10 feet), 140° ; and 14-inch sycamore tree, 8.5 meters (28 feet), 320° .

Mitchell=B.M. 36/2 (M.R.C.) (Dyer County, Tenn., Mississippi River Commission, 1880).—About 2 miles above mouth of the Obion River before it turns southwardly, 2 miles below foot of Island 21, 90 meters (295 feet) back of old river bank used as road, about in center of cottonfield, 80 meters (262 feet) south of north fence, and 75 meters (246 feet) north of south fence. Marked by stone post, top of which is 14 inches below surface of ground. Azimuths and distances from station are: Blazed 8-inch cottonwood tree, 30° , 70 meters (230 feet); and blazed 12-inch cottonwood tree, 40° , 70 meters (230 feet).

Obion = P.B.M. 32 (M.R.C.) (Dyer County, Tenn., Mississippi River Commission, 1880).—Three-fourths mile above Obion River at its junction with Mississippi River, 10 meters (33 feet) west of public road running to Obion River, 6 meters (20 feet) east of east bank of long narrow lake or slough, and 330 meters (1,083 feet) below angle in fence at southwest corner of cultivated field. Marked by copper bolt in stone post, top of which is flush with surface of ground. Stone is hidden in west side of double osage-orange stump which stands 2 feet above ground and has limbs growing out of it. Azimuths and distances from station are: 18-inch blazed honey-locust tree, north, 2.4 meters (8 feet); 48-inch blazed cottonwood tree, 240° , 30 meters (98 feet); 48-inch blazed cottonwood tree, 280° , 35 meters (115 feet); and 30-inch blazed cottonwood tree, 335° , 135 meters (443 feet).

Worthen (M.R.C.) (Jackson County, Ill., Mississippi River Commission, 1880; 1908).—On high point of bluffs about $1\frac{1}{4}$ miles above point where bluffs turn back forming upper boundary of Big Muddy River bottom, about $3\frac{1}{2}$ miles above Sand Ridge on Illinois Central Railroad, 2 miles northwest of Grimsby on St. Louis, Iron Mountain & Southern Railway, on land owned by the Worthen heirs, and a few rods from line between their property and railroad land. Road turning up bluffs one-half mile above Kinkaid Bridge leads past station about $1\frac{1}{2}$ miles farther on. Marked by center of stone post, top of which is broken off. In 1908 station was found in low chicken house, which was last remnant of old homestead in small clearing.

Backbone = B.M. 26/4 (M.R.C.) (Perry County, Mississippi River Commission, 1880; 1932).—On top of hill directly back of rock ledge known as "Devils Backbone", three-eighths mile below Red Rock, on river side of oak tree, top of which is sawed off. Marked by stone post. In 1932 stone post was found chipped but otherwise in good condition.

Manskear (M.R.C.) (Randolph County, Ill., Mississippi River Commission, 1880).—On prominent point of bluffs, directly back of Manskear's house, opposite foot of Crains Island, on right bank about midway between mouth of Marys River and Rockwood, 175 meters (574 feet) below railroad trestle. Marked by hole drilled in rock surrounded by triangle.

Chester lower base (M.R.C.) (Perry County, Mississippi River Commission, 1880; 1932).—Three-fourths mile above Bishop Landing, 335 feet from high bank, at top of slope, on land of Barney Huber, between fourth and fifth hurdles above Bishop Landing, and 900 feet and 456 feet from their respective shore ends. Surface mark is center of cap on iron pipe projecting 14 inches. Underground mark is cross on copper rivet in stone post 2 feet underground. Azimuths and distances from station to various objects are: Stone chimney of Mansker house, $161^\circ 10'$; north gable of Vessells' house, $295^\circ 37'$; south gable of Huber's house, $107^\circ 10'$; north gable of schoolhouse, $352^\circ 07'$; $3\frac{1}{2}$ -foot sycamore tree in northwest corner of field, $148^\circ 12'$; walnut stump on same ridge back of station, $78^\circ 42'$, 227 feet; 32-inch blazed pecan tree, $274^\circ 48'$, 356 feet; 38-inch blazed elm, $282^\circ 11'$, 585 feet; and $6\frac{1}{2}$ -foot blazed sycamore, $3^\circ 58'$, 965 feet.

Chester (M.R.C.) (Randolph County, Ill., Mississippi River Commission, 1880).—On highest point of bluffs about one-half mile below Chester, about one-half mile back of Cole's Mill, in cultivated field on Widow Cole's property, and downstream from angle in road leading from eastern part of Chester down bluffs to Cole's Mill. Marked by hole in stone post.

Rozier (M.R.C.) (Perry County, Mississippi River Commission, 1880).—On highest point of first prominent bluff about 2 miles below St. Marys. Path up bluff to station leaves St. Louis-San Francisco Railway at point 390 meters (1,280 feet) above Perryville Junction. Marked by center of stone post (shattered). Mark not found in 1932.

Vause (M.R.C.) (Ste. Genevieve County, Mississippi River Commission, 1880; 1932).—Three miles above St. Marys, one-half mile below River Aux Vases, about 1 mile above Saline Creek, on high bluff, and 300 meters (984 feet) back from old river. Marked by center of stone post with top broken off.

Brewerville (M.R.C.) (Randolph County, Ill., Mississippi River Commission, 1880; 1908).—On bluff, 1 mile above (northwest of) Modoc, $2\frac{1}{2}$ miles below Prairie du Rocher, near edge of low cliff, on bare spot in pasture, on land owned by Francis Bonlew. Marked by center of stone post with top broken off.

Magnolia (M.R.C.) (Ste. Genevieve County, Mississippi River Commission, 1880; 1903).—On highest point of high hill, 120 meters (394 feet) above trestle at Cambria Hollow, 1,500 meters (4,921 feet) below railroad bridge across Establishment Creek, and 100 meters (328 feet) back from railroad. Marked by center of stone post with top broken off. Mark not found in 1928.

County line (M.R.C.) (Monroe-Randolph Counties, Ill., Mississippi River Commission, 1880; 1908).—On bluffs, about $3\frac{1}{4}$ miles southeast of Glasgow City, about 2 miles northwest of Prairie du Rocher, on line between Monroe and Randolph Counties, 1.5 meters (6 feet) back of county-line stone. Marked by center of stone post.

Ceasars (M.R.C.) (Jefferson County, Mississippi River Commission, 1880; 1932).—Opposite foot of third stone dike below Michaels Hollow, on third prominent bluff below Michaels Hollow, and 10 feet west of face of cliff. Marked by stone post with corners broken off.

Herculeaneum (M.R.C.) (Jefferson County, Mississippi River Commission, 1880; 1902).—About $2\frac{1}{2}$ miles above Crystal City, 720 meters (2,362 feet) below mouth of Joachim Creek, and 10 feet back from most prominent point at upper end of Joachim Bluff. Marked by iron pipe.

Sulphur Springs (M.R.C.) (Jefferson County, Mississippi River Commission, 1880; 1900).—About one-half mile below town of Sulphur Springs, on top of bluff, 40 meters (131 feet) west of railroad track. Marked by stone post which has been cracked on river side and through center.

Meramec = B.M. 48/4 (M.R.C.) (Jefferson County, Mississippi River Commission, 1880; 1903).—On bluff, 65 meters (213 feet) back from St. Louis, Iron Mountain & Southern Railway, and $1\frac{1}{4}$ miles above mouth of Meramec River. Marked by stone post which was reset in 1903. Stone not found in 1929.

Forder (St. Louis County, C. H. Boyd, 1873, Mississippi River Commission, 1880).—Within the common of Carondelet, south of River des Peres, about 250 meters (820 feet) south-southwest of the intersection of the telegraph road and the Jefferson Barracks road, on a gentle rise a few meters north of a 20-foot road near its intersection with the telegraph road. Station is marked by nail in top of stake with a mound of dirt thrown up over it. Underground mark is an earthenware pyramid with edges about 6 inches long and having on its southern face the letters U.S.C.S., set 2 feet below the general surface of the ground.

Standpipe (M.R.C.) (St. Louis County, Mississippi River Commission, 1880).—On top of old standpipe at intersection of Grand Avenue and Twentieth Street, St. Louis. Marked by a dot in small, three-fourths-inch triangle cut in iron floor inside iron railing, 2.41 feet northwest of northwest side of iron post directly southwest of extreme east part of railing, 2.47 feet southwest of southwest side of iron post directly northwest of extreme east part of railing, and 2.57 feet east of east corner of iron bolt at circular edge of iron floor.

Robinson (M.R.C.) (St. Louis County, Mississippi River Commission, 1880; 1903).—On top of bluff at Chain of Rocks, about 527 feet downstream from northwest corner of north settling basin (measured in direction of Columbian Bottom road), 470 feet west of center of road, 25 feet west of crest of bluff,

220 feet northeast of nail 3 feet above ground driven into southwest side of 15-inch white oak tree 12 feet west of fence, and 14 feet from nail in 15-inch elm tree 13 feet east of fence. Marked by center of hole in 6-inch square stone post. In 1921 it was reported that mark was covered by roadway surface.

Soechtig (M. R. C.) (Madison County, Ill., Mississippi River Commission, 1880; 1903).—About 1 mile back of Cabaret Island, 430 meters (1,411 feet) northwest of track of Chicago & Alton Railroad, opposite two houses, at south end of clump of timber, on north bank of large gully. Marked by stone post. Mark not found in 1930.

Hop Hollow (M.R.C.) (Madison County, Ill., Mississippi River Commission, 1881; 1932).—About 2 miles above Alton, on crest of high bluff above abandoned quarry, on first knoll above point where railroad trestle crosses creek in ravine known as "Hop Hollow", and about 5 meters (16 feet) east of fence. Marked by stone post which is leaning slightly.

Hull (M.R.C.) (Madison County, Ill., Mississippi River Commission, 1881; 1932).—On slope of high bluff about $1\frac{1}{4}$ miles below Clifton Terrace, about 125 meters (410 feet) northwest of large brick mansion owned by Mr. Levis, about 60 meters (197 feet) west of water tank in back of house, about 15 meters (49 feet) from crest, and about 25 meters (82 feet) from edge of bluff. Marked by stone post, top of which is broken off.

Barwise (M.R.C.) (St. Charles County, Mississippi River Commission, 1881; 1932).—On head of Dresser Island, 300 meters (984 feet) above point opposite foot of Piasa Island, about 80 meters (262 feet) below small dike extending out from right bank, 70 meters (230 feet) from river bank, 30.8 meters (101 feet) south of 30-inch blazed black-oak tree, 32.3 meters (106 feet) northwest of 24-inch blazed black oak tree, and 34.2 meters (112 feet) northwest of 20-inch blazed sycamore tree. Marked by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper bolt in tile below, as described in note 16. Top of pipe projects 3 inches.

Eagles Nest (M.R.C.-Mo.R.C.) (Jersey County, Ill., Mississippi River Commission, 1881; 1932).—On lower part of wooded bluff ridge, at head of Eagles Nest Island, on land owned by Mr. Starr. Marked by 4-inch iron pipe, stamped "Missouri River Commission" which is boxed in concrete. Also station of Missouri River Commission (1887).

Portage (M.R.C.) (St. Charles County, Mississippi River Commission, 1881; 1932).—About three-eighths mile back of Portage des Sioux, on land owned by Mrs. Marie H. Lyons, in cultivated field, about 300 meters (984 feet) east of the north-and-south road which runs south from St. Francis Church. Marked by stone post projecting 8 inches.

Grafton (M.R.C.) (Jersey County, Ill., Mississippi River Commission, 1881; 1928).—On first bluff to west of Catholic Church at Grafton, about 10 meters (33 feet) north of edge of bluff, over old quarry which is directly back of Upper Grafton, 14.7 meters (48 feet) northeast of blazed elm stump at edge of cliff, 12.1 meters (40 feet) north of twin cedar stumps at edge of cliff, 11.1 meters (36 feet) west of hackberry bush on range with station and spire of Catholic Church, and 22 meters (72 feet) south of excavation or depression 3 feet across and 2 feet deep containing loose stone to depth of 6 inches. To reach go up south face of bluff. Marked by cross in copper bolt in solid rock about 6 inches below surface. Pile of loose stones, about 6 inches in depth, is over station.

River Mouth (M.R.C.) (Jersey County, Ill., Mississippi River Commission, 1881; 1893).—On north side of Illinois River, near center of small field on eastern crest of bluff, and 300 meters (984 feet) above (west of) Deer Plain ferry. To reach, follow path directly up south side of bluff. Originally marked by stone post but re-marked in 1893 by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper bolt in tile below, as described in note 16. In 1928, surface mark had been destroyed, and underground mark was not recovered.

Point Landing (M.R.C.) (Calhoun County, Ill., Mississippi River Commission, 1881).—About 800 meters (2,625 feet) below Point Landing, about 1,000 meters (3,281 feet) back from river bank, on land owned by Charles Keehner, in cultivated field, about 4 meters (13 feet) from fence along road, about 40 meters (131 feet) west of frame dwelling house, 5 meters (16 feet) northwest of 20-inch blazed walnut tree, 5 meters (16 feet) northeast of an 18-inch blazed

walnut tree, and 13 meters (43 feet) southwest of Illinois River Commission bench mark. Marked by stone post, flush with surface.

Calhoun (M.R.C.) (Calhoun County, Ill., Mississippi River Commission, 1881).—About 4 miles northeast of Point Landing, on property owned by Mr. Dearkess, on north side of east-and-west road which leads over timbered ridge. Marked by stone post.

Droege (M.R.C.) (Calhoun County, Ill., Mississippi River Commission, 1881).—About $2\frac{3}{4}$ miles east of Beach's Landing, on land owned by John Droege, on timbered hill, about 400 meters (1,312 feet) north of east-and-west road that leads from Beach's Landing. Marked by stone post.

Keel (M.R.C.) (Calhoun County, Ill., Mississippi River Commission, 1881).—About three-fourth mile east of Sunset (Brussels) Landing, on top of high hill, on land owned by Mrs. Lizzie Minesinger, in cultivated field, 6.7 meters (22 feet) south of center line of east-and-west road which runs over hill east from Sunset Landing, and 115 meters (377 feet) west of Mrs. Minesinger's house. Road runs through large apple and peach orchard which lies between station and river. Marked by stone post projecting 6 inches.

Cahill (M.R.C.) (Calhoun County, Ill., Mississippi River Commission, 1881).—About 750 meters (2,461 feet) below Cap Au Gris Rock, 190 meters (623 feet) from river bank, in field, 8 meters (26 feet) southwest of edge of cornfield, and about 42 meters (138 feet) from edge of bluff. Marked by stone post, top of which is broken off.

Winfield (M.R.C.) (St. Charles County, Mississippi River Commission, 1881).—About one-half mile below village of Winfield on Chicago, Burlington & Quincy Railroad, on land owned by Henry Schemme, and about 50 feet from road where it begins to turn off from railroad.

Wilson (M.R.C.) (Calhoun County, Ill., Mississippi River Commission, 1881).—About $1\frac{3}{4}$ miles back from river bank, about 3 miles above Cap Au Gris Rock, on land owned by J. C. Bell, on bluff, 125 meters (410 feet) above Batchtown cemetery, 3 meters (10 feet) south of east-and-west fence which runs along lower side of young orchard owned by Otto Snyder, 5 meters (16 feet) west of north-and-south fence along west side of cultivated field and 6 meters (20 feet) southwest of fence corner. Marked by stone post projecting 8 inches.

Kilham (M.R.C.) (St. Charles County, Mississippi River Commission, 1881).—In center of cultivated field on land owned by David Kilham, almost due north of barn, and about 250 meters (820 feet) north of tenant's house. Marked by stone post, projecting about 2 inches.

Peets (M.R.C.) (Calhoun County, Ill., Mississippi River Commission, 1881).—About opposite head of Maple Island, about 1,000 meters (3,281 feet) back from river bank, about 400 meters (1,312 feet) above Kritzville, on land owned by Bodle Castleton, in cultivated field, on crest of bluff, about 200 meters (656 feet) above Castleton's residence, on narrow ridge that begins at hollow just below Castleton's residence, 47.2 meters (155 feet) from timber at north end of field, and 5 meters (16 feet) east of timbered slope of bluff along west side of field. Bluffs to west of station are covered with young locust trees. Marked by stone post, projecting 3 inches.

Hamburg (M.R.C.) (Calhoun County, Ill., Mississippi River Commission, 1881).—On top of first bluff above Hamburg, on narrow ridge which is 2 meters (7 feet) wide and which runs parallel to river, just above point where transmission line turns back from river, on back part of ridge, on highest point in vicinity, 55 meters (180 feet) above monument to Capt. Lewis Swarnes, which is 1 meter (3 feet) below fence across hill, 2 meters (7 feet) back from crest of bluff, and 5.6 meters (18 feet) northeast of blazed ash tree standing in cluster of ash trees. Marked by stone post projecting 8 inches.

Bellevue (M.R.C.) (Calhoun County, Ill., Mississippi River Commission, 1881).—On cleared summit of bluff which makes out to west in long ridge, about 1 mile above village of Bellevue, on land owned by George Long, and about one-eighth mile south of his house.

Long (M.R.C.) (Pike County, Ill., Mississippi River Commission, 1881).—On steep, rocky point just back of Walnut Grove schoolhouse, about 4 miles above Pleasant Hill, 5 miles back from river bank, on property owned by May Vera, on bare point about 35 meters (115 feet) in front of timber, about 200 meters (656 feet) below road leading into bottoms, and 19.7 meters (65 feet)

southwest of 18-inch blazed oak tree. Marked by stone post projecting 5 inches.

Salt River (M.R.C.) (Pike County, Mississippi River Commission, 1881).—On summit and close to river face of high bluff at mouth of Salt River, and about 1 mile above station *Louisiana*. Bluff is mostly cleared.

McLean (M.R.C.) (Pike County, Mississippi River Commission, 1881).—On near edge of high bluff, about 3 miles below railroad bridge at Louisiana, about 160 meters (525 feet) from river bank, about opposite foot of Crider Island, 11 meters (36 feet) from fence, 3 meters (10 feet) south of 12-inch blazed forked elm tree, 4 meters (13 feet) east of 12-inch blazed burr-oak tree, and 7 meters (23 feet) northwest of 6-inch blazed hickory tree. Marked by copper bolt in stone post.

Louisiana inner base (M.R.C.) (Pike County, Ill., Mississippi River Commission, 1881).—About 2 miles from ferry landing opposite Louisiana, and 14½ feet northwest of rail of Chicago, Burlington & Quincy Railroad. Surface mark is hole in stone projecting 6 inches. Underground mark is cross on copper bolt in stone buried 2½ feet below surface.

Louisiana outer base (M.R.C.) (Pike County, Ill., Mississippi River Commission, 1881).—About one-fourth mile from ferry landing, 150 feet northeast of old water tank standing beside railroad track near old turntable and round-house, and 14½ feet northwest of rail of Chicago, Burlington & Quincy Railroad. Surface mark is hole in stone post projecting 6 inches. Underground mark is cross on copper bolt in stone buried 2½ feet below surface.

Louisiana (M.R.C.) (Pike County, Mississippi River Commission, 1881).—On summit of high bluff just above first sawmill north of elevator in town of Louisiana, and just north of large stone quarry. Marked by cross in top of stone post.

Red House (M.R.C.) (Ralls County, Mississippi River Commission, 1881).—About one-half mile below Taylor Island, about 260 meters (853 feet) back from Chicago, Burlington & Quincy Railroad, on crest of peaked bluff which is covered with light timber and underbrush and located between small ravine on its upper side, and valley on its lower side. Marked by copper bolt in stone post.

See Horn (M.R.C.) (Pike County, Ill., Mississippi River Commission, 1881).—On summit of ridge at edge of timber on first bluff north of railroad at station Seehorn on Chicago, Burlington & Quincy Railroad, on land owned by L. Baker.

Hannibal (M.R.C.) (Marion County, Mississippi River Commission, 1881).—About 2 miles below Hannibal, about 700 meters (2,297 feet) below transmission line across river, about 1 mile above cement works, about 20 meters (66 feet) back of telephone line, on crest of high bluff, which is on edge of steep ravine, about 160 meters (525 feet) back from river, and 3 meters (10 feet) east of 5-inch blazed sassafras tree. Ravine at base of bluff on which station is located is deep and extends far back from river. Marked by copper bolt in stone post.

Marblehead (M.R.C.) (Adams County, Ill., Mississippi River Commission, 1881).—About 500 meters (1,640 feet) above Marblehead, about 220 meters (722 feet) below large red barn on crest of bluff, and 7 meters (23 feet) northeast of 18-inch blazed elm tree, on extreme top of and about in center of natural clay mound which is about 15 meters (49 feet) in diameter by 3 meters (10 feet) in height. This mound is on edge of bluff on highest point in vicinity. A second clay mound, about 3 meters (10 feet) in height, is about 15 meters (49 feet) downstream from mound that station is on. Marked by hole in stone post which projects 14 inches.

Nelson (M.R.C.) (Marion County, Mississippi River Commission, 1881).—About opposite Quincy, Ill., about 1½ miles north of tank station on Hannibal & St. Joe Railroad, on land owned by Cornelius Nelson, about 200 feet in front of his house, and 50 feet south of barn standing close to corner of rail fence.

Quincy (M.R.C.) (Adams County, Ill., Mississippi River Commission, 1881).—On old Indian Mound, about 200 feet above Chicago, Burlington & Quincy Railroad tracks, on prolongation of Vine Street, almost on prolongation of Olive Street, on land owned by Mr. Zimmerman. Marked by 8-foot tripod and platform of milled lumber placed over stone flush with top of mound.

La Grange (M.R.C.) (Lewis County, Mississippi River Commission, 1881).—On flat tin roof of frame house owned by R. N. Blackwood, on northeast corner of street leading by La Grange College and Third Street north of Main Street leading west from landing levee and depot, 44¼ inches from north edge of flat tin roof, 45 inches from east edge, and 53 inches from west edge. Marked by "X" on copper tack driven into roof. Two reference stones project about 2 inches above surface of ground. No. 1 is 0.65 meter (2.1 feet) from fence, and 0.74 meter (2.4 feet) from southeast corner of street. No. 2 is 0.70 meter (2.3 feet) from fence, and about 20 meters (66 feet) from northwest corner of street.

Canton University (M.R.C.) (Lewis County, Mississippi River Commission, 1881).—On University dome, 15½ inches from outer edge of scuttle hole toward town (east), and 20¼ inches from southeast corner of scuttle. Marked by cross indented into tin roofing on dome. Reference stone no. 1 is 0.5 meter (2 feet) from northern boundary fence. Reference stone no. 2 is 11.27 meters (37.0 feet) from eastern gate, outside of fence, and about 0.75 meter (2.5 feet) south of sidewalk leading to building. Reference stone no. 3 is 1.90 meters (6.2 feet) from western gate, and inside of fence.

Cougil (M.R.C.) (Lewis County, Mississippi River Commission, 1881).—About 4 miles above Canton, at point about opposite head of Tully Island, about 100 meters (328 feet) above very prominent ravine, about 100 meters (328 feet) below smaller ravine, on land owned by Mr. Funkenbush, on brow of high hill, in east end of orchard, 55 meters (180 feet) up river from lower river corner of orchard fence, 2 meters (7 feet) from brow of hill, 4.5 meters (15 feet) west of 10-inch blazed hickory tree in fence line, and 17 meters (56 feet) southwest of 18-inch blazed white-oak tree. Two-story yellow house, occupied by Mr. John Johnson, stands on hill about 300 meters (984 feet) below station. Marked by hole in stone post 6 inches square, projecting 12 inches.

Yellow Banks (M.R.C.) (Lee County, Iowa, Mississippi River Commission, 1881).—On yellow clay bluff, on second projecting promontory at bend in old Des Moines River, about 5 miles up Des Moines River. Roadbed of Chicago, Rock Island & Pacific Railway runs along its base. Station is easily found as locality is popularly known for miles around as "The Yellow Banks."

Fox River (M.R.C.) (Clark County, Mississippi River Commission, 1881).—About 7 miles west of Alexandria, about 800 meters (2,625 feet) southwest of Fox River, on top of bluff about 150 meters (492 feet) back of State Route 61, about three-fourths mile below where Route 61 crosses Fox River, on property owned by Mr. Burk, on small mound on highest ground in vicinity, 200 meters (666 feet) (paced) above lower line of Burk's farm, about 150 meters (492 feet) below road coming in from east, 35.4 meters (116 feet) back of fence which runs along brow of hill, 26.5 meters (87 feet) west of 16-inch blazed hickory tree and 35.6 meters (117 feet) southwest of 16-inch blazed walnut tree. Marked by hole in stone post, 6 inches square, projecting 6 inches.

Warsaw (M.R.C.) (Hancock County, Ill., Mississippi River Commission, 1881).—About one-half mile above Warsaw, on brow of hill in open field which was once an orchard, opposite a point about 100 meters (328 feet) below dike which is just below first island above Warsaw, and 18 meters (59 feet) north of 18-inch chestnut tree. Large two-story stone house surrounded by evergreen trees stands about 100 meters (328 feet) to east on first hill above Popel & Giller's Delightful Brewery. Marked by hole in top of stone post, 6 inches square, projecting 10 inches.

Boardman (M.R.C.) (Lee County, Iowa, Mississippi River Commission, 1881).—On east side of Sugar Creek Road leading due west of station *Hughes* and about 200 feet from corner of farm owned by Mr. Boardman. Bluff at this point dips toward Des Moines River. Marked by 14-foot tripod placed over stone post projecting about 3 inches.

Hughes (M.R.C.) (Lee County, Iowa, Mississippi River Commission, 1881).—At corner of Sugar Creek Road and Boulevard, about 1½ miles back of city of Keokuk, beyond cemetery, on land owned by Dr. Joseph Hughes, 4¼ feet inside of fence along Sugar Creek Road, and 60 feet from fence along the Boulevard. Marked by 12-foot tripod of sawed lumber placed over stone projecting about 3 inches.

Worster (M.R.C.) (Hancock County, Ill., Mississippi River Commission, 1881).—On crest of bluff 1½ miles below Illinois end of Keokuk Dam, in yard

of Mr. Ackley's residence, 15 inches from north side of his small stucco house. Large house stands on river side of railroad about 100 meters (328 feet) above station. Path leads uphill from barn to Ackley's house. Marked by hole in top of stone post, 6 inches square, top of which is flush with surface of the ground. One corner of stone is chipped off, but center hole is intact. This stone is used as headstone for child's grave. Distances and azimuths from station to various objects are: 12-inch blazed wild-cherry tree, 5 meters (16 feet), 170°; 15-inch blazed walnut tree, 4.5 meters (15 feet), 219°; upper river corner of house, 4 meters (13 feet), 268°; and the lower river corner of house, 7.5 meters (25 feet), 331°.

Keokuk (M.R.C.) (Lee County, Iowa, Mississippi River Commission, 1881).—On east or river side of Grand Avenue between Thirteenth and Fourteenth Streets in Keokuk, in vacant lot covered with brush, 8.7 meters (29 feet) toward river from east curb line of Grand Avenue, and 20.9 meters (69 feet) south or downstream from prolongation of south curb line of Fourteenth Street. Marked by hole in top of a stone post 6 inches square, marked "U.S." Top of stone projects 8 inches.

Hamilton (M.R.C.) (Hancock County, Ill., Mississippi River Commission, 1881).—On island near head of Hamilton sloughs, about three-fourths mile above Keokuk Bridge, three-fourths mile from Hamilton, and about 30 meters (98 feet) from shore. Marked by 6-foot tripod over marking stone projecting 4 inches.

Rapids (M.R.C.) (Hancock County, Ill., Mississippi River Commission, 1881).—About 2½ miles above Keokuk Bridge, about 10 feet south of gulch, and about 6 feet from edge of river bank, between it and road. Marked by 8-foot tripod of sawed lumber over marking stone projecting about 3 inches.

Keokuk lower base (M.R.C.) (Lee County, Iowa, Mississippi River Commission, 1881).—Approximately 1,300 meters (4,265 feet) south of *Keokuk upper base (M.R.C.)*, about 100 feet west of Chicago, Burlington & Quincy Railroad track, in front of Anschutz's Brewery, and about 60 feet north of small house. Surface mark is stone post projecting about 6 inches. Underground mark is cross in copper bolt in stone post buried 30 inches beneath surface of ground.

Keokuk upper base (M.R.C.) (Lee County, Iowa, Mississippi River Commission, 1881).—Along west side of Des Moines Rapids Canal, about 10 feet west of Chicago, Burlington & Quincy Railroad track, and about 100 feet north of switch at upper end of middle lock. Surface mark is stone post projecting about 6 inches. Underground mark is cross in copper bolt in stone post buried 30 inches beneath surface of ground.

Church (M.R.C.) (Hancock County, Ill., Mississippi River Commission, 1891).—On bluff in timber, on land owned by Dr. Kennal, about 250 meters (820 feet) south of Mount Bell schoolhouse, 100 meters (328 feet) below very prominent ravine, 150 meters (492 feet) back of crest of bluff, and about opposite dry dock at middle lock of Des Moines Rapids Canal. Marked by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper bolt in tile below, as described in note 16.

Vineyard=B.M. 112/c (M.R.C.) (Lee County, Iowa, Mississippi River Commission, 1891).—About 3 miles above Keokuk, 3 meters (10 feet) back from crest of bluff, 100 meters (328 feet) below sign on railroad reading "Sandusky", in upper part of triangular field, on lower end of ridge, in front of deep ravine up which road runs back from river, about 90 meters (295 feet) above downstream side of field, and about 500 meters (1,640 feet) below large white house on top of hill. Marked by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper bolt in tile below, as described in note 16. Top of pipe projects 18 inches.

Waggoner (M.R.C.) (Hancock County, Ill., Mississippi River Commission, 1891).—On first bluff below mouth of Waggoners Creek, on cleared land, 17 meters (56 feet) south of wire fence running back from crest of bluff, and 45 meters (148 feet) back from crest of bluff. Marked by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper bolt in tile below, as described in note 16.

Sandusky (M.R.C.) (Lee County, Iowa, Mississippi River Commission, 1891).—Opposite Sandusky Station on Chicago, Burlington & Quincy Railroad, in dam between Des Moines Rapids Canal and river. Marked by copper bolt in coping stone on east side of wall and over south sluice gate of waste gate.

Larry (M.R.C.) (Hancock County, Ill., Mississippi River Commission, 1891).—On highest point of bluff just above mouth of Larrys Creek. Top of bluff is cultivated, and slopes are timbered 15 meters (49 feet) from wire fence running along crest of bluff. Marked by standard mark of Mississippi River Commission, brass cap on steel pipe above and copper bolt in tile below, as described in note 16.

Supplementary points

Chester church spire (M.R.C.) (Randolph County, Ill., Mississippi River Commission, 1880).—The most prominent church spire in Chester, in north-eastern part of city, and about 1 mile from river.

Jefferson Barracks flagstaff (M.R.C.) (St. Louis County, Mississippi River Commission, 1903).—Flagstaff at Jefferson Barracks.

Quincy Catholic Church, spire (M.R.C.) (Adams County, Ill., Mississippi River Commission, 1881).—Top of Adams Street Catholic Church at corner of Seventh and Adams Streets in Quincy.

La Grange College (M.R.C.) (Lewis County, Mississippi River Commission, 1881).—Top of finial of the La Grange College, in La Grange, Mo. College is now abandoned. The building is on top of the bluff at the north end of the town.

Hamilton Church spire (M.R.C.) (Hancock County, Ill., Mississippi River Commission, 1881).—Spire of church at Hamilton.

Mrs. H. W. Sample's house, cupola (M.R.C.) (Lee County, Iowa, Mississippi River Commission, 1881).—Peak of octagonal cupola on two-story brick house at southeast corner of Concert and Second Streets in Keokuk, belonging to Mrs. H. W. Sample. Tin roof is painted red. Cupola differs from others in that it has peculiar fence around it and has large windows.

Keokuk Unitarian Church spire (M.R.C.) (Lee County, Iowa, Mississippi River Commission, 1881).—Peak of octagonal spire of brick Unitarian Church at corner of Fourth and High Streets in Keokuk. Spire is slated and carries lightning rod.

Keokuk Presbyterian Church spire (M.R.C.) (Lee County, Iowa, Mississippi River Commission, 1881).—Peak of octagonal spire of stone Presbyterian Church at corner of Seventh and Blondeau Streets in Keokuk. Spire is slated and carries lightning rod.

Warsaw Presbyterian Church spire (M.R.C.) (Hancock County, Ill., Mississippi River Commission, 1881).—Brown spire of brick Presbyterian Church on Fourth Street in Warsaw.

Warsaw Methodist Church spire (M.R.C.) (Hancock County, Ill., Mississippi River Commission, 1881).—Gray spire of brick-towered Methodist Episcopal Church at Harrison and Fifth Streets in Warsaw.

NINETY-THIRD MERIDIAN ARC

Principal points

Clio (Wayne County, Iowa, E. O. Heaton, 1928).—About 2 miles north of Iowa-Missouri State line, about one-half mile west and $1\frac{3}{4}$ miles south of town of Clio, in northeast corner of sec. 14, T. 67 N., R. 23 W., on land owned by V. K. Stanley, of Humeston, and farmed by Joe Clay, who lives on the farm about one-half mile west. Station is on fence line, 61.75 meters (202.6 feet) west-southwest of section cornerstone, 5.7 meters (19 feet) south of center line of section-line road, and 95.05 meters (311.8 feet) southwest of southwest corner of farmhouse owned by Farmers Fund of Iowa. Surface and underground marks are standard disk station marks in concrete, notes 1 (a) and 7 (a). Upper mark projects 3 inches. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in fence line, 4.9 meters (16 feet) west of center line of section-line road, and 337 meters (1,106 feet) (paced distance) from station in azimuth $190^{\circ}18'39''$. No. 2 is in fence corner, 10.25 meters (33.6 feet) southwest of section cornerstone, and 54.01 meters (177.2 feet) from station in azimuth $272^{\circ}17'$.

Sewal (Wayne County, Iowa, E. O. Heaton, 1928).—About 1 mile south and 0.4 mile east of town of Sewal, on north side of NE $\frac{1}{4}$ sec. 10, T. 67 N., R. 21 W., on land of Mr. McCollough who lives on west side of this quarter

section. There is no road on east side of section 10. The north-and-south road is on half-section line through section 10. Station is 209 meters (686 feet) west of section corner, 586 meters (1,923 feet) east of half-section corner, 7.75 meters (25.4 feet) south of center line of road, and 0.20 meter (0.7 foot) north of fence. Surface and underground marks are standard disk station marks in concrete. Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 7.7 meters (25 feet) north of center line of road, 0.40 meter (1.3 feet) south of fence line, and about 209 meters (685 feet) from station in azimuth $266^{\circ}09'52''$. No. 2 is 7.3 meters (24 feet) north of center line of road, 0.40 meter (1.3 feet) south of fence, and 20.24 meters (66.4 feet) from station in azimuth $137^{\circ}34'$.

Easter (Mercer County, E. O. Heaton, 1928).—About 5 miles east and 1 mile north of Princeton, $2\frac{3}{4}$ miles south and 1 mile west of Ravanna, one-fourth mile south of State Highway 4, on west side center of SW $\frac{1}{4}$ sec. 22, T. 65 N., R. 23 W., on land owned by J. H. Easter, 23.8 meters (78 feet) west and 0.5 meter (1.6 feet) north of northwest corner of Mr. Easter's house, 34.0 meters (112 feet) south-southeast of the half-quarter corner, 6.5 meters (21 feet) east of section-line fence, and just south of five walnut trees. Surface and underground marks are standard disk station marks in concrete. Upper mark is 18 inches below surface of ground, and lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is about 230 meters (755 feet) south of concrete fence post, 6.1 meters (20 feet) east of center line of road, 0.3 meter (1 foot) east of east fence line of road, and 465 meters (1,526 feet) (paced distance) from station is azimuth $65^{\circ}14'01''$. No. 2 is 0.65 meter (2.1 feet) west of half-quarter corner post, 45.6 meters (150 feet) northwest of concrete post on northwest corner of Mr. Easter's porch, and 34.26 meters (112.4 feet) from station in azimuth $166^{\circ}48'$.

Fry (Putman County, E. O. Heaton, 1928).—About 4 miles southeast of Lucerne in the defunct village of Terre Haute, in the NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 15, T. 65 N., R. 21 W., on land deeded to the village for a public square, 7.80 meters (25.6 feet) east of east fence of property owned and occupied by Mrs. Fry, 18.8 meters (62 feet) southeast of pine tree in here yard, and 25 meters (82 feet) north of public road which is one-fourth mile south of east-west section-line road. Surface and underground marks are standard disk station marks in concrete. Underground mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 13.5 meters (44 feet) south of center line of road, 0.50 meter (1.6 feet) west of fence, and 103.6 meters (340 feet) (paced distance) from station in azimuth $244^{\circ}27'58''$. No. 2 is 7.2 meters (24 feet) north of center line of road, 0.40 meter (1.3 feet) east of fence, and 19.82 meters (65.0 feet) from station in azimuth $22^{\circ}50'$.

Olive (Mercer County, E. O. Heaton, 1928).—About 7 miles west and 1 mile south of Harris, one-half mile south of Mount Olive Church, in southwest corner of NE $\frac{1}{4}$ sec. 4, T. 63 N., R. 23 W., on land owned by Schuler King, a banker in Princeton. Station is in southwest corner of field, at the half-section corner, on east side of the road leading south from Mount Olive Church, on north side of road to east, 9.4 meters (31 feet) east of east fence line of half-section-line road, 5.8 meters (19 feet) north of north fence line of half-section-line road, 7.1 meters (23 feet) northeast of walnut tree about 1 foot in diameter with triangular blaze, and 6.3 meters (21 feet) northwest of another similar tree. Surface and underground marks are standard disk station marks in concrete. Upper mark is 20 inches below surface of ground, and lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is on west side of road at fence corner, 5.7 meters (19 feet) west of center line of road, 19.15 meters (62.8 feet) northeast of northeast corner of house, and 212.5 meters (697 feet) (slope distance) from station in azimuth $5^{\circ}46'51''$. No. 2 is 6.3 meters (21 feet) west of center line of road, 0.6 meter (2 feet) northwest of fence corner on prolongation of road from east, and 26.16 meters (85.8 feet) from station in azimuth $59^{\circ}26'$.

Harris (Sullivan County, E. O. Heaton, 1928).—About 4 miles east and 2 miles south of town of Harris, in NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 8, T. 63 N., R. 21 W., on the playground of the Griffith School, 38.17 meters (125.2 feet) southeast of southeast corner of schoolhouse, 4 meters (13 feet) north of fence, and 135 meters (443 feet) west of center line of half-section-line road. Surface and under-

ground marks are standard disk station marks in concrete. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 59 meters (194 feet) south of lane leading to schoolhouse, 5.40 meters (17.7 feet) west of center line of road, 0.45 meter (1.5 feet) east of fence, and 428 feet (paced distance) from station, in azimuth $277^{\circ}38'19''$. No. 2 is 0.45 meter (1.5 feet) east of fence, 4.52 meters (14.8 feet) north of fence intersection, and 25.20 meters (82.7 feet) from station in azimuth $88^{\circ}35'$.

Dunlap (Grundy County, E. O. Heaton, 1928; 1931).—About one-half mile south and 2 miles east of the town of Dunlap, near west side center of the NW $\frac{1}{4}$ sec. 12, T. 61 N., R. 23 W., on land owned by Fisher and Callahan, of Galt. Station is in hay field, 43.7 meters (143 feet) northwest of northwest corner of old vacant house, 12.5 meters (41 feet) east of center line of section-line road, 6.0 meters (20 feet) east of east fence line along road, 35 meters (115 feet) north of driveway leading to old house, 28.1 meters (92 feet) north of center of maple tree near fence line, and 27.7 meters (91 feet) north of another just east of former one. Surface and underground marks are standard disk station marks in concrete. Upper mark is 15 inches below surface of ground, and lower mark 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 6.0 meters (20 feet) west of section-line road, 19.25 meters (63.2 feet) northeast of northeast corner of house owned by Mr. Kincaid, 0.4 meter (1.3 feet) east of fence line, 0.7 meter (2 feet) north of telephone pole, and 407 meters (1,335 feet) (approximate distance) from station in azimuth $2^{\circ}00'57''$. No. 2 is 5.8 meters (19 feet) west of center line of road, 1.5 meters (5 feet) east of fence line, and 20.00 meters (65.6 feet) from station in azimuth $113^{\circ}16'$.

Whaley (Sullivan County, E. O. Heaton, 1928; 1931).—About $1\frac{1}{2}$ miles east and 2 miles south of Humphreys, in northwest corner of the SW $\frac{1}{4}$ sec. 8, T. 61 N., R. 21 W., on land owned by Higgins & McDuff Land Co. and farmed by J. R. Lewis who lives one-fourth mile south. Station is 30 meters (98 feet) east of north-and-south road, 4.35 meters (14.3 feet) south of center line of old east-and-west road, 50 meters (164 feet) northeast of northeast corner of Whaley schoolhouse, and 0.55 meter (1.8 feet) north of fence. Surface and underground marks are standard disk station marks in concrete. Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 4.43 meters (14.5 feet) east of center line of road, 0.45 meter (1.5 feet) west of fence, and 672 feet (paced distance) from station in azimuth $6^{\circ}20'46''$. No. 2 is 6.00 meters (19.7 feet) south of center line of old road, 0.6 meter (2 feet) south of fence, 0.73 meter (2.4 feet) east of a north-and-south fence, and 77.9 feet from station in azimuth $85^{\circ}37'$.

Ruddy (Linn County, E. O. Heaton, 1928; 1931).—About 9 miles west of Purdin, about 8 miles west and 5 miles north of Linneus, about 0.9 mile west of Antioch Church, on north side of NW $\frac{1}{4}$ sec. 11, T. 59 N., R. 22 W., one-fourth mile west of schoolhouse, on land owned by William Ruddy, who lives one-half mile south on west side of section-line road. Station is 7.4 meters (24 feet) south of center line of road, 1.45 meters (4.8 feet) south of south fence line along road, 13.5 meters (44 feet) south of hedge fence on north side of road, about 80 meters (262 feet) west of west end of row of trees on south side of road, and 169.7 meters (557 feet) east of hedge fence along east side of road. Surface and underground marks are standard disk station marks in concrete. Upper mark projects about 3 inches and disk is stamped "ROWDR." Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 6 meters (20 feet) east of center line of north-and-south section-line road, 48.7 meters (160 feet) north-northeast of large locust on west side of road, 0.7 meter (2 feet) east of east fence line, 1 meter (3 feet) northeast of fence post on north side of driveway into field, and 430 meters (1,411 feet) (paced distance) from station in azimuth $23^{\circ}04'39''$. No. 2 is on fence line, 6.3 meters (21 feet) south of center line of road, 12 meters (39 feet) south of hedge fence, 141.3 meters (464 feet) east of east fence line along north-and-south section-line road, and 28.38 meters (93.1 feet) from station in azimuth $91^{\circ}48'$.

Purdin (Linn County, E. O. Heaton, 1928; 1931).—About $1\frac{1}{2}$ miles east of the town of Purdin, in NE $\frac{1}{4}$ sec. 9, T. 59 N., R. 20 W., on land owned by Joseph A. Street, of Purdin. Station is on south side of road opposite home of Mr. McGee, 7.8 meters (26 feet) south of center line of road, 0.6 meter (2 feet)

south of fence line, and 14.8 meters (49 feet) south-southwest of black locust tree in Mr. McGee's barnyard. Surface and underground marks are standard disk station marks in concrete. Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 in fence line, 7.0 meters (23 feet) north of center line of road, and 61.1 meters (200 feet) (slope distance) from station in azimuth $256^{\circ}19'$, was reported in 1931 as having been removed, the concrete block with marker lying on edge of road. No. 2 is 10.6 meters (35 feet) north of center line of road, 0.50 meter (1.6 feet) south of fence, 10.7 meters (35 feet) west of black locust tree mentioned above, and 19.40 meters (63.6 feet) from station in azimuth $163^{\circ}32'$.

Meadville (Linn County, E. O. Heaton, 1928; 1931).—About one-half mile south and one-half mile east of the town of Meadville, on north side of NE $\frac{1}{4}$ sec. 7, T. 57 N., R. 21 W., on land owned by Lippippi brothers of Meadville. Station is 16.5 meters (54 feet) south of center line of Route 36, 7.2 meters (24 feet) south of south fence line, 7.3 meters (24 feet) south of telephone pole 6162, 250 meters (820 feet) west of center line of north-and-south section-line road, and 22.95 meters (75.3 feet) west of most western tree in group of dead locusts. Surface and underground marks are standard disk station marks in concrete. Upper mark is 18 inches below surface of ground, and lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 8.5 meters (28 feet) north of center line of Route 36, 17.7 meters (58 feet) north of row of telephone poles at pole 6162, 0.3 meter (1 foot) south of north fence line, and 25.20 meters (82.7 feet) from station in azimuth $183^{\circ}35'$. No. 2 is in northeast corner of pasture field, about 390 meters (1,280 feet) east of north-and-south section-line road, 9.2 meters (30 feet) south of center line of Route 36, 10 meters (33 feet) west of telephone pole 6146, and 640 meters (2,100 feet) (paced) from station in azimuth $269^{\circ}29'33''$.

Heckman (Linn County, E. O. Heaton, 1928).—About $1\frac{1}{2}$ miles west of Brookfield, near northeast corner of the SE $\frac{1}{4}$ sec. 2, T. 57 N., R. 20 W., on land owned by O. H. Heckman. The station is one-eighth mile east of Heckman's house, 102 meters (335 feet) west of road intersection, 8.6 meters (28 feet) south of center line of half-section-line road, and 0.50 meter (1.6 feet) north of fence. Surface and underground marks are standard disk station marks in concrete. Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 9.9 meters (32 feet) north of the east-and-west road, 9.8 meters (32 feet) east of north-and-south road, in fence line, and 114.55 meters (375.8 feet) (slope distance) from station in azimuth $258^{\circ}14'51''$. No. 2 is 6.65 meters (21.8 feet) north of center line of road, 1.30 meters (4.3 feet) south of fence, and 16.435 meters (53.92 feet) from station in azimuth $152^{\circ}22'$.

Hale (Carroll County, E. O. Heaton, 1928).—About $1\frac{1}{2}$ miles east and three-fourths mile south of the town of Hale, on highest ground in northeast corner of SW $\frac{1}{4}$ sec. 12, T. 55 N., R. 22 W., on land owned by G. W. Linton, 5 meters (16 feet) south of east-and-west hedge fence, and 26.9 meters (88 feet) west of south post of gate at center of section where a north-and-south wire fence and an east-and-west hedge fence intersect. Surface and underground marks are standard disk station marks in concrete. Upper mark is 20 inches below surface of ground, and lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 0.5 meter (2 feet) southwest of above gate post, and 26.33 meters (86.4 feet) from station in azimuth $287^{\circ}58'$. No. 2 is about 105 meters (344 feet) (paced distance) south of large dead tree in north-and-south fence line, 0.7 meter (2 feet) northwest of corner post by bush on south side of driveway connecting two fields, 9.0 meters (30 feet) south of corner post on north side of driveway, and 400 meters (1,312 feet) (paced distance) from station in azimuth $356^{\circ}03'46''$.

Campfield (Chariton County, E. O. Heaton, 1928).—About $3\frac{1}{2}$ miles east and 2 miles north of Mendon, and 12 miles south of Brookfield, in the NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 6, T. 55 N., R. 19 W., on land owned by Zeigler brothers, who live 1 mile south. Station is in pasture lot, 218 meters (715 feet) west of center line of north-and-south road, 120 meters (394 feet) south of barn lot, and 0.60 meter (2.0 feet) east of fence. Surface and underground marks are standard disk station marks in concrete. Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 0.42 meter (1.4 feet) east of fence line, and 41.32 meters (135.6

feet) from station in azimuth $180^{\circ}58'$. No. 2 is 6.80 meters (22.3 feet) west of center line of road, 0.45 meter (1.5 feet) east of fence line, and 212.6 meters (698 feet) (slope distance) from station in azimuth $278^{\circ}07'47''$.

Bosworth (Carroll County, E. O. Heaton, 1928).—About $1\frac{3}{4}$ miles west of Bosworth, in NW $\frac{1}{4}$ sec. 27, T. 54 N., R. 22 W., on land belonging to the Golder heirs and farmed by Charlie Feares. Station is about 50 meters (164 feet) south of farmhouse occupied by Mr. Feares, on range with east side of chimney and west side of a leaning white elm at corner of smokehouse, 90 meters (295 feet) south of north section line, 75 meters (246 feet) east of west section line, 11.8 meters (39 feet) west of small apple tree, partly dead, and 15.8 meters (52 feet) east of another partly dead apple tree. Surface and underground marks are standard disk station marks in concrete. Upper mark is about 21 inches below surface of ground and lower mark 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in southeast corner of field, 2.2 meters (7 feet) west of corner post, 7.5 meters (25 feet) west of center line of north-and-south road, and 300 meters (984 feet) (paced distance) from station in azimuth $17^{\circ}09'17''$. No. 2 is 0.5 meter (2 feet) southeast of northwest corner post of old orchard, 6.3 meters (21 feet) east of center line of north-and-south road, and 93.63 meters (307.2 feet) from station in azimuth $124^{\circ}08'$.

Pittman (Chariton County, E. O. Heaton, 1928).—About 6 miles north of the town of Brunswick, one-half mile south of Newcomer, in NW $\frac{1}{4}$ sec. 12, T. 54 N., R. 20 W., on land owned by R. C. Pittman, in a cultivated field, 422 paces east of center line of north-and-south section-line road, 4.2 meters (14 feet) south of the line fence between sections 1 and 12, and 63.2 meters (224 feet) west of fence on east side of field. Surface and underground marks are standard disk station marks in concrete. Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 0.6 meter (2 feet) south of section-line fence, and 36.60 meters (120.1 feet) from station in azimuth $267^{\circ}57'$. No. 2 is 20.50 meters (67.3 feet) south of section corner, 5.0 meters (16 feet) east of center line of road, 0.40 meter (1.3 feet) west of fence, and 417.5 meters (1,370 feet) (paced distance) from station in azimuth $90^{\circ}42'25''$.

Missouri (Carroll County, E. O. Heaton, 1928).—About three-fourths mile southwest of Dewitt, in N $\frac{1}{2}$ sec. 26, T. 53 N., R. 21 W., on land owned by S. P. Casebolt, about one-fourth mile south of his farmhouse, on the highest ground in the vicinity, about the heads of two gullies leading down to the Missouri River, 67 meters (220 feet) west of center line of old road along hilltop, 48.7 meters (160 feet) (slope distance) west of northwest corner of old barn, and 39.4 meters (129 feet) (slope distance) northwest of 14-inch white oak in fence line near head of gully. Surface and underground marks are standard disk station marks in concrete. Upper disk is stamped "Dewitt", and is 12 inches below surface of ground. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is near hilltop in northeast corner of field, 35.2 meters (115 feet) north of north gatepost at driveway into field at head of gully, 17.5 meters (57 feet) west of west gatepost on west side of old road, 0.9 meter (3 feet) southwest of northeast corner post, and 145 meters (476 feet) (slope distance) from station in azimuth $205^{\circ}31'26''$. No. 2 is 17 meters (56 feet) west of center line of old road, 5.2 meters (17 feet) north of northeast corner of old barn, 0.5 meter (1.6 feet) west of fence which is on line with east side of barn, and 60.00 meters (196.8 feet) (slope distance) from station in azimuth $270^{\circ}09'$.

Utz (Saline County, E. O. Heaton, 1928; 1931).—About 3 miles south and 2 miles west of the village of old Miami, near west side center of sec. 19, T. 52 N., R. 21 W., on a cleared knoll, near northwest corner of pasture, on land owned by Mrs. W. C. Utz, who lives about one-half mile southeast. Station is 120 meters (394 feet) east of fence along east side of woods, 15 meters (49 feet) south of trail through pasture, about 110 meters (361 feet) south of small tree in fence line, and on range with this tree and a large lone tree on hilltop about $1\frac{1}{2}$ miles to northward. Surface and underground marks are standard disk station marks in concrete. Upper mark projects 2 inches. Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is near southwest corner of open pasture, 33 meters (108 feet) northwest of large Spanish oak, 2 meters (7 feet) north of trail leading southward through pasture and woods, 0.4

meter (1 foot) east of fence line, and 210 meters (689 feet) (paced distance) from station in azimuth $36^{\circ}02'31''$. No. 2 is in front of home of J. R. Sinnett, 9.6 meters (31 feet) south of southeast corner of his house, 4.6 meters (15 feet) southeast of cedar in yard, 15 meters (49 feet) west of elm in southeast fence corner, 0.3 meter (1 foot) south of front fence, and 134.17 meters (440.2 feet) from station, in azimuth $140^{\circ}11'30''$.

High Hill (Mo.R.C.) (Saline County, Missouri River Commission, 1887, E. O. Heaton, 1928).—About 6 miles north of the town of Slater, near center of $E\frac{1}{2}$ of sec. 11, T. 52 N., R. 20 W., on land owned by Ray Gillam who lives one-half mile southwest of station. Station is on highest point of bluff overlooking Missouri River, 6.6 meters (22 feet) south of center line of public road, opposite barn of Mrs. Eva Singleton, 146 paces northwest of High Hill Cemetery, 20.4 meters (67 feet) southwest of east gatepost on north side of road, and 2.3 meters (8 feet) south of fence. Surface mark is a standard disk station mark in concrete, 4 inches above surface of ground. Underground mark is copper bolt in concrete, 38 inches below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 5.8 meters (19 feet) west of center line of north-and-south road, 1.35 meters (4.4 feet) west of fence, and 138.5 meters (454 feet) (slope distance) from station in azimuth $319^{\circ}35'53''$. No. 2 is 5.7 meters (19 feet) north of center line of road, 0.35 meter (1.2 feet) south of fence, and 39.38 meters (129.2 feet) from station in azimuth $110^{\circ}29'$.

Shackle (Saline County, E. O. Heaton, 1928).—About 6 miles west and $1\frac{1}{2}$ miles south of Marshall, 1 mile south of Shackleford, about 160 meters (525 feet) east of the Shackleford-and-Herndon road, on section line between sections 25 and 26, T. 50 N., R. 22 W., on land owned by Castle brothers. There is no road on this section line. Station is on fence line, about 450 meters (1,476 feet) northwest of one farmhouse and 200 meters (656 feet) east-southeast of another, on northwest side of road intersection where section-line road leads west. Surface and underground marks are standard disk station marks in concrete. Upper mark projects about 1 inch. Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 6 meters (20 feet) east of center line of road, near south end of row of trees along road on north side of gate, 0.5 meter (1.6 feet) east of fence, and 425 meters (1,394 feet) (paced distance) from station in azimuth $22^{\circ}53'51''$. No. 2 is at northwest corner of section, 4 meters (13 feet) south of north gatepost which is also a corner post, 6 meters (20 feet) east of center line of road, 0.3 meter (1 foot) east of fence, and 146.00 meters (479.0 feet) from station in azimuth $91^{\circ}14'54''$.

Slater (Saline County, E. O. Heaton, 1928).—About 4 miles south of the town of Slater, near the north side center of $NE\frac{1}{4}$ sec. 35, T. 51 N., R. 20 W., on land owned by J. P. Lawler, one-fourth mile north of his home, in a pasture, 161 meters (528 feet) east of center line of north-and-south road, 11.9 meters (39 feet) south of center line of east-and-west road, 6.50 meters (21.3 feet) south of fence line, and 22.10 meters (72.5 feet) west of fence on east side of pasture. Surface and underground marks are standard disk station marks in concrete. Upper mark is 22 inches below surface of ground. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 10.90 meters (35.8 feet) east of center line of road, 1.65 meters (5.4 feet) east of fence, and 223.40 meters (732.9 feet) (slope distance) from station in azimuth $45^{\circ}43'41''$. No. 2 is in northwest corner of pasture, 150.85 meters (494.9 feet) from station in azimuth $94^{\circ}10'21''$.

Reid (Pettis County, E. O. Heaton, 1928).—About 15 miles north and $1\frac{1}{2}$ miles west of Sedalia, $1\frac{1}{2}$ miles east of Range Line Church, $1\frac{1}{2}$ miles west of State Highway 3 (United States Highway 65), on the highest ground in $SW\frac{1}{4}$ sec. 20, T. 48 N., R. 21 W., on land owned by M. F. Reid, about one-third mile west of his home, about 195 meters (640 feet) south of center line of highway, and 4.9 meters (16 feet) west of north-and-south fence line along a one-wire phone line. Surface and underground marks are standard disk station marks in concrete. Upper mark is 20 inches below surface of ground, and lower mark about 5 feet below surface. Reference mark is standard reference disk in concrete, note 11 (a), in southeast corner of field, 0.6 meter (2 feet) northwest of corner post, 1.4 meters (5 feet) northwest of small telephone pole of one-wire line along a north-and-south fence, 0.8 meter (3 feet) north of a corner stone on far side of east-and-west fence, and 180.67 meters (592.7 feet) from station in azimuth $1^{\circ}28'04''$.

Ridge (Cooper County, E. O. Heaton, 1928).—About 15 miles west of Boonville, 2 miles east of Prairie Ridge, 1 mile east of the Pettis-Cooper County line, in southwest corner of sec. 5, T. 48 N., R. 19 W., on land owned by Herbert Cramer, about one-fourth mile southwest of his home, 55 meters (180 feet) east of southeast corner of Cotton Patch Schoolhouse, 30 meters (98 feet) east of southeast fence corner of school yard, 15.30 meters (50.2 feet) north of center line of United States Highway 40, and 6 meters (20 feet) north of fence line. Surface and underground marks are standard disk station marks in concrete. Upper mark is 22 inches below surface of ground, and lower mark 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 8.6 meters (28 feet) north of the center line of road, 0.56 meter (1.8 feet) south of fence, and 93.80 meters (307.7 feet) from station in azimuth $281^{\circ}51'$. No. 2 is in southwest corner of school grounds, 93.3 meters (306 feet) (slope distance) from station in azimuth $93^{\circ}54'$.

Ross (Benton County, E. O. Heaton, 1928).—About 6 miles north and 12 miles east of Warsaw, 4 miles east and 1 mile north of Edmondson, 5 miles northwest of the Zoro post office, 1 mile southeast of Ross' schoolhouse, in SE $\frac{1}{4}$ sec. 17, T. 41 N., R. 20 W., on land owned by Mrs. Litcham, about one-half mile south of her home, on the highest part of knob timbered with small oak, 54.7 meters (180 feet) east of center line of public road leading from Zoro post office to Ross' schoolhouse, 8.5 meters (28 feet) west-southwest of 20-inch blazed oak, and 9.2 meters (30 feet) north-northwest of 10-inch blazed oak. Surface and underground marks are standard disk station marks in concrete. Upper mark projects 4 inches. Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 5.3 meters (17 feet) east of center line of road, 0.9 meter (3 feet) east of fence, and 48.50 meters (159.1 feet) from station in azimuth $107^{\circ}14'$. No. 2 is 7 meters (23 feet) northwest of 12-inch blazed oak, 0.9 meter (3 feet) east of 10-inch blazed ash, and 38.78 meters (127.2 feet) from station in azimuth $172^{\circ}52'$.

Sory (Benton County, E. O. Heaton, 1928).—About 12 miles southeast by road from Warsaw, three-fourths mile west of Fristo, in SW $\frac{1}{4}$ sec. 24, T. 39 N., R. 22 W., on land owned by H. C. Sory. Station is 160 meters (525 feet) south of public road from Fristo, on highest ground near southeast corner of field, and 23 meters (75 feet) northwest of 10-inch black oak at bend in wire fence, on southwest side of road through woods. Surface and underground marks are standard disk station marks in concrete. Upper mark projects 6 inches. Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at southeast corner of cultivated field and at northeast corner of a woodland, 4 meters (13 feet) southwest of center line of road through woods, 7.5 meters (25 feet) southwest of 18-inch white oak on northeast side of road, 0.6 meter (2 feet) southwest of wire fence, and 35.23 meters (115.6 feet) from station in azimuth $220^{\circ}02'$. No. 2 is in the southwest corner of pasture field, 5 meters (16 feet) north of center line of road leading west from Fristo, 0.6 meter (2 feet) northeast of fence post at south end of rail fence lined with bushes, and 195.0 meters (640 feet) from station in azimuth $151^{\circ}03'02''$.

Vogel (Camden County, E. O. Heaton, 1928).—About 25 miles by road west of Linn Creek, 2 $\frac{1}{2}$ miles south of Climax Springs, in NE $\frac{1}{4}$ sec. 6, T. 38 N., R. 19 W., on land owned by Pete Vogel of Climax Springs. Station is in the southeast corner of lot surrounding old log house, 19.3 meters (63 feet) southeast of southeast corner of house, 16 meters (52 feet) east-northeast of large cottonwood tree, 16.5 meters (54 feet) north of center line of lane road, and 10.5 meters (34 feet) north of 10-inch sycamore tree. Surface and underground marks are standard disk station marks in concrete. Upper mark is 4 inches above surface of ground. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in the northeast corner of pasture lot, 10.4 meters (34 feet) west of center line of road, 6.5 meters (21 feet) west of fence line, 0.50 meter (1.6 feet) south of east-and-west fence line, and 137.8 meters (452 feet) (slope distance) from station in azimuth $172^{\circ}38'33''$. No. 2 is 7.5 meters (25 feet) north of large oak tree in lane road, 0.40 meter (1.3 feet) east of fence, 11.4 meters (37 feet) south of well, and 65.75 meters (215.7 feet) from station in azimuth $83^{\circ}03'$.

Preston (Hickory County, E. O. Heaton, 1928; 1931).—About 2 miles west and one-half mile south of the village of Preston, in S $\frac{1}{2}$ sec. 21, T. 37 N., R.

21 W., on land owned by Widow Mobray, on highest ground in woodland, about 110 meters (361 feet) south of center line of State Highway 64 at top of grade, 10.3 meters (34 feet) west of center line of road through woods, and 7 meters (23 feet) west of 14-inch oak tree with triangular blaze on north side. Surface and underground marks are standard disk station marks in concrete. Upper mark projects 6 inches, and lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 7 meters (23 feet) south of center line of Highway 64, at top of grade, in north edge of woods, 1.1 meters (4 feet) west of corner post in wire fence, and 103.0 meters (338 feet) from station in azimuth $192^{\circ}22'58''$. No. 2 is in woodland, 8.7 meters (29 feet) east of center line of road through woods, 26.8 meters (88 feet) southeast of 14-inch oak tree on west side of road with triangular blaze on its north side, and 30.79 meters (101 feet) from station in azimuth $326^{\circ}19'$.

Branch (Camden County, E. O. Heaton, 1928).—About 25 miles by State Highway 54 southwest of Linn Creek, 23 miles by State Highway 54 east of north of Buffalo, 0.3 mile south and one-half mile east of the village of Branch, on east side of SE $\frac{1}{4}$ sec. 34, T. 37 N., R. 19 W., on land owned by Mrs. Julia Clark of Branch. Station is on east side of old cultivated field, at west edge of timber, 4.5 meters (15 feet) west of rail fence which is line between sections 34 and 35, 110 meters (361 feet) north of fence at south end of field, 106 meters (348 feet) east of wild cherry tree in center of field, and about 0.40 mile north of Camden-Dallas county line. Surface mark is standard disk station mark in concrete, 24 inches below surface of ground. Underground mark is standard disk in concrete 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 9.0 meters (30 feet) east of center line of Highway 54, 0.45 meter (1.5 feet) west of fence, and 285 meters (935 feet) (paced distance) from station in azimuth $59^{\circ}09'07''$. No. 2 is 0.9 meter (3 feet) west of rail fence, and 51.56 meters (169.2 feet) from station in azimuth $357^{\circ}26'$.

Butler (Dallas County, E. O. Heaton, 1928).—About 7 $\frac{1}{2}$ miles north by east of Buffalo, about three-fourths mile east of Butler schoolhouse and United States Highway 54, on north side of sec. 2, T. 33 N., R. 20 W., on land owned by a Mrs. Bennett, about 75 meters (246 feet) south of township-line road leading east from Butler schoolhouse, about 100 meters (328 feet) southeast of old deserted farm shack, 25.3 meters (83 feet) west of west side of lane leading south to pasture, and 26.5 meters (87 feet) southwest of partly dead double apple tree. Surface and underground marks are standard disk station marks in concrete. Upper mark projects about 6 inches. Lower mark is about 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 2.6 meters (9 feet) east of center line of roadway leading south, 7.5 meters (25 feet) south of center line of east-and-west township road, 0.8 meter (3 feet) southwest of corner post at northwest corner of field just west of farmhouse, and 74.44 meters (244.2 feet) from station in azimuth $204^{\circ}50'$. No. 2 is in northeast corner of field west of farm house, 0.6 meter (2 feet) southwest of corner post, 6.5 meters (21 feet) south of center line of township road, and 147.0 meters (482 feet) from station in azimuth $244^{\circ}06'31''$.

Blue (Polk County, E. O. Heaton, 1928).—About 3 $\frac{1}{2}$ miles south and 4 $\frac{1}{4}$ miles west of Buffalo, one-half mile west of Dallas-Polk county line, near west side center of SE $\frac{1}{4}$ sec. 13, T. 33 N., R. 21 W., on highest part of bare hill locally known as Blue Mound, 10.4 meters (34 feet) southeast of large thorn bush on top of hill, and 29.3 meters (96 feet) east of north-and-south fence. Surface and underground marks are standard disk station marks in concrete. Upper mark projects about 4 inches. Lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 1.8 meters (6 feet) southeast of most southeasterly of two large thorn bushes, and 58.8 meters (192 feet) from station in azimuth $197^{\circ}05'$. No. 2 is 0.2 meter (0.7 foot) east of north-and-south fence near top of hill, and 29.14 meters (95.6 feet) from station in azimuth $101^{\circ}15'$.

Bateman (Laclede County, E. O. Heaton, 1928).—About 1 $\frac{1}{2}$ miles southwest of Phillipsburg, one-fourth mile east of Highway 66, in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 33, T. 33 N., R. 17 W., on land owned by G. L. Bateman, who operates the Bateman goldfish farm on the place and lives one-fourth mile west of station. Station is in small clearing, 148 meters (469 feet) south of line between sections 28 and 38, at northeast corner of timbered section on highest point of the knoll.

Surface mark is a standard disk station mark stamped "Batesman", in concrete, 4 inches above surface of ground. Underground mark is standard disk in concrete 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 106.78 meters (350.3 feet) from station, in azimuth $255^{\circ}18'05''$. No. 2 is at west edge of timbered section, 445 feet (paced distance) from station in azimuth $35^{\circ}39'09''$.

Elkland (Webster County, E. O. Heaton, 1928).—About 8 miles north and 7 miles west of Marshfield, 1 mile north and one-half mile east of the village of Elkland, in SW $\frac{1}{4}$ sec. 28, T. 32 N., R. 19 W., on land owned by Lewis Davidson, about one-half mile southeast of his home, in northeast corner of cultivated field, 300 meters (984 feet) north of road, 75 meters (246 feet) west of half-section-line fence, and 135 meters (443 feet) south of fence at north end of field. Surface mark is standard disk station mark in concrete, 22 inches below surface of ground. Underground mark is standard disk in concrete, 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in northeast corner of field, 168 meters (518 feet) from station in azimuth $209^{\circ}13'36''$. No. 2 is in fence row, 74.52 meters (244.5 feet) from station in azimuth $269^{\circ}05'$.

Strafford (Greene County, E. O. Heaton, 1928; 1931).—About 1 mile west and 3 miles north of Strafford, about 14 miles by road northeast of Springfield, on east side of SE $\frac{1}{4}$ sec. 16, T. 30 N., R. 20 W., about 85 meters (279 feet) west of Strafford and Fair Grove road, on top of high wooded ridge extending east and west, 12.25 meters (40.2 feet) northwest of roadway through woods, 6.4 meters (21 feet) northeast of 20-inch blazed oak, and 10.7 meters (35 feet) southeast of 12-inch blazed oak. Surface and underground marks are standard disk station marks in concrete. Upper mark projects 4 inches and is stamped "Strafford." Lower mark is about 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is on top of wooded ridge, 5 meters (16 feet) east of center line of road, 0.85 meter (2.8 feet) east of telephone line, 0.3 meter (1 foot) east of wire fence, and 91.5 meters (300.2 feet) from station, in azimuth $230^{\circ}59'$. No. 2 is a little south of top of ridge, 4.5 meters (15 feet) east of center line of road, 5.5 meters (18 feet) south of center line of roadway through woods, 7.6 meters (25 feet) southwest of 11-inch oak used as gatepost, and 79.00 meters (259.2 feet) from station in azimuth $297^{\circ}47'$.

Marshfield (Webster County, E. O. Heaton, 1928).—About 1 mile southeast of the town of Marshfield, one-fourth mile south of Marshfield-Seymour road, one-fourth mile south of St. Louis-San Francisco Railway tracks, in SW $\frac{1}{4}$ sec. 11, T. 30 N., R. 18 W., on land owned by W. W. Cantrell, one-fourth mile east of his home, on high point of ridge in old cleared field, about 210 meters (689 feet) south of prominent grove of trees at north end of ridge, and 95 meters (312 feet) north of 16-inch blazed ash tree, the tallest one in grove south of station. Surface mark is a standard disk station mark in concrete, 6 inches above surface of ground. Underground mark is standard disk in concrete 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at west edge of grove of trees, 0.45 meter (1.5 feet) north of fence, and 42.29 meters (138.7 feet) from station in azimuth $316^{\circ}01'$. No. 2 is at south edge of timber, 0.3 meter (1 foot) south of fence, and 210 meters (689 feet) (paced distance) from station, in azimuth $134^{\circ}10'23''$.

Rogersville west base (Greene County, E. O. Heaton, 1928; 1931).—About 1 $\frac{1}{2}$ miles west and one-half mile north of Rogersville, in sec. 13, T. 28 N., R. 20 W., on land owned by S. E. Holland, about one-third mile west of his home, about one-fourth mile north of United States Highway 60, at northeast corner of small piece of timbered land surrounded by pasture and cultivated fields, 7.85 meters (25.8 feet) east of 10-inch blazed white oak, and 14.8 meters (49 feet) north of 16-inch blazed white oak. Surface and underground marks are standard disk station marks in concrete. Upper mark is about 20 inches below surface of ground, and lower mark about 5 feet below surface. Reference marks are standard reference disks in concrete, note 11(a). No. 1 is in the northeast corner of a pasture, about 100 meters (328 feet) northeast of a pond, about 50 meters (164 feet) northwest of Mr. Holland's barn, at west edge of young orchard, 0.6 meter (2 feet) southwest of corner post, and 425 meters (1,394 feet) (paced distance) from station in azimuth $268^{\circ}23'03''$. No. 2 is at the southwest corner of cultivated field, at the southeast corner of clump of

woods, 8.2 meters (27 feet) west of 11-inch blazed white oak, 7.65 meters (25.1 feet) east of 12-inch blazed black oak, 0.25 meter (1 foot) north of wire fence, and 61.59 meters (202.1 feet) from station in azimuth $354^{\circ}08'$.

Rogersville east base (Webster County, E. O. Heaton, 1928; 1930).—About six-tenths mile west of Diggins railroad station, in NE $\frac{1}{4}$ sec. 35, T. 29 N., R. 18 W., in a pasture, 10.5 meters (34 feet) north of center line of Highway 60, 4.4 meters (14 feet) north of fence line, 105 meters (344 feet) east of half-section-line fence, and 38 meters (125 feet) north of the St. Louis-San Francisco Railway tracks where they run parallel to highway. Surface mark is standard disk station mark in concrete projecting 4 inches above surface of ground. Underground mark is standard disk in concrete 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 8.3 meters (27 feet) south of center line of road, 13.4 meters (44 feet) north of north rail of railroad, and 50.14 meters (164.5 feet) from station in azimuth $255^{\circ}19'$. No. 2 is 7.3 meters (24 feet) north of center line of road, 0.7 meter (2 feet) east of half-section-line fence, and 103.20 meters (338.6 feet) (slope distance) from station in azimuth $51^{\circ}46'37''$.

Sparta (Christian County, E. O. Heaton, 1928).—About one-half mile south of town of Sparta, in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, T. 27 N., R. 20 W., on land owned by C. B. Loveland, on highest ground on west side of cultivated field, about 75 meters (246 feet) east of Mr. Loveland's house, about 35 meters (115 feet) south-southeast of his stock barn, about 30 meters (98 feet) southwest of small clump of trees, 3.35 meters (11.0 feet) east of fence, 4.1 meters (13 feet) south-east of southeast corner of upused concrete watering basin, 5.8 meters (19 feet) south of east gatepost, and about in line with this gatepost and fence connecting it to southeast corner of barn. Surface and underground marks are standard disk station marks in concrete. Upper mark is about 20 inches below surface of ground. Lower mark is about 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in southeast corner of cultivated field, 5.8 meters (19 feet) southeast of lone elm, 0.3 meter (1 foot) northwest of southeast corner post which is west gatepost, and 323.5 meters (1,061 feet) (slope distance) from station in azimuth $359^{\circ}58'42''$. No. 2 is in northwest corner of barn lot, at southeast side of T-road intersection, 0.65 meter (2.1 feet) southeast of northwest corner post, 7 meters (23 feet) northwest of pond, and 184.40 meters (605.0 feet) from station, in azimuth $116^{\circ}52'51''$.

Painter (Douglas County, E. O. Heaton, 1928).—About 13 miles west of Ava, 23 miles east of Sparta, $\frac{1}{4}$ miles east of Dogwood store on Highway 14, in NW $\frac{1}{4}$ sec. 22, T. 27 N., R. 17 W., on land owned and occupied by Mrs. T. J. Williams, in small cleared field, 63 meters (207 feet) east of lane leading to house, 12 meters (39 feet) south of center line of road, and 5 meters (16 feet) south of fence line. Surface and underground marks are standard disk station marks in concrete. Upper mark projects 4 inches, and lower mark is 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 9.3 meters (30 feet) south of center line of road, 4.1 meters (13 feet) south of fence, and 69.55 meters (228.2 feet) (slope distance) from station in azimuth $261^{\circ}21'$. No. 2 is 7.8 meters (26 feet) south of center line of road, 2 meters (7 feet) south of fence, 4.5 meters (15 feet) east of center line of lane, and 58.40 meters (191.6 feet) from station in azimuth $87^{\circ}09'$.

Taney (Taney County, E. O. Heaton, 1928).—About 4 miles northeast of Taneyville, 5 miles west of Bradleyville, one-half mile southeast of George S. Summerton's home, near the west side of sec. 7, T. 24 N., R. 19 W., on highest point at intersection of 2 spurs of L-shaped hill, 1 spur running to the southwest and 1 to the northwest. It is 9.9 meters (32 feet) east of blazed oak, 5.8 meters (19 feet) south of blazed oak, 9.2 meters (30 feet) west of blazed oak, and 13.8 meters (44 feet) north of blazed oak. Surface mark is standard disk station mark in iron pipe projecting 6 inches above surface of ground. Underground mark is a standard disk station mark in rock 5 feet below surface of ground. Reference marks are standard reference disks wedged in drill holes in boulders, note 12 (c). No. 1 is 35.99 meters (118.1 feet) from station in azimuth $271^{\circ}18'$. No. 2 is 48.27 meters (158.4 feet) (slope distance) from station, in azimuth $151^{\circ}43'$.

Knight (Taney County, E. O. Heaton, 1928).—About 25 miles by road west of south of Ava, 13 miles south of Rome, 9 miles south of Brown Branch which

is on the Forsyth-Ava road, in SW $\frac{1}{4}$ sec. 1, T. 23 N., R. 17 W., on land owned by James Knight, 300 meters (984 feet) east of his home, on highest point of cleared rocky hill, 300 meters (984 feet) east of road, 53 meters (174 feet) west of west edge of timber, and 137 meters (449 feet) north of rail fence, at south end of field. Surface and underground marks are standard disk station marks in concrete. Upper mark is 12 inches below surface of ground and lower mark 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at west edge of timber, and 52.46 meters (172.1 feet) from station in azimuth 377°56'. No. 2 is in fence row at south end of field, and 140 meters (469 feet) (paced distance) from station in azimuth 47°40'39''.

Irma (Taney County, E. O. Heaton, 1928; 1931).—About 7 miles direct or 10 miles by road northwest of Branson, about 300 meters (984 feet) southwest of highway garage at junction of United States Highways 65 and 76, about 275 meters (902 feet) south of Highway 65, on "backbone" of hill, on south side of rocky field, 5 meters (16 feet) north of north edge of timber tract, and 10.7 meters (35 feet) east of center line of neighborhood road. Surface and underground marks are standard disk station marks in concrete. Upper mark projects about 6 inches. Lower mark is about 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is about 100 meters (328 feet) east of gate on south side of United States Highway 65, opposite store, about 33 meters (108 feet) west of concrete reservoir on south side of highway near junction, 11 meters (36 feet) south of south fence line along highway, 0.6 meter (2 feet) west of row of old fence posts, and 265 meters (869 feet) (paced distance) from station in azimuth 198°57'07''. No. 2 is at northwest corner of woodland, on southeast edge of cleared field, 32 meters (105 feet) west of road where it enters woodland, 1.4 meters (5 feet) north of notched 8-inch dead oak, and 43.30 meters (142.1 feet) from station in azimuth 71°12'.

Thomason (Taney County, E. O. Heaton, 1928).—About 8 miles by road southwest of Branson, on east side of sec. 36, T. 22 N., R. 22 W., on range line between townships, about one-fifth mile southeast of junction of United States Highways 65 and 86, on land owned by Riley Thomason who lives on west side of highway about 200 meters (656 feet) northwest of station. Station is on the east side of small field containing stumps and several dead trees, about 95 meters (312 feet) northeast of Highway 65, 21 meters (69 feet) southwest of southwest corner of old deserted dwelling, and 0.2 meter (0.7 foot) east of fence on west side of lane at its north end. Surface and underground marks are standard disk station marks in concrete. Upper mark projects 3 inches and lower mark is about 5 feet below surface of ground. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 7.7 meters (25 feet) north of center line of Highway 65, 12.5 meters (41 feet) west of 18-inch Spanish oak on west side of lane at south end, 0.4 meter (1 foot) south of north highway fence, and 74.60 meters (244.3 feet) from station in azimuth 10°49'. No. 2 is at fence corner, about 100 meters (328 feet) southeast and across Highway 65 from Riley Thomason's farmhouse, 6.7 meters (22 feet) east of center line of highway, 0.6 meter (2 feet) southwest of corner post, and 114.50 meters (375.7 feet) from station in azimuth 115°11'54''.

Burlington (Boone County, Ark., E. O. Heaton, 1928; 1931).—About 18 miles by road northwest of Harrison, 6 miles by road southwest of Omaha, 3 miles by road northwest of Burlington store, 2 $\frac{1}{4}$ miles by road northwest of Highway 65, on highest point of wooded ridge just northwest of cleared place, locally known as the "King place" and used for baseball grounds. To reach from Omaha follow Highway 65 about 3.9 miles south to road on right leading westerly of highway through cut in bank, and follow this road 2 $\frac{1}{4}$ miles to ball grounds. Station is 4 meters (13 feet) east of center line of road, 16.5 meters (54 feet) northwest of "home plate" of baseball diamond, in vicinity of 3 triangle-blazed trees, and 7 $\frac{1}{2}$ meters (25 feet) southwest of the 1 of these having 3 trunks growing from 1 root. Surface and underground marks are standard station disks. Surface mark is in top of flat boulder, note 4. Underground mark is in boulder 3 feet below surface, note 9 (a). Reference remarks are standard reference disks in boulders, note 12 (o). No. 1 is at southeast edge of baseball field, 7.3 meters (24 feet) southeast of small triple oak, and 86.3 meters (283 feet) (slope distance) from station in azimuth 358°26'. No. 2 is at northwest edge of field, 1 $\frac{1}{2}$

meters (5 feet) east of a small forked tree, and 23.50 meters (77.1 feet) from station in azimuth $128^{\circ}24'$. In 1931, plate of reference mark No. 1 was reported found underneath small boulder to which it had been attached. Boulder was on surface of ground.

Bergman (Boone County, Ark., E. O. Heaton, 1928).—About 17 miles east of north of Harrison, 7 miles north of Bergman railroad station, on ridge road, on land owned by Mr. Rushbins, one-fourth mile southeast of his home, on south side of old cleared field, 30 meters (98 feet) north of road, and 10.8 meters (35 feet) north of rail fence. Surface and underground marks are standard station disks. Surface mark is in boulder 14 inches below surface and underground mark in boulder 5 feet below surface. Reference marks are standard reference disks in boulders flush with surface, note 12 (c). No. 1 is in fence row, 78.22 meters (256.6 feet) (slope distance) from station in azimuth $277^{\circ}03'52''$. No. 2 is in fence row, 51.235 meters (168.09 feet) from station in azimuth $77^{\circ}32'$. A bench mark of United States Geological Survey, iron pipe projecting 12 inches, elevation 1,356 feet, is 250 meters (820 feet) west of station in fork of road.

Supplementary points

Iamo (Wayne County, Iowa, E. O. Heaton, 1928).—About $3\frac{1}{4}$ miles south and $1\frac{1}{4}$ miles east of town of Clilo on the Iowa and Missouri State boundary line. Owner of land unknown. Station is opposite farm owned by W. L. B. De Graffenreid who lives 0.4 mile west of station on south side of road, 5.7 meters (19 feet) north of center line of road, 1.4 meters (5 feet) north of fence, and 112.7 meters (370 feet) west of west gate post at southeast corner of field. Surface and underground marks are standard disk station marks in concrete. Upper mark is 20 inches below surface. Lower mark is 6.6 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 5.1 meters (17 feet) south of center line of road, 0.45 meter (1.5 feet) east of north-and-south fence line, and 146.71 meters (481.3 feet) from station in azimuth $274^{\circ}06'15''$. No. 2 is 5.4 meters (18 feet) south of center line of road, 0.45 meter (1.5 feet) south of fence line, and 11.25 meters (36.9 feet) from station in azimuth $8^{\circ}14'$.

Brunswick (Mo.R.C.) (Chariton County, Missouri River Commission, 1887, E. O. Heaton, 1928).—About 3 blocks north of post office at Brunswick, on highest point of bluff, on land owned and occupied by W. M. Lane, 15.3 meters (50 feet) east of southwest corner of Mr. Lane's property, and 1.4 meters (5 feet) south of large maple tree in fence line. Marked by Missouri River Commission disk in iron pipe projecting 6 inches above surface of ground.

Hawkins (Mo.R.C.) (Saline County, Missouri River Commission, 1887, E. O. Heaton, 1928).—About 4 miles east and 2 miles north of Miami, about one-fourth mile north of section line, in $SE\frac{1}{4}NE\frac{1}{4}$ sec. 26, T. 53 N., R. 21 W., on land of Walter Hawkins, on knoll in pasture, about 33 meters (108 feet) north of large maple, about midway between 2 cedar trees which are about 12 feet apart, about 100 meters (328 feet) southwest of Mr. Hawkins' house, about 125 meters (410 feet) south of Hawkins' barn, on first line of bluffs overlooking the Missouri River, about 12 meters (39 feet) west of north-and-south fence line, and 30 meters (98 feet) north of east-and-west fence line. Marked by Missouri River Commission disk in top of iron pipe projecting about 6 inches above surface of ground.

NINETY-THIRD MERIDIAN TO CAIRO, ILL., ARC

Principal points

Squires (Douglas County, E. O. Heaton, 1928).—About 10 miles southeast by road from Ava, one-third mile southwest of Squires post office, which is on State Highway 5, on land owned by Joe Thompson, who lives near the Squires post office. Station is on highest point of wooded hill about one-eighth mile northwest of county road leading southwest from Squires post office, 5.75 meters (18.9 feet) south of triangle-blazed 7-inch walnut tree, and 4.95 meters (16.2 feet) east of 15-inch oak tree similarly blazed. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 4 inches above the surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is on slope of hill, 20,545 meters (67.40

feet) from station in azimuth $304^{\circ}57'$. No. 2 is on top of hill, 23.67 meters (77.7 feet) from station in azimuth $5^{\circ}42'$.

Romance (Ozark County, E. O. Heaton, 1928).—About 32 miles southeast of Ava, 18 miles by road north of Gainesville, 8 miles by road south of east of the Romance post office, $4\frac{1}{2}$ miles by road southeast of G. B. Watson's place, on highest point of wooded ridge, 5 meters (16 feet) east of west slope, 25 meters (82 feet) north (or east) of road known as the Potter road leading from the Watson place and passing over the ridge, and 10 meters (33 feet) west of 18-inch blazed oak tree. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 5 inches and lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 35.07 meters (115.1 feet) from station in azimuth $260^{\circ}34'$. No. 2 is 19.82 meters (65.0 feet) from station in azimuth $7^{\circ}31'$.

Twin (Douglas County, E. O. Heaton, 1928).—About 14 miles, airline, south of Mountain Grove (19 miles by road) $6\frac{1}{2}$ miles by road southeast of Vanzant post office, about two-thirds mile west of county road, and one-fourth mile west of Hawkins farmhouse, on highest point of wooded round-topped hill known locally as Twin Knob, the highest and southernmost of the Twin Knobs, and $3\frac{1}{2}$ meters (11 feet) from each of 3 blazed 12-inch trees forming an approximate equilateral triangle around station. Surface and underground marks are standard station disks in concrete, note 1 (a) and 7 (a). Upper mark projects 6 inches. Reference marks are standard reference disks in bedrock, note 12 (a). No. 1 is on top of Twin Knob, 3 meters (10 feet) southwest of 16-inch blazed hollow tree, and 22.89 meters (75.1 feet) from the station in azimuth $227^{\circ}53'$. No. 2 is on top of knob, 3.35 meters (11.0 feet) northeast of 28-inch white oak, and 18.56 meters (60.9 feet) from station in azimuth $325^{\circ}31'$.

Siloam (Howell County, E. O. Heaton, 1928).—About $16\frac{1}{2}$ miles by road west of West Plains, 1 mile north of Siloam Springs, and 200 meters (656 feet) south of point on county road which runs from point 1 mile north of Siloam Springs to Roosevelt post office. To reach from Siloam Springs, go north 1 mile to road leading west, then three-tenths mile west to top of hill, then south and east 250 meters (820 feet) to station. Station is on highest point of round-topped hill, 12.9 meters (42 feet) southwest of blazed oak, 8.3 meters (27 feet) west of another blazed oak, and 9.4 meters (31 feet) south of third blazed oak. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 2 inches and lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 31.245 meters (102.51 feet) from station in azimuth $222^{\circ}49'$. No. 2 is 45.24 meters (148.4 feet) along slope from station in azimuth $313^{\circ}58'$.

Amy (Howell County, E. O. Heaton, 1928).—About 14 miles by road southwest of West Plains, 1 mile south of Highway 80, in the village of Amy, in the east side of an uncultivated field owned by Mrs. J. C. Clark, 10.8 meters (35 feet) west of fence line, 36 meters (118 feet) west of Mrs. Clark's house, 25 meters (82 feet) northwest of west post of south-yard gate, 27.5 meters (90 feet) north of center line of east-and-west road, and 22.2 meters (73 feet) north of fence line. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 18 inches and lower 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 0.65 meter (2.1 feet) northwest of gate post referred to above, and 24.03 meters (78.3 feet) from station in azimuth $336^{\circ}00'$. No. 2 is 0.40 meter (1.3 feet) north of the fence, and 33.64 meters (110.4 feet) from station in azimuth $53^{\circ}40'$.

Pomona (Howell County, E. O. Heaton, 1928).—About 9 miles west of north from West Plains, 13 miles east of south from Willow Springs, 1 mile south of the town of Pomona, on land owned by Mrs. Mackay, who lives about one-fourth mile to northwest on the west side of Highway 63. Station is on wooded hill, 300 meters (984 feet) east of Highway 63, 70 meters (230 feet) south of old apple orchard, 125 meters (410 feet) west of the St. Louis-San Francisco Railway, 85 meters (115 feet) south-southeast of fenced-in burial plot, 6.2 meters (20 feet) southeast of 12-inch blazed oak, and 19.9 meters (65 feet) north of 20-inch blazed chinquapin tree. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 8 inches. Lower mark is 5 feet below the surface. Reference marks are standard reference disks in concrete. No. 1 projects 6 inches above surface, and

is 36.19 meters (118.7 feet) from station in azimuth $77^{\circ}52'$. No. 2 is about 5 meters (16 feet) east of burial plot, and 37.70 meters (123.7 feet) from station in azimuth $161^{\circ}42'$.

Homeland (Howell County, E. O. Heaton, 1928).—About $6\frac{1}{2}$ miles by road southwest of West Plains, 1 mile south of State Highway 80, and three-fourths mile southeast of the Homeland church and schoolhouse, on highest point of prominent wooded hill known locally as the "Homeland Hill", 200 meters (656 feet) north of the east-and-west road, and 4.8 meters (16 feet) north-east of 10-inch blazed white oak. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 4 inches. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11(a). No. 1 is 2.8 meters (9 feet) north-northwest of 10-inch blazed white oak, and 29.82 meters (97.8 feet) from station in azimuth $337^{\circ}32'$. No. 2 is 2.5 meters (8 feet) east of 10-inch blazed black oak, and 24.36 meters (79.9 feet) from station in azimuth $138^{\circ}53'$.

Brands (Howell County, E. O. Heaton, 1928; 1934).—About 14 miles southeast of West Plains, 1 mile east of Brandsville, one-fourth mile east of State Highway 63, on land owned by J. T. Gray, of Iowa, and rented by M. L. Curcie who lives one-third mile northeast of station. Station is on highest point of enclosed, cleared ridge, 130 meters (427 feet) south of county road, and 72 meters (236 feet) east of fence at west end of field. To reach from Thayer, take United States Route 63, and from bridge at Thayer, go 14.1 miles to where there are two filling stations, Sinclair on west and Marathon on east. Turn east on country road, at this intersection, and continue for 0.2 mile to gate on right, and go to top of hill and station site, about 150 yards from gate. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 4 inches. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 30.470 meters (99.97 feet) from station in azimuth $193^{\circ}37'$. No. 2 is 1.2 meters (4 feet) east of fence, and 73.20 meters (240.2 feet) from station in azimuth $70^{\circ}21'$. Azimuth mark established in 1934 is standard reference disk in concrete, note 11 (a), along east-and-west fence, 12 feet from center line of country road, and 0.2 mile from station in azimuth $245^{\circ}00'09''$.

Congo (Shannon County, E. O. Heaton, 1928).—About $7\frac{1}{2}$ miles east of south of Teresita, and about the same distance west of south of Montier, 1 mile south of Congo post office, on highest point of cut-over timbered hill, the highest hill in vicinity, known locally as "Dessett Point" or "The High Hill". Station is 5.5 meters (18 feet) north-northwest of 18-inch blazed oak, and 5.8 meters (19 feet) east-northeast of 20-inch blazed oak. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects about 8 inches. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 projects 6 inches above surface, and is 46.46 meters (152.4 feet) from station in azimuth $324^{\circ}26'$. No. 2 projects 6 inches above surface, and is 27.44 meters (90.0 feet) from station in azimuth $99^{\circ}09'$.

Rover (Oregon County, E. O. Heaton, 1928).—About 20 miles east of West Plains, 5 miles northeast of Rover post office, 4 miles southwest of Thomasville, one-quarter mile east of home of W. R. Jalliff, on highest point of flat timbered hill that slopes gently in all directions, 7.2 meters (24 feet) south of center line of trail, and 8.5 meters (28 feet) southwest of 16-inch blazed Spanish oak tree. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 4 inches. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 4 meters (13 feet) south of 16-inch blazed white oak tree, and 41.55 meters (136.3 feet) from station in azimuth $167^{\circ}10'$. No. 2 is 6.4 meters (21 feet) south of center line of trail, and 21.97 meters (72.1 feet) from station in azimuth $69^{\circ}33'$.

Pinwood (Oregon County, E. O. Heaton, 1928; 1934).—About $6\frac{1}{2}$ miles west of Alton, 9 miles by road east of the Rover post office, 0.4 mile north of the West Plains, Rover, and Alton road, and the same distance north of Pinwood schoolhouse, on highest point of timbered ridge, 6.5 meters (21 feet) east of center line of road leading north, which is 100 meters (328 feet) west of Pinwood schoolhouse, 4.8 meters (16 feet) north of 10-inch blazed hickory tree, and 5 meters (16 feet) southwest of 8-inch black oak. To reach from

Alton, go west on the old Alton-Rover and West Plains road about 6 miles to the Pinwood schoolhouse, turn right (northward) on local road and go 0.5 mile to station. Mark is in plain view from road and trees marked with triangular blazes are nearby. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 4 inches. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in fork of two roads, 6.4 meters (21 feet) north-northwest of center line of road leading northeast, 4 meters (13 feet) east of road leading north, and 25.51 meters (83.7 feet) from station in azimuth $184^{\circ}40'$. No. 2 is 3.3 meters (11 feet) east-southeast of center line of road leading to northeast, and 40.6 meters (133.2 feet) from station in azimuth $268^{\circ}06'$. Azimuth mark established in 1934 is standard reference disk stamped "Pinwood Azi. 1934", in concrete, note 11 (a). It projects about 14 inches above ground, is 30 feet south of road leading to station, and about 0.1 mile from station in azimuth $42^{\circ}52'50''$.

Banner (Oregon County, E. O. Heaton, 1928; 1934).—About one-fourth mile south of the Oregon-Shannon county line, $11\frac{1}{2}$ miles by road southeast of Birch Tree, $7\frac{1}{2}$ miles southeast of the Oak Grove schoolhouse and church, 2.2 miles south of the Banner schoolhouse, on the south side of a shallow lake known as the "Slash", on a flat, short-timbered ridge, gently sloping on south side, near western edge of ridge, 75 paces east of road passing along north slope, and midway between four triangle-blazed 8-inch oak trees. To reach from Birch Tree, go southeast about 4.3 miles to the Oak Grove Church and school, thence east and south 5.7 miles to the Banner schoolhouse, then south 1.8 miles to end of country road at C. C. Ross' house. There pass through wire gap west of the Ross house and follow road through woods 0.6 mile to small house in clearing on left of road and continue south and east 0.4 mile to station. About 200 yards west of station, road forks at triangular blaze on tree where take left fork. Station is on highest point of ridge, 50 yards from left side of road. Two oak trees marked with triangular blazes are on left side of road about 50 paces west of station. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 6 inches. Lower mark is 5 feet below the surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 projects 4 inches above surface, and is 37.955 meters (124.52 feet) from station in azimuth $205^{\circ}59'$. No. 2 is 30.325 meters (99.49 feet) from station in azimuth $54^{\circ}24'$. In 1934 an azimuth mark was established at this station. Azimuth mark is standard reference disk in concrete, note 11 (b), stamped "Banner Azi. 1934", projecting about 14 inches above ground, and is 83.008 meters (272.34 feet) from station in azimuth $73^{\circ}27'13''$.

Alton (Oregon County, E. O. Heaton, 1928; 1934).—About $4\frac{1}{4}$ miles north of east of the town of Alton, on land said to belong to the Logan heirs, who live in the vicinity. Station is on highest point of timbered ridge, 100 meters (328 feet) north of the Alton and Braswell road, 18.5 meters (61 feet) west of north-and-south road, 20 meters (66 feet) west of fence on west side of cleared field, 6.5 meters (21 feet) east of 8-inch blazed oak, 13 meters (43 feet) west-southwest of 16-inch blazed oak, and 10.5 meters (34 feet) west-northwest of 10-inch blazed oak. To reach from Alton, go one square east from southeast corner of court house, turn north one square, turn right and follow main traveled road 4.5 miles to forks, take right fork straight ahead 150 yards to dim road on left, turn left and follow to station. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark projects 4 inches. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 3.5 meters (12 feet) south of lane road, and 30.63 meters (100.5 feet) from station in azimuth $358^{\circ}45'$. No. 2 is 6.25 meters (20.5 feet) southwest of 16-inch blazed oak, and 32.46 meters (106.5 feet) from station in azimuth $99^{\circ}28'$. Azimuth mark is standard reference disk, note 11 (b), in cleared field about 150 feet west of old barn, and about 0.35 mile from station in azimuth $276^{\circ}32'08''$.

Tram (Shannon County, E. O. Heaton, 1928; 1934).—About 10 miles, air-line, and 14 miles by road southeast of Winona, 7 miles, air-line, and 11 miles by road west of south of Fremont, 0.6 mile west of old Tram road (formerly logging road and now county road), on timbered hill about three-fourths mile west of southeast corner of Shannon County and west line of Carter

County and very nearly on line between Shannon and Oregon Counties. To reach from Winona, follow State Highway 60 to Fremont. Just after crossing bridge take first right-hand road and follow main-traveled road 8.2 miles, take right fork and follow through woods on old logging road 2.4 miles, then take left fork 0.6 mile to station site. Station is about 100 meters (328 feet) west of point where road leading from Tram road forks, 40 paces south of fork passing over hill, 40 paces west of fork turning south along east slope, 3.8 meters (12.5 feet) southwest of 12-inch oak tree marked with triangular blaze, 8.3 meters (27 feet) north of 12-inch oak similarly marked, and 100 meters (328 feet) west of triangle-blazed hickory at fork of road. Surface and underground marks are standard disk station marks in concrete, notes 1 (*a*) and 7 (*a*). Lower mark is 5 feet below surface. Reference and azimuth marks are standard reference disks in concrete, note 11 (*a*). Reference mark no. 1 is 2 meters (7 feet) north of north fork of road, and 27.09 meters (88.9 feet) from station in azimuth $189^{\circ}01'$. No. 2 is 5 meters (16 feet) north of southeast fork and 26.84 meters (88.1 feet) from station in azimuth $302^{\circ}39'$. Azimuth mark is on ridge across small ravine from station, about 100 feet south of old logging road, and 0.15 mile from station in azimuth $263^{\circ}11'39''$.

Camp (Oregon County, E. O. Heaton, 1928; 1930).—About 23 miles east of Alton, 7 miles north of State Highway 42, 5 miles north of Bardley post office, on the Bardley-Wilderness road, near an old lumber camp known as No. 5, at southern end of old cleared field, 24.4 meters (80 feet) west of center line of road, and 25.1 meters (82 feet) west of 18-inch blazed oak which is in fence line. Surface and underground marks are standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Upper mark projects 4 inches. Lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (*a*). No. 1 is 0.3 meter (1 foot) west of fence line and 37.23 meters (122.1 feet) from station in azimuth $183^{\circ}17'$. No. 2 is 0.3 meter (1 foot) west of fence, 1.65 meters (5.4 feet) south of oak tree at gate, and 163.90 meters (537.7 feet) along slope from station in azimuth $145^{\circ}21'05''$.

Dodd (Ripley County, E. O. Heaton, 1928; 1930).—About 20 miles by road south of east of Alton, 2 miles south and $1\frac{1}{4}$ miles east of Bardley post office, 20 miles northwest of Doniphan on Highway 42, on land owned by E. V. Snodgrass and farmed by G. O. Snodgrass who lives one-third mile east of station. Station is on highest point of a cleared knoll, 300 paces north of highway, 100 meters (328 feet) east of timber at west edge of field, and 42 meters (138 feet) south of fence line. Surface and underground marks are standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Upper mark projects 4 inches and lower mark is 5 feet below surface. Reference marks are standard reference disks in concrete, note 11 (*a*). No. 1 is 0.35 meter (1.2 feet) south of the fence line, and 41.38 meters (135.8 feet) from station in azimuth $194^{\circ}56'$. No. 2 is 6.60 meters (21.6 feet) north of center line of State Highway 42, 0.4 meter (1 foot) north of fence, and about 247 meters (810 feet) (paced) from station in azimuth $343^{\circ}00'57''$.

Montay (Carter County, E. O. Heaton, 1928; 1930).—About 14 miles by road from Van Buren, $8\frac{1}{2}$ miles south of Highway 60, one-half mile south of the old village of Eastwood, on the highest point of a wooded hill, about 250 paces south of small graveyard, about 75 paces east of the Eastwood and Barren road, 5.6 meters (18 feet) south-southwest of triangular blazed 20-inch oak tree, and 9.8 meters (32 feet) north-northeast of similarly blazed 12-inch oak. Surface mark is standard station disk in rock flush with surface of ground; underground mark is standard disk in rock 3 feet below surface. Reference marks are standard reference disks in rock outcrop, note 12 (*a*). No. 1 is 31.62 meters (103.7 feet) from station in azimuth $244^{\circ}04'$. No. 2 is 33.14 meters (108.7 feet) from station in azimuth $335^{\circ}59'$.

Brooks (Ripley County, P. A. Smith, 1930).—About 6 miles, air line, and $10\frac{1}{2}$ miles by road, northeast of Doniphan, and 0.8 mile west by south of John E. Brook's house. To reach from Doniphan go east on Route 42 to junction with Route 21, thence 4.7 miles north on Route 21 to small school building at crossroads, turn west one-fourth mile to old Route 21, thence 2.6 miles west and north to two blazed trees at crossroads, turn west and follow road 1.3 miles to blazed tree on left where road descends slightly to northwest. Station is on top of timbered ridge, 22 meters (72 feet) southwest of road, and about

22 meters (72 feet) south by west of blazed tree. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 10 meters (33 feet) northeast of road, and 112.6 feet from station in magnetic azimuth 18°. No. 2 is 3 meters (10 feet) north of road at curve, and 120.1 feet from station in magnetic azimuth 100°.

Junction (Carter County, P. A. Smith, 1930).—About 22 miles northwest of Poplar Bluff, $4\frac{1}{2}$ miles northeast of Hunter, and 0.2 mile northeast of Y-junction of newly built Highway 60 and Highway 21. To reach from Poplar Bluff, go 22 miles northwest on Route 60 to Y-junction with Route 21, thence 100 yards across railroad tracks, branch from Williamsville to Hunter, turn right along railroad right-of-way 150 meters (492 feet) to two triangular-blazed trees on left, turn left (northeast) through pine and oak thicket 45 meters (148 feet) to station which is on flat timbered ridge three-fourths mile northeast of railroad junction switch, 50 meters (164 feet) northeast of third telegraph pole southeast of mile board 220, 60 meters (197 feet) northeast of tracks; 9.1 meters (30 feet) northeast of 10-inch oak tree, and 8.9 meters (29 feet) southwest of 7-inch pine. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in thicket, 12 meters (39 feet) north-northeast of dirt road along railroad, and 32.67 meters (107.2 feet) from station in azimuth 3°23'. No. 2 is in thicket, 33.70 meters (110.6 feet) from station in azimuth 290°34'.

Martin (Butler County, P. A. Smith, 1930).—About 9 miles, air line, and 12 miles by road northwest of Poplar Bluff, 2 miles north of Poplar Bluff-Canecreek road, and one-half mile west of Philip Martin's house, on west end of flat timbered ridge. To reach from Poplar Bluff, go 5 miles northwest on United States Route 67 to fork at Road House, leave Route 67 and take county road west, following the main-traveled and straight road at crossings, past schoolhouse at $1\frac{1}{2}$ miles, on 0.7 mile to crossing, and straight through 2.6 miles to fork, take right or straight road 1.9 miles to T-intersection, then right-hand road 0.4 mile, turn right onto dim hill road in sight of creek and follow 0.5 mile up hill and along ridge. Martin's house is on road at foot of hill. Station is 4 meters (13 feet) southwest of dirt ridge road, 7.8 meters (26 feet) southeast of 16-inch oak tree, and 7.6 meters (25 feet) west of 12-inch oak tree. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 12 meters (39 feet) east of ridge road and 28.18 meters (92.5 feet) from station in azimuth 258°09'. No. 2 is 16 meters (52 feet) east of ridge road, and 55 meters (180 feet) from station in azimuth 349°52'.

Berry (Butler County, P. A. Smith, 1930).—About 10 miles southwest of Poplar Bluff, $2\frac{1}{2}$ miles north and one-half mile west of junction of Routes 42 and 67, and one-half mile northeast of Lone Hill church and school building, on land owned by Oscar Berry. To reach from Poplar Bluff, go $4\frac{1}{4}$ miles southwest on Route 67 to point where road turns south, west of county poor farm, thence west and south 7.8 miles over county road to Berry's house on west side of road. Station is about 150 meters (492 feet) west of house, 20 feet north of path leading west, in orchard south of path, and 1 meter (3 feet) east of line prolonged from third row of trees from east. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 18 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in fence line east of county road, 20 meters (66 feet) northeast of barn and one-eighth mile from station in azimuth 299°19'32''. No. 2 is in fence line west of orchard, 21 meters (69 feet) south of fence corner, and 237.2 feet from station in azimuth 80°33'.

Deal (Butler County, P. A. Smith, 1930).—About 8 miles northeast of Poplar Bluff, on highest part of low, wooded ridge owned by J. H. Hartwell. To reach from Poplar Bluff, go east on Route 60 to school northeast of levee, thence 2.7 miles north to fork, keep main road east of levee across railroad tracks to fork, take right road past Dealtown School and continue 2.2 miles northeast to station which is 91 feet east of county road at small cut, between forked entrance to woods road to east, and about 60 feet from each fork. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 25 feet west of county road, and 119.9 feet from station in azimuth

135°59'. No. 2 is 20 meters (66 feet) east of county road, 5 meters (16 feet) south of south fork of woods road and 166.9 feet from station in azimuth 39°59'.

Head (Butler County, P. A. Smith, 1930).—About 9 miles, air line, and 14.5 miles by road southeast of Poplar Bluff, 5.5 miles south of United States Route 60, one-fourth mile west of Brosely, on land owned by S. C. Head who lives on east side of Brosely Road about one-fourth mile south of station. To reach from Poplar Bluff, go 8.5 miles east on Route 60 to dirt road leading south (about one-half mile west of railroad station, Ash Hill), follow this road 5.7 miles to crossroads 1 mile north of Brosely, take right-hand road (west) 0.2 mile to small house on north side of road, turn in driveway past barn and go north to station which is on highest point of highest sand knoll in vicinity, in cleared field, about 140 meters (459 feet) south of north fence of field alongside ditch, about 50 meters (164 feet) east of thicket on west side of field, and 33.1 meters (109 feet) south-southwest of lone 16-inch walnut tree in center of field. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in fence corner on west fence line of small apple orchard, and 0.2 mile from station in azimuth 348°15'34''. No. 2 is in intersection of fence parallel to road and fence going north to barn, 25 meters (82 feet) south by east of barn, 0.3 mile west of crossroads, and 0.33 mile from station in azimuth 46°24'03''.

Boyd (Stoddard County, P. A. Smith, 1930).—About 6½ miles, air line, and 8 miles by road southwest of Dexter, 0.7 mile southwest of Boyd schoolhouse, on land owned and occupied by Mrs. Allie Chadwell. To reach from Dexter, go 1 mile west on United States Route 60 to fork, leave Route 60 and follow straight road south and southwest 6.3 miles to Boyd schoolhouse, thence 0.3 mile to crossroads, take right-hand road 0.4 mile to William's gravel pit, thence to right, through gap in fence, past house, to top of hill and station which is 70 meters (230 feet) west of old Chalk Bluff Road, at William's gravel pit, about 200 meters (656 feet) north of Mrs. Chadwell's house, in southwest side of small pasture field, about 20 meters (66 feet) west of a small cluster of bushes, 6 meters (20 feet) east of north-and-south fence on east side of cultivated field, and 35 meters (115 feet) from fence corner. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is in west fence line paralleling road, about 30 meters (98 feet) south of north fence corner and gap, and 100 meters (328 feet) from station in azimuth 234°45'. No. 2 is at east corner of barn, about 45 meters (148 feet) east of road, 8 meters (26 feet) south of fence corner of barn lot, and 180 meters (591 feet) from station in azimuth 345°13'07''.

Poor (Stoddard County, P. A. Smith, 1930).—About 6 miles north of Dexter and 1 mile south of Bloomfield, on the Stoddard County poor farm. To reach from Bloomfield, go 1 mile south on Route 25 to farm. Station is 148 feet west of fence along Route 25, on highest part of small knoll about one-eighth mile southwest of home, in field about 200 yards south of barn, 216 feet west of center line of pavement, and 14 feet north of barbed-wire fence. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 18 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is about 80 meters (262 feet) southwest of barn, 2 feet south of fence at east end of rail section, and 333.85 feet from station in azimuth 196°21'. No. 2 is in north-and-south fence line, about 30 meters (98 feet) south of east-and-west fence, and about one-fourth mile from station in azimuth 97°51'46''.

Idalia (Stoddard County, P. A. Smith, 1930).—About 7 miles east by north of Bloomfield, 3 miles northeast of Idalia, and 7 miles north of Essex, on highest knob on old bluff road, on land owned and occupied by J. M. Hopkins. To reach from road 1 block south of courthouse in Bloomfield, go east 3.8 miles to fork, take left fork 1.0 mile to road turning east, thence 1.4 miles east to top of thinly wooded knoll to where road forks just after passing through cut, which is about 300 meters (984 feet) east of Hopkins' house. Station is about 30 meters (98 feet) west of fork, in southeast corner of small peach orchard, and 7.3 meters (24 feet) northwest of top of cut on road. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 6 meters (20 feet) south of road to east, 20 meters (66 feet) east of fork,

and 75 meters (246 feet) from station in azimuth $264^{\circ}26'$. No. 2 is on top of ridge, 1 foot northeast of woven-wire fence, and 32.94 meters (108.1 feet) from station in azimuth $51^{\circ}51'$.

Ditch (Stoddard County, P. A. Smith, 1930).—About 8 miles west of Sikeston, 2 miles west of Morehouse, 3 miles east of railroad station at Grayridge, on top of west bank of Little River Drainage Ditch No. 1, and 35 meters (115 feet) south of center line of pavement west of bridge on Route 60. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference mark no. 1 is standard reference disk in drill hole in southwest corner of west approach abutment of bridge, and 32.52 meters (106.7 feet) from station in azimuth $184^{\circ}35'$. No. 2 is a standard reference disk in concrete, note 11 (a), in fence line east of county road, 26 meters (85 feet) south of Route 60, and about one-half mile from station in azimuth $70^{\circ}14'04''$.

Bell (Stoddard County, P. A. Smith, 1930).—About 10 miles, air line, and 16 miles by road northeast of Bloomfield, 1 mile, air line, and $1\frac{1}{2}$ miles by road west by south of Bell City, and 1.2 miles southwest of the Bell City-Bloomfield road, on highest knob on north side of old bluff road. Top of knob is partly timbered, with cleared field to west. To reach from Bloomfield, go 11 miles north on Route 25 to road leading east at mile board "Bell City 4 miles", follow Bell City road 3.6 miles to top of hill, take road on right which leads up ridge through deep narrow cut 1.2 miles to top of ridge and station. Station is 7 meters (23 feet) north by west (right side) of center line of bluff road, 9.8 meters (32 feet) northeast of 30-inch oak tree with triangular blaze, and 10 meters (33 feet) northeast of split-picket fence. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is 4 meters (13 feet) north of center line of dirt road and 28.55 meters (93.7 feet) from station in azimuth $238^{\circ}38'$. No. 2 is 4 meters (13 feet) southeast of center line of dirt road, in edge of woods, and 55 meters (180 feet) from station in azimuth $21^{\circ}32'$.

Morley (Scott County, P. A. Smith, 1930).—About 10 miles north of Sikeston, 2 miles south of Morley, and three-fourths mile east of Route 61, on land owned by H. K. Dickey. To reach from Sikeston, go 39 miles north on Route 61 to road leading east at junction with electric power line leading east from north-and-south power line. Follow road east three-fourths mile to dirt road leading north, and go 0.2 mile north on road to station which is on highest point of prominent sand hill, top and west side of which are covered with small jack-oak sprouts (surrounding land is clear and in cultivation), and 50 meters (164 feet) west of center line of dirt-and-sand road. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is along-side road, in west fence line, 30 meters (98 feet) south of south end of gate at foot of sand hill, and 200 meters (656 feet) from station in azimuth $205^{\circ}08'28''$. No. 2 is on small knoll on public road, on south right-of-way fence line of road, on north side of peach orchard, and one-fourth mile from station in azimuth $305^{\circ}52'55''$.

Sikeston (Scott County, P. A. Smith, 1930).—About 1 mile north of town of Sikeston, on Matthew's farm. To reach from Sikeston, go about 1 mile north on Route 61 to point where highway jogs west several hundred yards and country road leads off to west (a two-story house is at northwest corner of junction), and continue west across railroad tracks about one-fourth mile to station which is 13.9 meters (46 feet) north of road, 5.9 meters (19 feet) north of wire fence, and 39.5 meters (130 feet) west of west rail of St. Louis-San Francisco Railway. Surface and underground marks are standard station disks in concrete, notes 1 (a) and 7 (a). Upper mark is 18 inches below surface. Reference marks are standard reference disks in concrete, note 11 (a). No. 1 is at corner of field, 14 meters (46 feet) west of cattle guard on tracks, and 29.50 meters (96.8 feet) from station in azimuth $278^{\circ}12'$. No. 2 is 11 meters (36 feet) northwest of small house, in fence line, 3 meters (10 feet) south of corner, and 39.40 meters (129.3 feet) from station in azimuth $54^{\circ}22'$. Azimuth from station to Sikeston municipal water tank is $310^{\circ}02'05''$.

Diehlstadt (Scott County, P. A. Smith, 1930).—About 6 miles northwest of Charleston and 1.4 miles north of Diehlstadt, on land owned by Dr. Gallagher, of St. Louis, and cared for by J. F. Misfeldt of Ironton. To reach from Charles-

ton, go 4 miles west on United States Route 60 to junction with gravel road (Route 55), thence $2\frac{3}{4}$ miles north of Diehlstadt, continue $1\frac{1}{2}$ miles to lane leading east 200 yards to tenant house. Station is in barn lot, 12.52 meters (41 feet) southeast of southeast corner of barn, 6.3 meters (21 feet) northwest of southeast fence corner of barn lot, and 21.2 meters (70 feet) east of 26-inch oak tree. Surface and underground marks are standard station disks set in concrete, notes 1 (*a*) and 7 (*a*). Reference mark no. 1 is standard reference disk in concrete, note 11 (*a*), in southeast fence corner of cultivated field adjoining barn lot, on edge of dirt lane, 1 meter (3 feet) west of west end of gate, and 170 meters (558 feet) from station in azimuth $271^{\circ}44'18''$.

Armour (Mississippi County, P. A. Smith, 1930).—About 7 miles southwest of Charleston and 3 miles south of Bertrand, in northwest corner of NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, T. 26 N., R. 15 E., in yard of the Armour School (District 14). To reach from Charleston, go 7 miles west on Route 60 to Bertrand, continue through Bertrand to road just west of town that jogs south, go 2.6 miles south to corner, and then west one-fourth mile to school on south side of road. Station is 3 meters (10 feet) from south side of schoolyard, and 1 meter (3 feet) east of line along east side of schoolhouse. Surface and underground marks are standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Reference marks are standard reference disks in concrete, note 11 (*a*). No. 1 is along east side of yard, 15 meters (49 feet) north of small oak tree in southeast corner, and 39.16 meters (128.5 feet) from station in azimuth $251^{\circ}53'$. No. 2 is in fence line along south side of road, about 200 yards west of corner of school, in azimuth $107^{\circ}24'17''$ from station.

Supplementary point

Clark (Ripley County, P. A. Smith, 1930).—About 14 miles, airline, and 16 miles by road west of Poplar Bluff, and 4 miles northwest of west store at String Town, on property owned by R. T. Clark, of Little Rock, Ark., and occupied by Elins Sneathern, on highest ground in vicinity, 60 paces south of Sneathern's house, and 30 paces south of yard fence. Surface and underground marks are probably standard station disks in concrete, notes 1 (*a*) and 7 (*a*). Reference marks are probably standard reference disks in concrete, note 11 (*a*). No. 1 is 23.80 meters (94.5 feet) from station in magnetic azimuth $64^{\circ}30'$. No. 2 is 40.18 meters (131.8 feet) from station in magnetic azimuth $174^{\circ}15'$.

THIRTY-SEVENTH PARALLEL TO THIRTY-NINTH PARALLEL ARC

Principal points

Winter 2 (Gasconade County, C. I. Aslakson, 1933).—About 0.9 mile east of Drake, a village at intersection of State Route 19 and United States Route 50, in southeast corner of NW $\frac{1}{4}$ sec. 24, T. 43 N., R. 5 W., on land owned by Mrs. Fritz Zimmerly. To reach from Drake, follow dirt road east, from general store 0.9 mile to Zimmerly's house and station site. Station is opposite farm buildings, 33 feet south of center of dirt road, and about 20 meters (66 feet) east of dirt farm-road. Surface and underground marks are standard disk station marks in concrete, notes 1 (*b*) and 7 (*a*). Upper mark is 20 inches below ground. Reference and azimuth marks are standard reference disks in concrete, note 11 (*b*). No. 1 is near southeast fence corner of barnyard, about 25 feet north of center line of road, and 115.2 feet from station in azimuth $264^{\circ}24'$. No. 2 is along east-and-west fence line on south side of road opposite Zimmerly's house, and 27.44 meters (90.0 feet) from station in azimuth $119^{\circ}50'$. Azimuth mark is near group of farm buildings about one-third mile east of Zimmerly's house, on fence line on west side of north-and-south road, about 300 feet south of east-and-west road, and about one-third mile from station in azimuth $292^{\circ}38'05''$. Azimuth from station to church steeple, $1\frac{1}{2}$ miles southeast of Drake, is $18^{\circ}37'45''$. A 6-inch square block of limestone with cross on top and projecting 10 inches above the ground, the original surface mark of station *Winter 1874* (see description thereof), is 3.69 meters (12.1 feet) north of station. Evidence indicated that this mark had been moved, but a search failed to disclose the underground mark. New station, *Winter 2*, is in immediate vicinity of old station site.

Jacobs 2 (Franklin County, C. I. Aslakson, 1933).—About 4.7 miles by road northeast of Gerald, in extreme southeast corner of NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 28, T. 43 N.,

R. 3 W., on western edge of gravel cut-off road leading northwest from Farm to Market Road (Old Canaan Road) to old State road. To reach from Gerald railroad station, go northeast on United States Route 50, 4.2 miles to new graded road at sign and arrow "New Haven 15 mi." This is Farm to Market Road. Go north on this road 0.3 mile to forks, take left fork marked "Jaeggens Shop" and go 0.2 mile to station site on west side of road. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Upper mark projects about 10 inches above ground. Reference and azimuth marks are standard reference disks in concrete, note 11 (b). No. 1 is across road from station and 33.60 meters (110.2 feet) from station in azimuth $224^{\circ}58'$. No. 2 is across road from station and 31.71 meters (104.0 feet) from the station in azimuth $301^{\circ}26'$. Azimuth mark is on east-and-west section line about 40 meters (131 feet) east of New Haven Road, about 0.6 mile northeast of road fork mentioned above, and approximately 0.55 mile from station in azimuth $243^{\circ}30'48''$. Station *Jacobs* established in 1874 and recovered in 1922, was not recovered. New station, *Jacobs* 2, is in immediate vicinity of old station.

Price (Gasconade County, C. I. Aslakson, 1934).—About 3.9 miles south of Owensville, on west side of State Highway 19, in south end of triangular clearing on land owned by Arthur Price, and 34.3 meters (113 feet) west of highway. Surface and underground marks are standard disk marks in concrete, notes 1 (b) and 7 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). No. 1 is 27 meters (89 feet) west of center line of north-and-south country road, and 35.29 meters (115.8 feet) from station in azimuth $178^{\circ}23'$. No. 2 is 13.5 meters (44 feet) west of center line of State Highway 19, and 47.53 meters (155.9 feet) from station in azimuth $254^{\circ}54'$. Azimuth mark is on fence line on west edge of timber, 25 feet east of center line of highway, and 0.2 mile from station in azimuth $177^{\circ}20'24''$. Azimuth from station to church steeple, distant $1\frac{1}{2}$ miles, is $352^{\circ}11'52''$.

Elmont (Franklin County, C. I. Aslakson, 1933).—About 5.6 miles west by north of Sullivan, a town on United States Route 66, 0.5 mile west of Elmont, on Farm to Market road between Gerald and Sullivan, 0.6 mile west of Lutheran Church in Elmont, on land owned by David Datter. To reach from Sullivan, take Farm to Market road leading to Gerald 5.0 miles to Elmont, thence westward about 0.6 mile to farm buildings on south side of road and gap in fence on north side. Go through gap about 150 meters (492 feet) to top of ridge to station site on highest point. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Upper mark is 10 inches below surface of ground. Reference and azimuth marks are standard reference disks in concrete, note 11 (b). No. 1 is at edge of ridge of dirt enclosing a water hole, and 52.2 meters (171 feet) from station in azimuth $198^{\circ}08'$. No. 2 is in north-and-south fence line and 134.0 meters (440 feet) from station in azimuth $277^{\circ}32'56''$. Azimuth mark is reached by going east 0.6 mile on road to Sullivan, turning northwest on dirt road by Lutheran Church 1.2 miles to white farmhouse on left side of road. Mark is southwest of house, in fence line parallel to road, and approximately $1\frac{1}{4}$ miles from station in azimuth $194^{\circ}48'34''$. The following distances and azimuths are from station: Cuba black water tank, 8 miles, $35^{\circ}37'07''$; Sullivan municipal water tank (silver), 6 miles, $289^{\circ}33'57''$; Elmont Lutheran Church, 0.5 mile, $273^{\circ}25'12''$.

Bourbon (Crawford County, C. I. Aslakson, 1933).—About 2.1 miles south of Bourbon, on south side of United States Highway 66, in yard of a Phillips "66" filling station named "Hill", owned by Miss M. J. Popitowitz, who lives about 0.75 mile north of station. Station is 43 feet from center line of highway, 66.131 feet from northeast corner of filling station, and 17.5 feet from railroad fence line. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Upper mark projects about 8 inches above ground. Reference and azimuth marks are standard reference disks in concrete, note 11 (b). No. 1 is just inside of railroad fence line and 29.38 meters (96.4 feet) from station in azimuth $236^{\circ}55'$. No. 2 is inside of railroad fence line, and 28.65 meters (87.4 feet) from station in azimuth $27^{\circ}25'$. Azimuth mark is about 30 feet north of center line of United States Route 66, 20 feet southeast of large Barnsdall Gasoline sign, and 0.6 mile from station in azimuth $90^{\circ}36'23''$. Azimuth from station to Bourbon municipal water tank, distant 2.1 miles, is $211^{\circ}50'03''$, and to Cuba black water tank is $57^{\circ}02'13''$.

Hughes (Crawford County, C. I. Aslakson, 1934).—About 7 miles southwest of Cuba, in SE $\frac{1}{4}$ sec. 1, T. 38 N., R. 5 W., in highest point of cleared field owned by Mr. Hughes, and northeast of his house. To reach from Cuba, go west 5.7 miles on State Highway 66 to gravel road which forks to right, follow this road 1.1 miles to station on north side of road in cleared field. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). No. 1 is along fence on north side of east-and-west country road, 7.75 meters (25.4 feet) from center line of this road and 45.90 meters (150.6 feet) from station in azimuth 88°53'. No. 2 is along same fence line, 26.3 meters (86 feet) from center line of east-and-west country road, and 37.42 meters (122.8 feet) from station in azimuth 194°21'. Azimuth mark is about 100 feet north of east-and-west road 300 feet east of and on opposite side of road from farmhouse, and 0.3 mile from station in azimuth 229°13'14". Azimuth from station to St. James municipal water tank is 60°46'20".

Wallis (Crawford County, C. I. Aslakson, 1933).—About 10.1 miles by road northeast of Steelville, in NE $\frac{1}{4}$ sec. 28, T. 38 N., R. 3 W., on south side of dirt road, in peach orchard owned by Mr. Wallis, who lives 75 yards east of station. To reach from Steelville, go east on State Route 8 from junction of Routes 8 and 19 in south part of town 5.5 miles to a sign which points north and has legend "Scotia P.O." Turn north on dirt road 2.0 miles to cross road, then east on dirt road leading past Mr. Wallis' house 0.5 mile to station site. Station is 50 feet south of east-and-west fence line and 80 feet west of north-and-south fence line which follows lane leading to Mr. Wallis' house. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). Reference mark no. 1 is in southwest fence corner of peach orchard, 10 feet west of north-and-south fence line, 53.91 meters (176.9 feet) from *Primary traverse station no. 108* (U.S.G.S.) (see description thereof), and 53.852 meters (176.68 feet) from station in azimuth 323°52'. No. 2 is in east-and-west fence line of road leading to station, and 53.11 meters (174.2 feet) from station in azimuth 94°36'. Azimuth mark is 60 feet east of road which turns north at Mr. Wallis' house, at edge of woods and about 0.4 mile from station in azimuth 218°31'40". *Primary traverse station no. 108* (U.S.G.S.) (see description thereof) is 26.21 meters (86.0 feet) from station in azimuth 247°44'48".

Perkins (Phelps County, C. I. Aslakson, 1933).—About 12.4 miles by road southeast of St. James, in NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 1, T. 36 N., R. 6 W., on north side of dirt road, on land owned by Mr. Perkins who lives 1.0 mile east of station, and 0.2 mile east of farm road leading north on crest of hill. To reach from St. James, go south on County Route H 11.3 miles to dirt T-road turning east, thence east on T-road 1.2 miles to station site. Station is 5 meters (16 feet) north of east-and-west fence line. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). Reference mark no. 1 is on east-and-west fence line, across road leading to station, and 45.82 meters (150.3 feet) from station in azimuth 329°33'. No. 2 is on east-and-west fence line, slightly down grade, a cross road leading to station, and 45.17 meters (148.2 feet) from station in azimuth 103°00'. Azimuth mark is 0.1 mile south of T-road leading to station, 12 meters (39 feet) east of center line of County Highway H, on north-and-south fence line, 12 meters (39 feet) east of center line of County Highway H, on north-and-south fence line, and 1.2 miles from station in azimuth 86°00'57".

Dillard (Crawford County, C. I. Aslakson, 1934).—About 7.6 miles southeast of Cherryville, 3.8 miles by road northwest of Dillard, on south side of County Highway B, on highest point of hill covered with small timber. To reach from Steelville, take State Highway 19 south to Cherryville to junction with County Highway B. Turn left on junction of State and county highways and follow 5.5 miles to point where County Highway B turns right. Turn right here and go 2.1 miles to station site. Surface and underground marks are standard disk's station marks in concrete, notes 1 (b) and 7 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). Reference mark is in timber 50.63 meters (166.1 feet) from station in azimuth 296°36'.

Azimuth mark is about 75 feet south of center line of County Highway B, approximately 200 feet west of private farm cross-road, in small patch of cleared land, and 0.3 mile from station in azimuth $183^{\circ}28'42''$. Witness mark, a cylindrical block of concrete without disk, is in woods, 44.73 meters (146.8 feet) from station in azimuth $41^{\circ}20'$. Azimuth from station to silver tank (Gulf pumping station) distant 6 miles, is $154^{\circ}13'12''$, and to gable of small white house, distant $1\frac{1}{2}$ miles, is $212^{\circ}34'29''$.

Howe (Dent County, C. I. Aslakson, 1934).—About 4.6 miles by road (State Highway 19) north by east of Salem, 0.5 mile south of Howes railroad station, on summit of rise west of highway and railroad tracks. Station is on highest ground, 188 feet west of center of tracks, about 40 feet south of road leading into woods from highway and crossing tracks about 200 feet north of station. Surface mark is standard disk station mark in concrete, note 1 (b), projecting about 8 inches above ground. Underground mark is standard disk station mark in bedrock, note 8 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). Reference mark no. 1 projects about 6 inches and is on north slope of hill, about 40 feet west of tracks, about 50 feet south of woods road leading west, about 10 feet west of woods road running along west side of tracks, and 147.27 feet from station in azimuth $234^{\circ}56'14''$. No. 2 projects about 14 inches and is on south slope of hill, about 125 feet west of Highway 19, about 50 feet west of tracks, about 25 feet west of woods road leading south, and 123.353 feet from station in azimuth $323^{\circ}31'10''$. Azimuth mark is on fence line on east side of highway, about 100 feet north of house, 25 feet north of gate leading into house, and about 150 yards from station in azimuth $202^{\circ}08'46''$.

Penrod (Dent County, C. I. Aslakson, 1934).—About 17 miles by road east of Salem, 2.3 miles by road southwest of Howes Mill, 0.2 mile southeast of State Highway 32, on highest point of flat ridge, on land owned by W. T. Watkins, of Kansas City, Mo., and occupied by G. H. Penrod, in farmyard, near some old unoccupied buildings. To reach from Salem, go east 13.6 miles on State Route 32 to junction with State Highway 72. Continue $3\frac{1}{2}$ miles on Highway 32 to old log barn on southeast side of highway near point where highway starts down long hill to northeastward. Old barn is at north side of cleared land at north end of flat cleared ridge. Another log shed is east of barn and cedar trees are east of shed. At northeast side of old barn take T-road southeast 0.2 mile to station site. Station is about 250 feet west of Mr. Penrod's house, about 150 feet north of old east-and-west country road, and about 40 paces southward from cut-off road leading westward to Highway 32. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). Reference mark no. 1 is in corner of Mr. Penrod's farmyard, and 39.64 meters (130.1 feet) from station in azimuth $258^{\circ}08'$. No. 2 is north of old country road, in farmyard along fence line, and 46.18 meters (151.5 feet) from station in azimuth $9^{\circ}04'$. Azimuth mark is on north side of State Highway 19, about 100 feet west of gate, and 0.3 mile from station in azimuth $98^{\circ}17'16''$. Azimuth from station to Salem water tank, distant 15 miles, is $96^{\circ}26'23''$.

Grogan (Dent County, C. I. Aslakson, 1934).—About 8.7 miles south of Salem, in SE $\frac{1}{4}$ sec. 17, T. 33 N., R. 5 W., 0.1 mile northwest of Sinclair filling station, on highest point of pasture owned by Frank Grogan, who lives 1.1 miles north of station site and 475 feet north of Highway 19. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). Reference mark no. 1 is 5 meters (16 feet) northwest of water hole, 30 feet from 20-inch oak tree, and 64.228 meters (210.72 feet) from station in azimuth $359^{\circ}06'$. No. 2 is 9 meters (30 feet) northeast of center line of Highway 19, 0.2 mile northwest of filling station, in north-and-south fence line, and 135.165 meters (443.45 feet) from station in azimuth $52^{\circ}20'01''$. Azimuth mark is on north-and-south fence line, 10 meters (33 feet) southwest of center line of Highway 19, about 190 feet southeast of Mr. Grogan's mail box, and 0.4 mile from station in azimuth $106^{\circ}31'07''$.

Lewis (Dent County, C. I. Aslakson, 1934).—About 15.0 miles by road southwest from Salem, 3.7 miles southwest of Gladden post office, on land owned by the Potosie Tie Co. of Salem, 64 feet west of center line of Route 19, and 0.85 mile south of farm of Mr. Lewis which is in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 14, T.

32 N., R. 5 W. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). All marks project from 8 to 10 inches above ground and can be easily seen from highway. Reference mark no. 1 is 20 feet east of road and 171.54 feet from station in azimuth $219^{\circ}21'$. No. 2 is 20 feet east of road, 281.55 feet from no. 1, and 168.95 feet from station in azimuth $330^{\circ}57'$. Azimuth mark is 25 feet west of Route 19 and approximately 0.15 mile from station in azimuth $216^{\circ}11'18''$.

Bunker (Dent County, C. I. Aslakson, 1933).—In village of Bunker, a small town on State Highway 72, on property of Neely Oil Co. of Ellington, 23.1 meters (76 feet) east of center line of Main Street, 26.0 meters (85 feet) north of center line of County Highway A, opposite E. H. Highley Mercantile Co. store. To reach from Salem follow Route 72 to Bunker. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). Reference mark no. 1 is at southeast corner of small white building, 15.0 meters (49 feet) from center line of Main Street, and 61.91 meters (203.1 feet) from station in azimuth $139^{\circ}47'$. No. 2 is along north-and-south fence, 10.5 meters (34 feet) west of center line of Main Street, and 64.84 meters (212.7 feet) from station in azimuth $31^{\circ}44'$. Azimuth mark is 15.5 meters (51 feet) south of center line of Route 72, in cleared unused field, just east of gravel country road, and 0.2 mile from station in azimuth $296^{\circ}55'01''$.

Young (Shannon County, C. I. Aslakson, 1934).—About 7.4 miles northwest of courthouse in Eminence, on high rocky hill, on land owned by G. E. Young. To reach from Eminence, follow Route 19 northwest 7.4 miles to Mr. Young's filling station and house on north side of road. Station is about 25 yards north of highway, 35 yards southeast of large barn, and 10.5 meters (34 feet) south of fence line. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). Reference mark no. 1 is on down slope of hill, in north central part of inclosure, along timber line, and 198.82 feet from station in azimuth $223^{\circ}37'$. No. 2 is on southwestern edge of hill, just north of old road, about 20 meters (66 feet) north of center line of Route 19 and 189.30 feet from station in azimuth $344^{\circ}52'$. Azimuth mark is on fence line on west side of highway, and approximately 0.3 mile from station in azimuth $327^{\circ}56'18''$.

Stegall (Carter County, C. I. Aslakson, 1934).—About 11.7 miles southeast of Eminence, on highest point of one of prominent knobs of range of hills known as Stegall Mountain. To reach from Eminence, at junction of State Route 19 and County Route C, go southeast on Route C 4.3 miles to Little Shawnee Creek road, then south 3.8 miles to T-road, take right branch 1.8 miles to another T-road, and take left branch 1.7 miles to house of J. W. Denton who can direct one to station. Trail to station starts 0.9 mile southeast of Mr. Denton's house on south side of road and is marked by two triangular blazes. Trail proceeds southerly for about 1.0 mile to station site on top of second ridge. Station marked by standard disk station mark in red sandstone outcrop, note 2. Reference and azimuth marks are standard reference disks in outcropping bedrock or boulders. Reference mark no. 1, in boulder, 3 feet by 2 feet in size, note 12 (c) is 18.300 meters (60.04 feet) from station in azimuth $224^{\circ}32'40''$. No. 2 in rock outcrop, note 12 (a), is 96.53 feet from no. 1 and 14.422 meters (47.32 feet) from station in azimuth $352^{\circ}20'$. Blazed trail leads from station across hollow to azimuth mark, in large boulder, note 12 (c), one-half mile distant in azimuth $180^{\circ}55'00''$.

Webb (Shannon County, C. I. Aslakson, 1934).—About $1\frac{1}{4}$ miles north by west of Bartlett railroad station, 0.9 mile north by west of junction of United States Route 60 and County Route E, in SE $\frac{1}{4}$ sec. 7, T. 27 N., R. 4 W., on highest point of gently sloping high hill, in wooded area. To reach from vicinity of Winona or Bartlett, go to Highway 60 and follow to junction with County Route E, which is just 0.015 mile west of railroad crossing at Bartlett, then northward on Route E 0.9 mile to station site. Station is about 85 feet southwest of center line of Route E. Surface and underground marks are standard disk station marks in concrete, notes 1 (b) and 7 (a). Reference and azimuth marks are standard reference disks in concrete, note 11 (b). Reference mark no. 1 is on north slope of high wooded hill, at intersection of two fence lines, 45 feet southeast of center line of Route E, and 248.15 feet from station in

azimuth $265^{\circ}49'$. No. 2 is on south slope of high wooded hill, 33 feet southeast of center line of Route E, and 211.17 feet from station in azimuth $155^{\circ}52'$. Azimuth mark is 36 feet southeast of center line of Route E, and 0.1 mile from station in azimuth $285^{\circ}41'01''$. Brush must be cleared before azimuth mark can be seen from station.

Supplementary points

M.S.M. (Phelps County, C. I. Aslakson, 1934).—In northeast corner of campus of Missouri School of Mines at Rolla, just west of intersection of Main Street and Sixteenth Street, and 49 paces northeast of college water tank. Surface and underground marks are standard disk station marks in concrete, notes 1 (*b*) and 7 (*a*). Reference and azimuth marks are standard reference disks in concrete, note 11 (*b*). Reference mark no. 1 is just east of east edge of Main Street sidewalk, between gravel road which leads west from Main Street and Highway 66, and 193.35 feet from station in azimuth $205^{\circ}29'$. No. 2 is just north of sidewalk on Sixteenth Street and 245.65 feet from station in azimuth $299^{\circ}42'$. Azimuth mark is in southwest corner of football field, between track and bank, about 10 feet from bank, and about one-fourth mile from station in azimuth $39^{\circ}10'04''$. Azimuth from station to Missouri School of Mines stack, distant about one-fourth mile, is $5^{\circ}57'59''$. College authorities are familiar with location of all marks.

Primary traverse station no. 108 (U.S.G.S.) (Crawford County, C. I. Aslakson, 1934).—About 5 miles southwest of Scotia, on Steelville-Scotia road, in $NE\frac{1}{4}$ sec. 28, T. 38 N., R. 3 W., 150 feet northwest of F. C. Wallis' farmhouse, in southwest angle of T-lane, south and 53.91 meters (176.9 feet) from reference mark no. 1 of station *Wallis* (see description thereof). Mark is standard disk of Geological Survey, in concrete post, stamped with legend "P.T. Sta. No. 108 S 1926". Station *Wallis* (see description thereof) is distant 26.21 meters (86.0 feet) from station in azimuth $67^{\circ}44'48''$.

For notes in regard to marking of stations see p. 80.

68297°—34—11



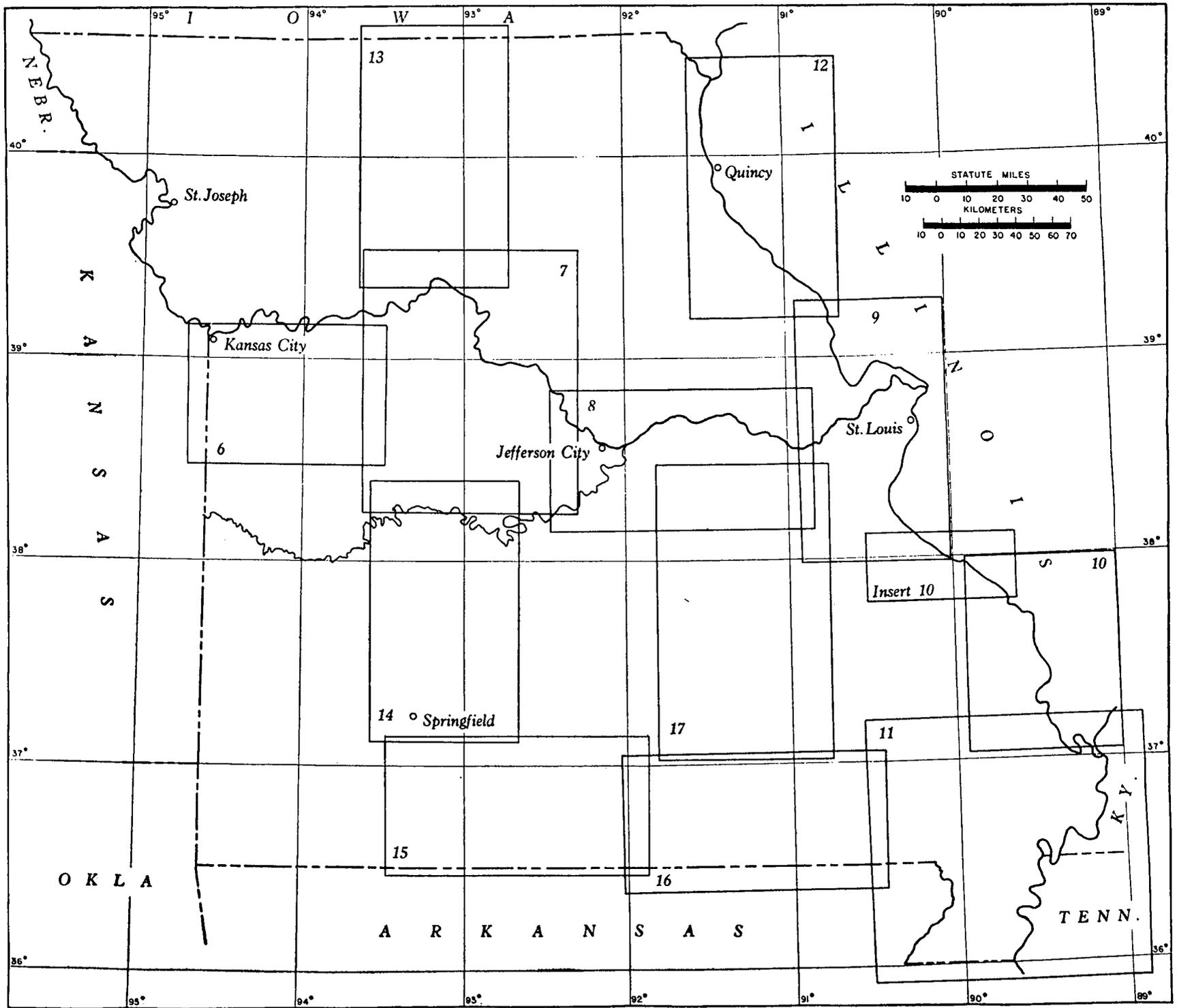


FIGURE 5.—Index map of Missouri showing areas covered by each of the following sketches, figures 6 to 17.

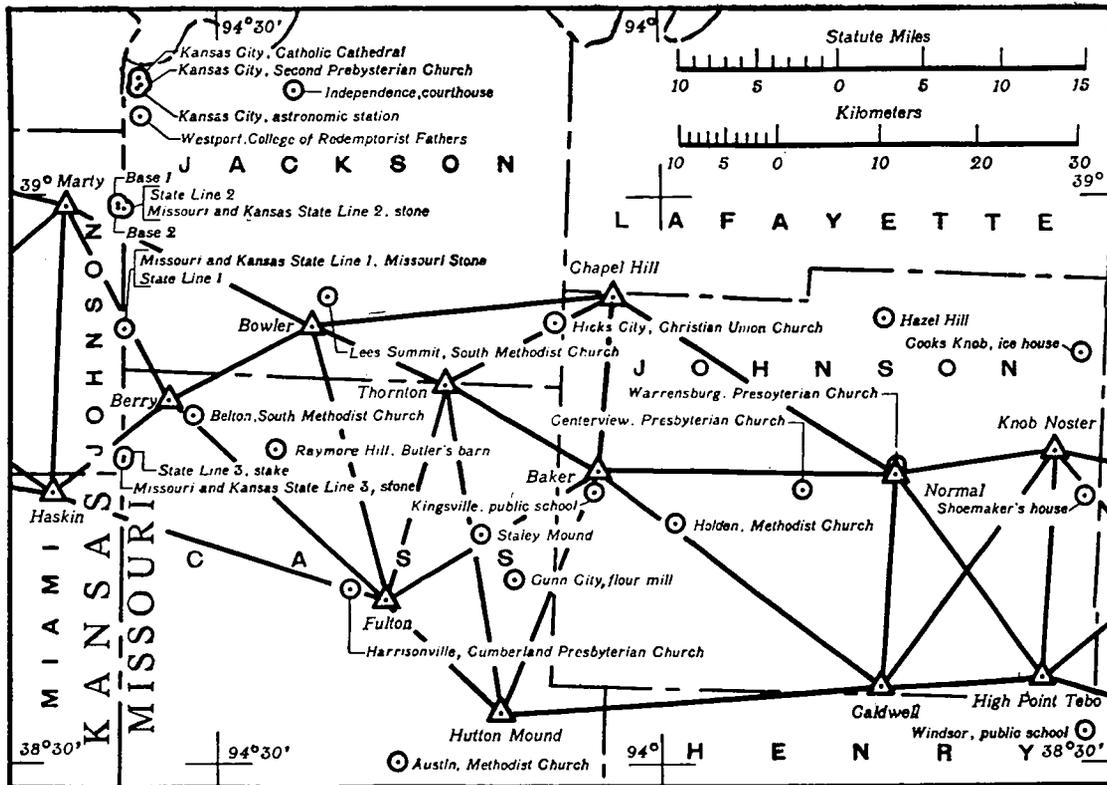


FIGURE 6.—First-order triangulation, thirty-ninth parallel arc, west.

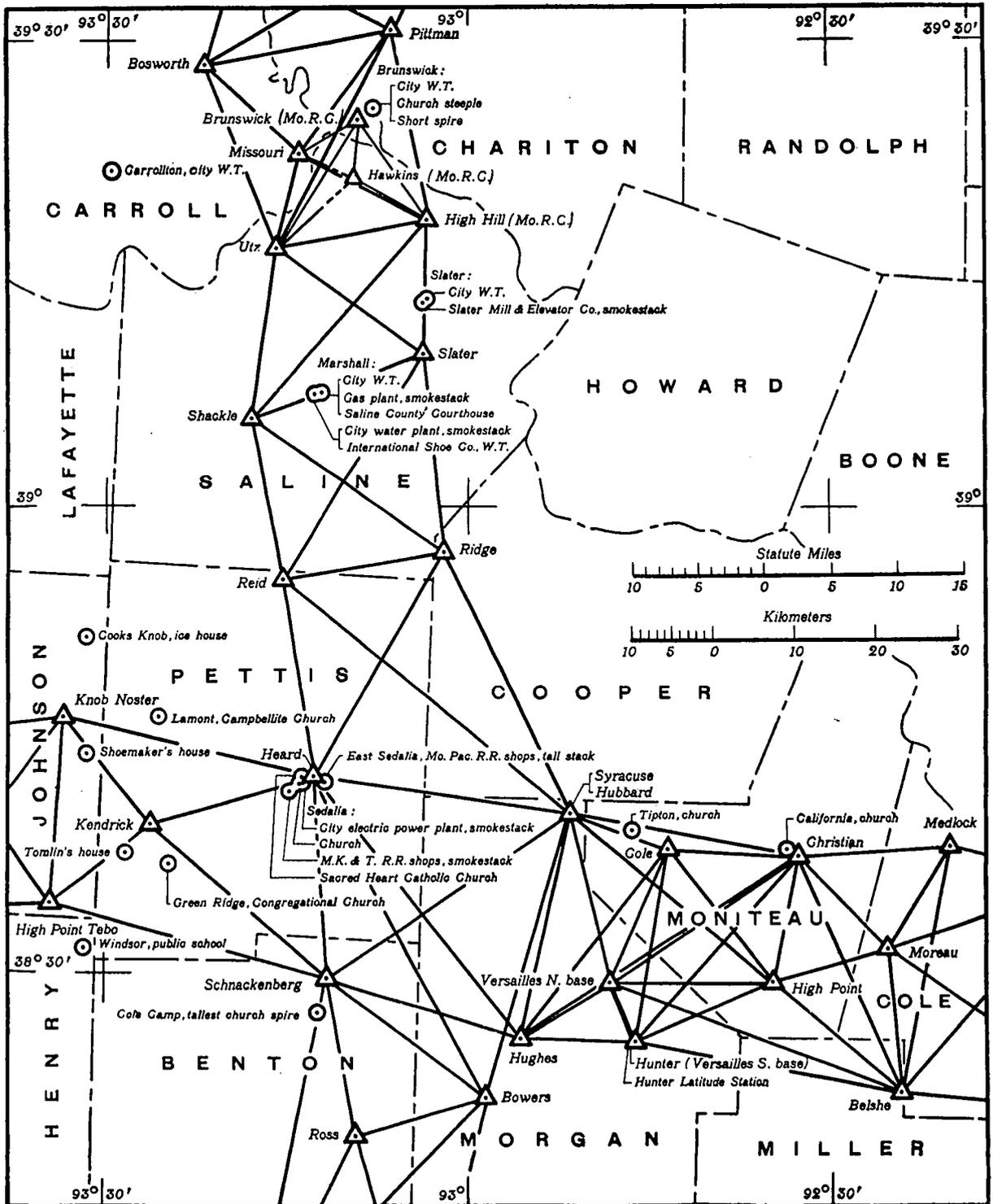


FIGURE 7.—First-order triangulation, junction of thirty-ninth parallel and ninety-third meridian arcs.

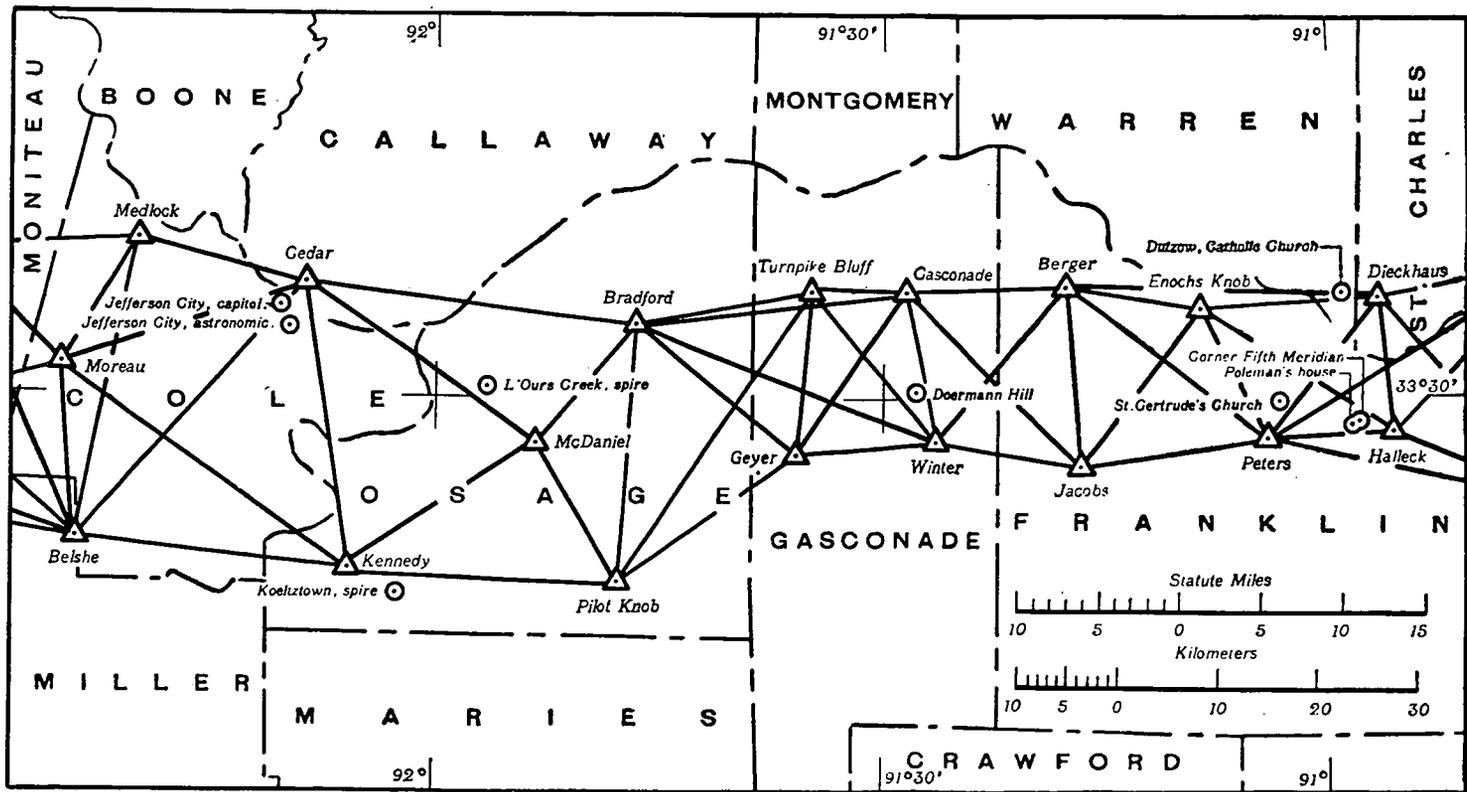


FIGURE 8.—First-order triangulation, thirty-ninth parallel arc, east.

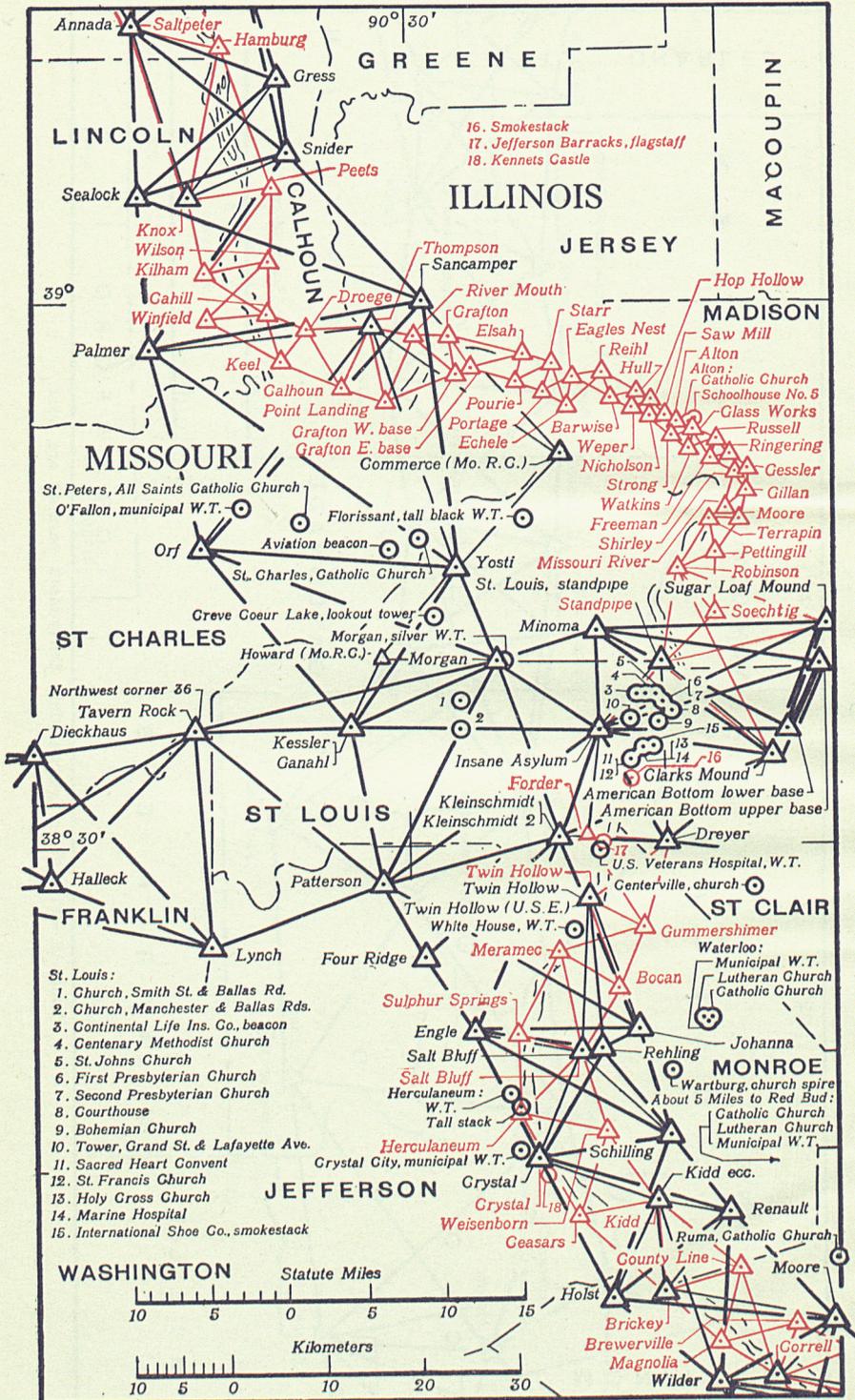


FIGURE 9.—First- and second-order triangulation, junction of thirty-ninth parallel and Mississippi River arcs.

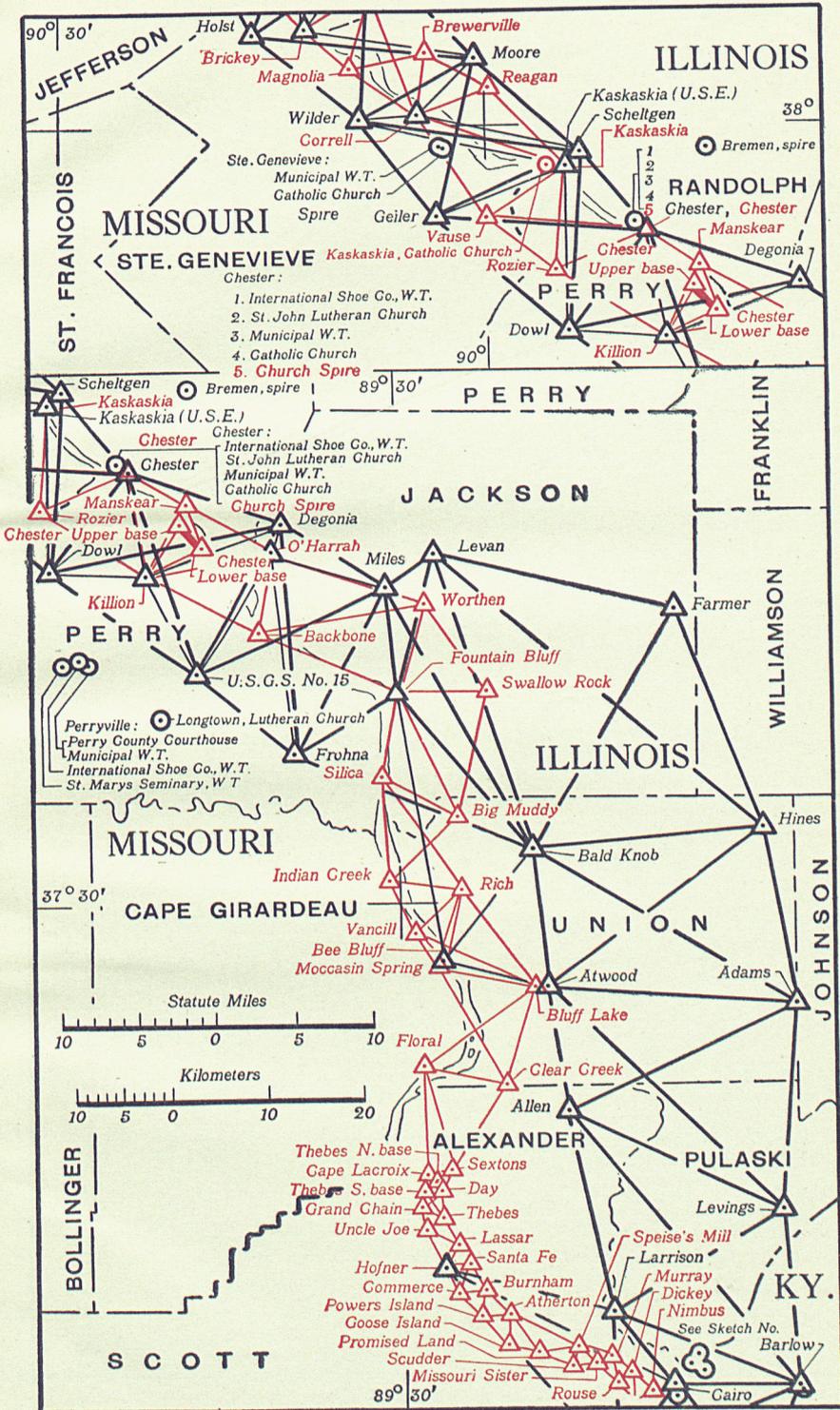


FIGURE 10.—First- and second-order triangulation, Mississippi River arc north of Cairo.
 NOTE.—The names of the intersection stations in the lower right-hand corner of this sketch will be found in Figure 11.

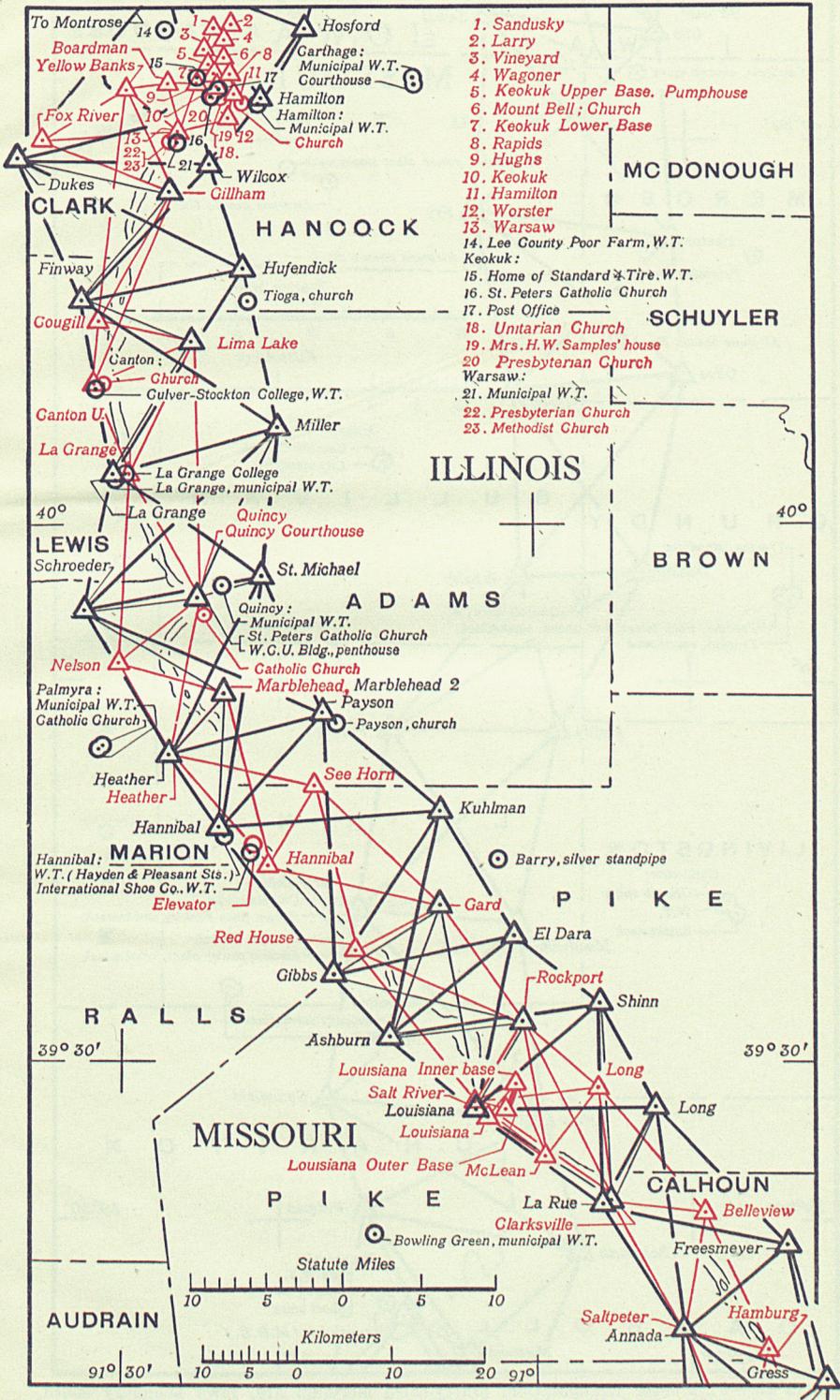


FIGURE 12.—First- and second-order triangulation, Mississippi River arc, Iowa boundary south.

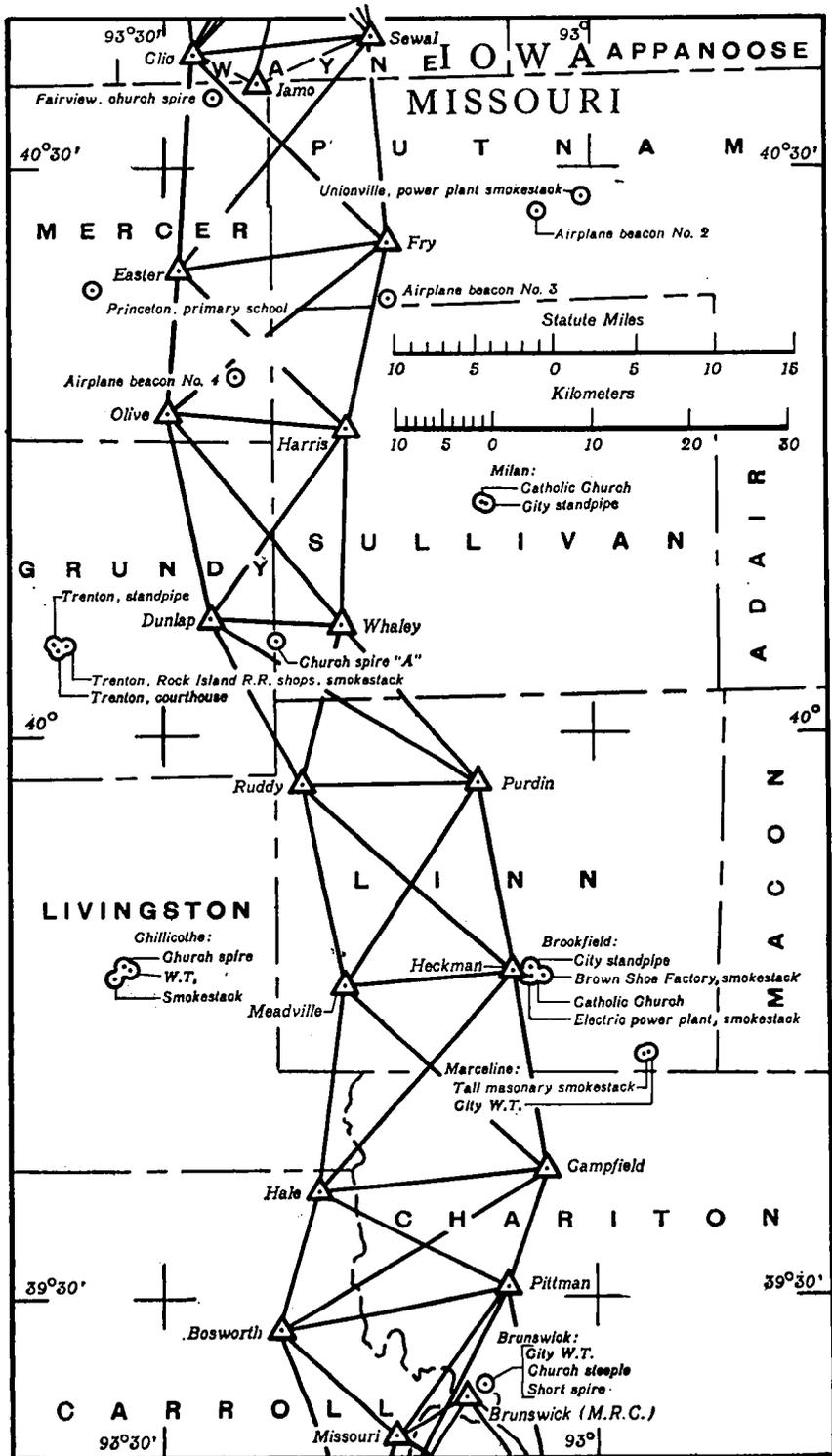


FIGURE 13.—First-order triangulation, ninety-third meridian arc, Iowa boundary south.

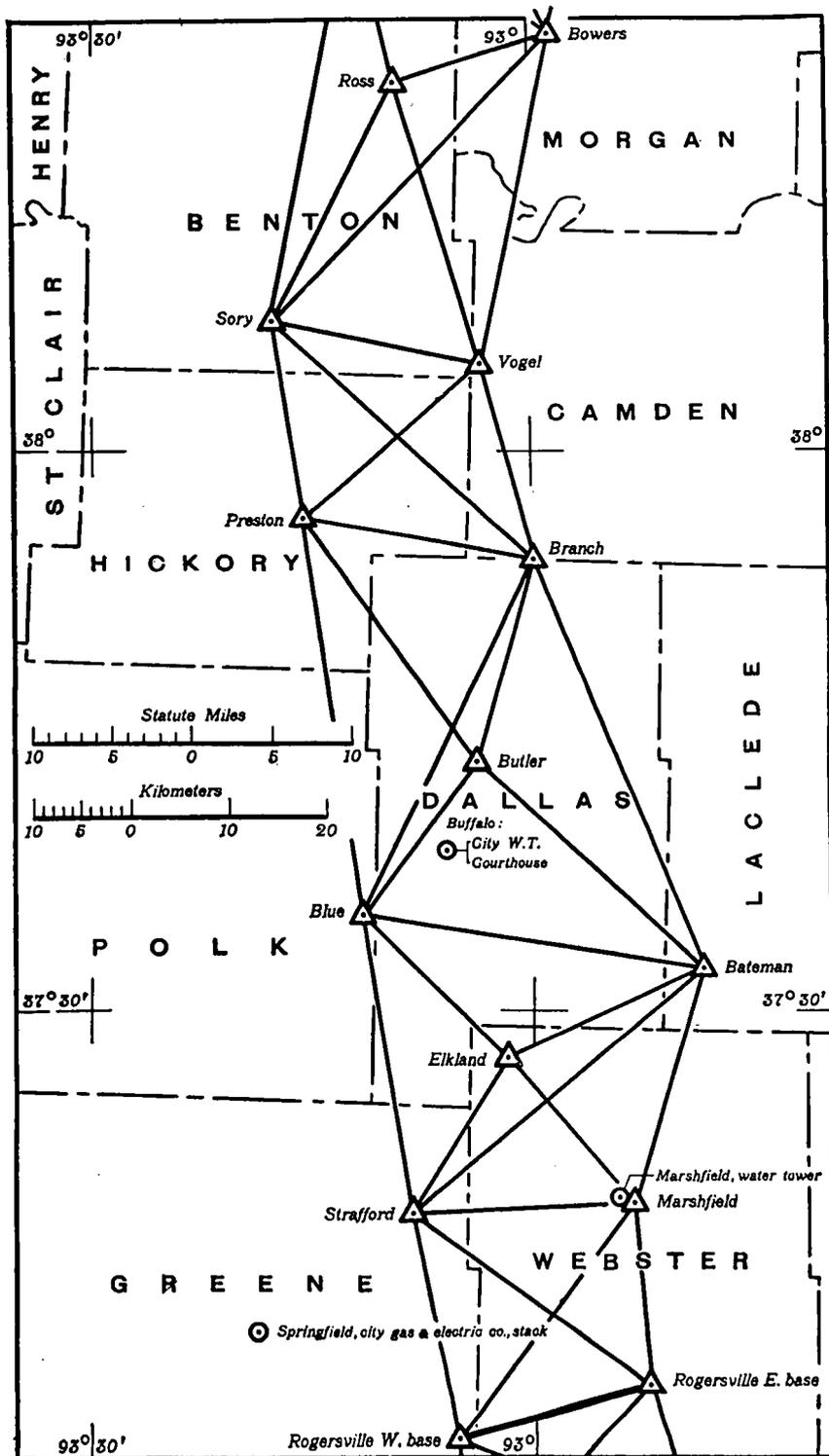


FIGURE 14.—First-order triangulation, ninety-third meridian arc, south of thirty-ninth parallel.

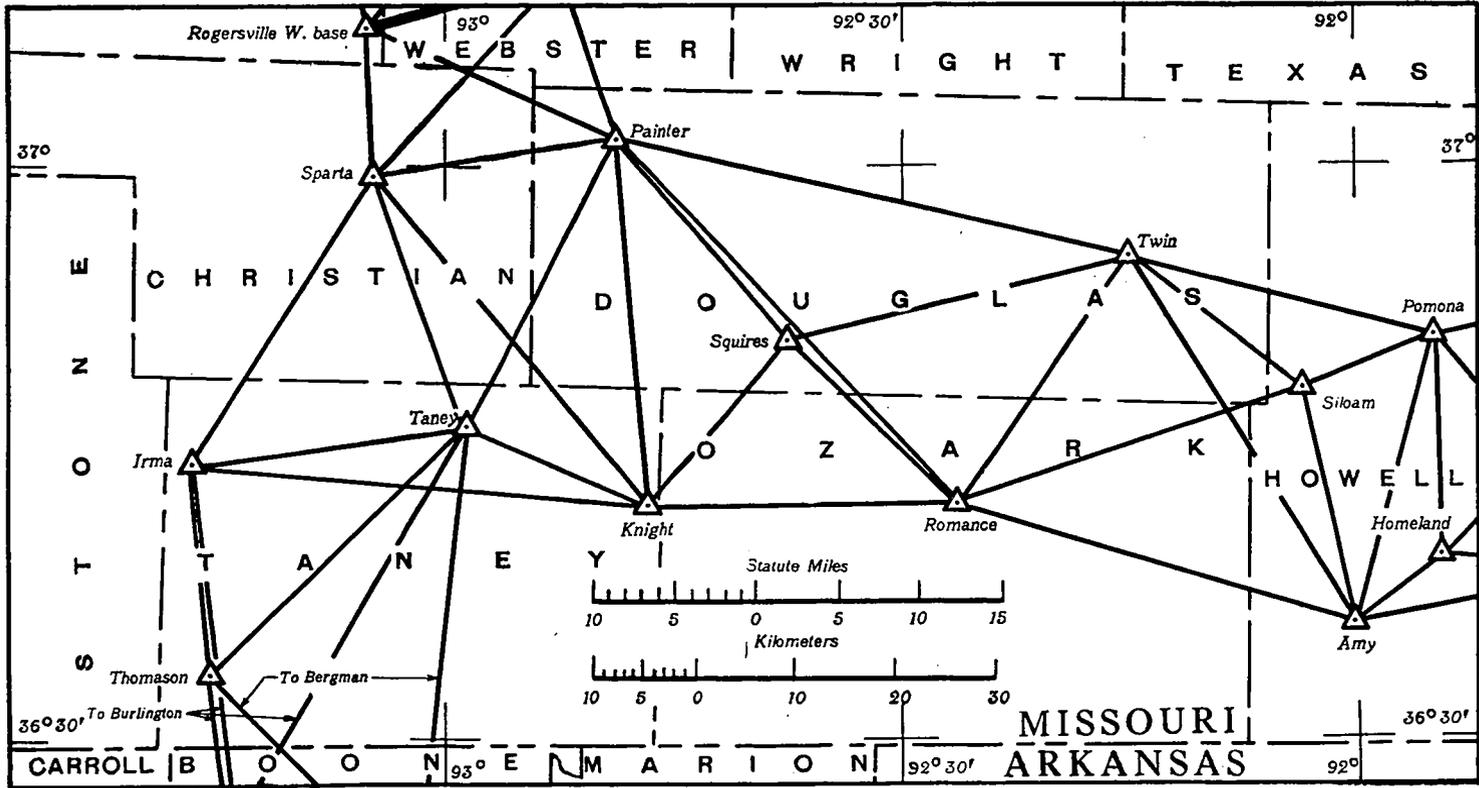


FIGURE 15.—First-order triangulation, junction of ninety-third meridian arc with arc along parallel 36°30'.

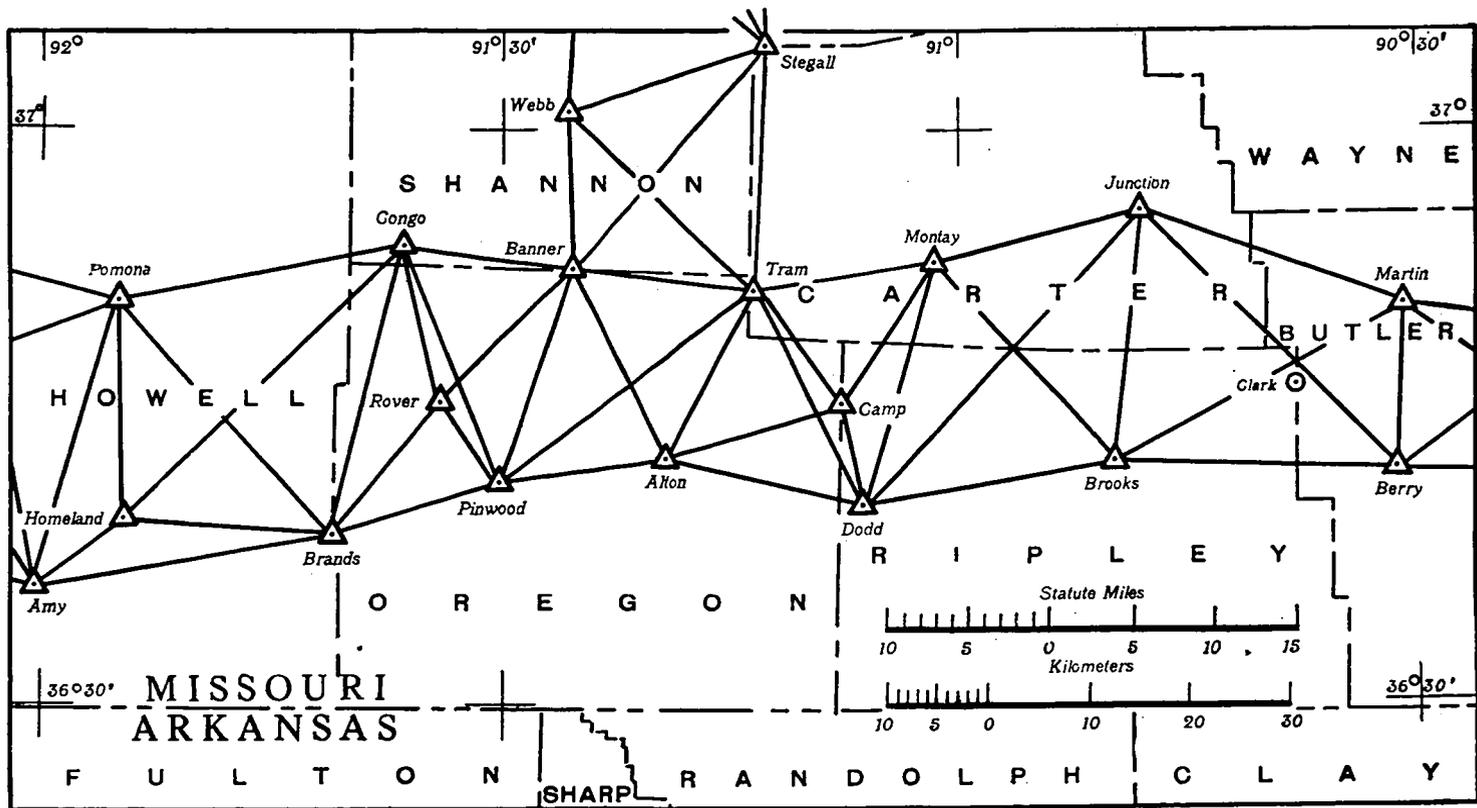


FIGURE 16.—First-order triangulation, arc along parallel 36°30'.

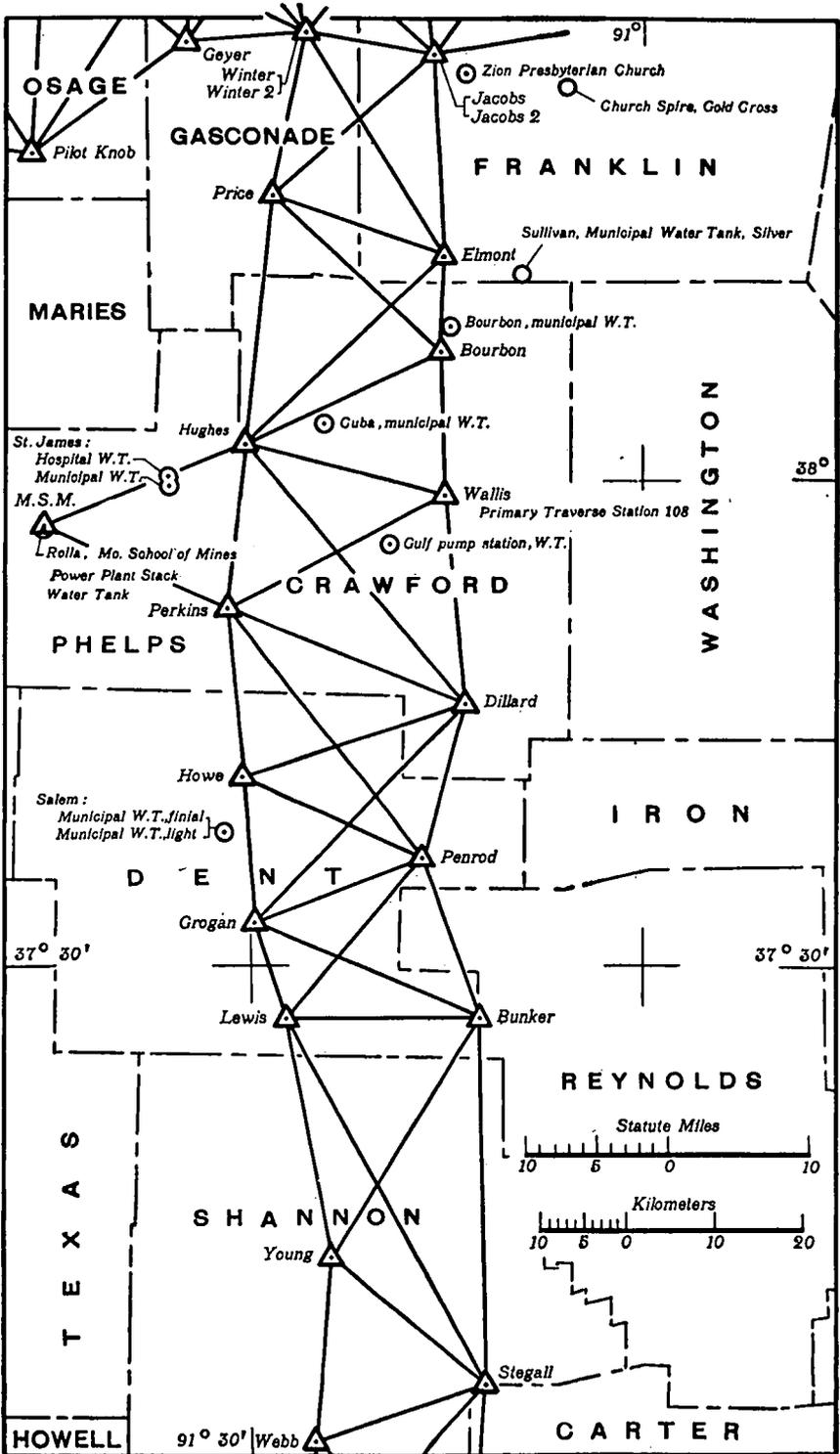


FIGURE 17.—First order triangulation, arc along meridian 91°30'.

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Station	Position	Description	Elevation	Sketch	Station	Position	Description	Elevation	Sketch
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Abbot (M.R.C.)	48			11	Bird Point	38	115		11
Adams (Ill.)	27	98		10	Birds Ferry (U.S.L.S.)	43			11
Airplane beacon no. 2	66			13	Birds Point (U.S.L.S.) (Ky.)	44			11
Airplane beacon no. 3	66			13	Birds Point School (M.R.C.)	38	115		11
Airplane beacon no. 4	66			13	Birdsall (M.R.C.)	48			11
Allen (Ill.)	26	97		10	Bloomfield, municipal water tank	73			11
Alton	71	147		16	Blue Bluff Lake (M.R.C.) (Ill.)	64	140		14
Alton (M.R.C.) (Ill.)	56			9	B.M. Bird Point 2 (U.S.E.)	41	122		10
Alton:					B.M. Caruthersville (M.R.C.)	38	116		11
Catholic Church (M.R.C.) (Ill.)	61			9	B.M. Ohio Mouth (M.R.C.)				11
Schoolhouse No. 5 (M.R.C.) (Ill.)	61			9	Boardman (M.R.C.) (Iowa)	59	131		12
American Bottom lower base (Ill.)	19	92		9	Bob Watson (M.R.C.) (Ky.)	49			11
American Bottom upper base (Ill.)	19	92		9	Bocan (M.R.C.) (Ill.)	55			9
Army	70	145		15, 16	Boom (M.R.C.) (Tenn.)	48			11
Annada	30	109		9, 12	Booth's Point (M.R.C.) (Tenn.)	52			11
Arkansas (M.R.C.) (Ark.)	53			11	Bosworth	63	137		7, 13
Armour	72	152		11	Bourbon	74	163		17
Ashburn	31	110		12	Bourbon, municipal water tank	76			17
Atherton (M.R.C.) (Ill.)	42	124		10, 11	Bowers	16	85		7, 14
Atkinson (M.R.C.)	50			11	Bowler	15	82	77	6
Atwood (Ill.)	27	98		10	Rowles (M.R.C.)	43			11
Austin, Methodist Church, spire	21		78	6	Bowling Green, municipal water tank	73			12
Auxiliary (M.R.C.) (Ky.)	46			11	Boyd	71	150		11
Aviation beacon	25			9	Bradford	17	87	77	8
Backbone = B.M. 26/4 (M.R.C.)	53	126		10	Branch	64	140		14
Baker	15	83	77	6	Brands	70	146		16
Bald Knob (Ill.)	27	98		10	Bremen, spire (Ill.)	34			10
Ballard (M.R.C.)	47			11	Brewerville (M.R.C.) (Ill.)	54	127		9, 10
Balson (M.R.C.)	50			11	Briokey (M.R.C.)	39	118		9, 10
Banner	71	147		16	Brier (M.R.C.)	48			11
Barlow (Ky.)	26	97		10, 11	Brookfield:				
Barlow, water tank (Ky.)	33			11	Brown shoe factory, smokestack	67			13
Barnes	27	99		11	Catholic Church, spire	67			13
Barry, silver standpipe (Ill.)	36			12	City standpipe	67			13
Barwise (M.R.C.)	56	128		9	Electric power plant, smokestack	67			13
Base 1 (Kans.)	20	94		6	Brooks	71	148		16
Base 2 (Kans.)	20	94		6	Brown (M.R.C.)	47			11
Bass (M.R.C.) (Tenn.)	50			11	Brunswick:				
Bateman	65	140		14	Church steeple	68			7, 13
Bayou du Chien (M.R.C.) (Ky.)	47			11	City water tank	68			7, 13
Beckwith (M.R.C.)	44			11	Short spire, top of dome	68			7, 13
Bee Bluff (M.R.C.)	38	117		10	Brunswick (Mo. R.C.)	68	144		7, 13
Bell	72	151		11	Bryans (M.R.C.)	49			11
Belleview (M.R.C.) (Ill.)	58	129		12	Buddell (M.R.C.)	49			11
Bells Point (M.R.C.) (Tenn.)	52			11	Buffalo:				
Belmont (M.R.C.)	45			11	City water tower	69			14
Belshe	17	86	77	7, 8	Courthouse, dome	69			14
Belton, South Methodist Church, spire	20		78	6	Bunker	75	156		17
Berger	18	89	78	8	Burlington (Ark.)	65	143		15
Bergman (Ark.)	65	144		15	Burnham (M.R.C.) (Ill.)	42			10, 11
Berry (Butler County)	71	140		11, 16	Bushart (M.R.C.) (Ky.)	47			11
Berry (Cass County)	15	82		6	Butler	64	140		14
Beshire (M.R.C.) (Tenn.)	49			11					
Big Lake	26	96		11					
Big Muddy (M.R.C.) (Ill.)	41	122		10					

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Cahill (M. R. C.) (Ill.)	67	120		9	Chigger (Tenn.)	27	100		11
Cairo (Defiance) (U. S. L. S.) (Ill.)	43	124		11	Chillicothe:				
Cairo (Ill.)	26	97		10, 11	Church spire	67			13
Cairo:					Smokestack	67			13
Bruce Lumber Co., water tank (Ill.)	32			11	Water tank	67			13
Catholic Church, spire (Ill.)	32			11	Christian	17	86	77	7
Singer Sewing Machine Co., stack (Ill.)	33			11	Church (M. R. C.) (Ill.)	60	132		12
Water supply, water tank (Ill.)	32			11	Church, spire, A	67			13
Cairo north base (U. S. L. S.) (Ill.)	43			11	Church spire, gold cross	76			17
Cairo south base (U. S. L. S.) (Ill.)	43			11	Chute (M. R. C.) (Ky.)	44			11
Caldwell	15	83	77	6	Clark	73	152		16
Calhoun (M. R. C.) (Ill.)	67	129		9	Clarks Mound (Ill.)	19	91		9
California, church, spire	23			7	Clarksville (M. R. C.)	40	120		12
Camp	71	148		16	Clear Creek (M. R. C.) (Ill.)	41	122		10
Campbell (M. R. C.) (Ky.)	45			11	Clio (Iowa)	62	133		13
Campfield	63	136		13	Cole	16	85	77	7
Cannon (M. R. C.)	45			11	Cole Camp, tallest church spire	69			7
Canton:					Columbus, water tank (Ky.)	33			11
Church spire (M. R. C.)	61			12	Commerce (M. R. C.)	42	123		10, 11
Culver-Stockton College, water tank	37			12	Commerce (Mo. R. C.)	40	119		9
Canton University (M. R. C.)	69	131		12	Compromise (M. R. C.) (Tenn.)	49			11
Cape Lacroix = B. M. 11/3 (M. R. C.)	41	123		10	Congo	70	146		16
Carrollton, city water tank	68			7	Cooks Knob ice house	22	95	78	6, 7
Carthage:					Corner fifth meridian	23	95		8
Courthouse dome (Ill.)	37			12	Correll (M. R. C.)	39	118		9, 10
Municipal water tank (Ill.)	27			12	Cotton	28	102		11
Caruthers	37	101		11	Cottonwood north base (P. B. M. north base (M. R. C.))	52	125		11
Caruthersville (M. R. C.)	51			11	Cottonwood south base (P. B. M. south base (M. R. C.))	38	116		11
Standpipe	33			11	Cougil (M. R. C.)	59	131		12
Water tank	33			11	Countyline (M. R. C.) (Ill.)	54	127		9
Casselsberry (M. R. C.) (Ark.)	53			11	Creve Coeur Lake, lookout tower	25			9
Ceasars (M. R. C.)	54	127		9	Cronin (M. R. C.) (Tenn.)	49			11
Cedar	17	83	77	8	Crystal	29	106		9
Centerview, Cumberland Presbyterian Church, cupola	22			6	Crystal (M. R. C.)	39	118		9
Centerville, church, spire (Ill.)	24			9	Crystal City, municipal water tower	36			9
Chalk (Ky.)	26	96		11	Cuba, municipal water tank	76			17
Chalk A (Ky.)	38			11	Cypress (M. R. C.)	45			11
Chalk B (Ky.)	38			11	Czar (M. R. C.) (Ark.)	53			11
Chapel Hill	15	82	77	6	Davidson (M. R. C.) (Ky.)	44			11
Charleston:					Davis (M. R. C.) (Ky.)	46			11
Church spire	33			11	Day (M. R. C.) (Ill.)	42	123		10
Water tank, higher	33			11	Deal	71	149		11
Chester (Ill.)	28	104		10	Defiance (Cairo) (U. S. L. S.) (Ill.)	43	124		11
Chester (M. R. C.) (Ill.)	53	127		10	Degonia (Ill.)	28	103		10
Chester:					Dexter, municipal water tank	73			11
Catholic Church, spire (Ill.)	34			10	Dickey (M. R. C.) (Ill.)	43	124		10, 11
Church spire (M. R. C.) (Ill.)	60	133		10	Dieckhaus	18	90		8, 9
International Shoe Co., water tower (Ill.)	34			10	Diehlstadt	72	151		11
Municipal water tower (Ill.)	34			10	Dillard	75	154		17
St. Johns Lutheran Church (Ill.)	34			10	Ditch	72	151		11
Chester lower base (M. R. C.)	53	128		10	Dr. S. Smith (M. R. C.) (Tenn.)	51			11
Chester upper base (M. R. C.)	53			10	Dodd	71	148		16
					Doermann Hill	23	95	78	8
					Donaldson (M. R. C.)	48			11
					Dowl	28	103		10
					Dreyer (Ill.)	19	92		9
					Droege (M. R. C.) (Ill.)	57	129		9
					Dukes	31	114		12
					Dunlap	62	135		13
					Dutzow Catholic Church, east gable	23			8

Index to Positions, Descriptions, Elevations, and Sketches—Continued.

Station	Position	Description	Elevation	Sketch	Station	Position	Description	Elevation	Sketch
Eagles Nest (M.R.C.-Mo. R.C.) (Ill.)	Page 57	Page 128	Page	Figure 9	Gummershimer (M.R.C.) (Ill.)	Page 55	Page	Page	Figure 9
Easter	62	134		13	Gunn City Flour Mill	21			6
East Sedalia, Missouri Pacific R.R. shops, tall masonry stack	69			7	Hale	63	130		13
Echele (M.R.C.)	57			9	Halleck	19	91		8, 9
El Dara (Ill.)	31	110		12	Hamburg (M.R.C.) (Ill.)	68	129		9, 12
Elkland	65	141		14	Hamilton (Ill.)	32	114		12
Elmont	74	153		17	Hamilton (M.R.C.) (Ill.)	60	132		12
Elsah (M.R.C.) (Ill.)	57			9	Hamilton: Church spire (M.R.C.) (Ill.)	61	133		12
Engle	29	106		9	Municipal water tank (Ill.)	37			12
Enoch Knob	18	90		8	Hannibal	31	111		12
Esley (M.R.C.) (Ky.)	47			11	Hannibal (M.R.C.)	59	130		12
Everett (M.R.C.) (Ky.)	49			11	Hannibal: Elevator (M.R.C.)	61			12
Fairview, church spire	66			13	Hayden and Pleasant Streets, water tank	36			12
Farmer (Ill.)	27	99		10	International Shoe Co., red water tank	36			12
Fan (M.R.C.)	45			11	Harbert (M.R.C.)	51			11
Ferguson (U.S.L.S.) (Ky.)	44			11	Harris	62	134		13
Ferris (M.R.C.)	51			11	Harrisonville, Cumberland Presbyterian Church, spire	21		78	6
Ferris Landing (M.R.C.)	46			11	Haskin (Kans.)	15	82		6
Fillmore (U.S.L.S.) (Ky.)	44			11	Hathaway (M.R.C.) (Tenn.)	51			11
Finway	31	113		12	Hawkins (Mo. R.C.)	68	144		7
Fishgap (Tenn.)	27	100		11	Hayti: Water tank, higher	33			11
Floral (M.R.C.)	41	122		10	Water tank, lower	33			11
Florissant, tall black water tank	25			9	Hazel Hill	22	95	78	6
Fordor	55	127		9	Head (Butler County)	71	150		11
Fort Halleck (M.R.C.) (Ky.)	45			11	Head (Tenn.)	28	102		11
Fountain Bluff (M.R.C.) (Ill.)	28	102		10	Heard	16	84	77	7
Four Ridge	29	107		9	Heather	31	112		12
Fox River (M.R.C.)	59	131		12	Heather (M.R.C.)	40	121		12
Franklin (M.R.C.) (Tenn.)	52			9	Hockman	63	136		13
Franklin (M.R.C.)	55			9	Herculeanum (M.R.C.)	54	127		9
Freeman (M.R.C.)	30	109		12	Herculeanum: Tall stack	35			9
Freesmeyer (Ill.)	30			12	Water tower	36			9
Freesmeyer Point (M.R.C.) (Ky.)	47			11	Hickman (Ky.)	27	100		11
Frohna	28	103		10	Hickman (M.R.C.) (Ky.)	47			11
Fry	62	134		13	Hickman, standpipe (Ky.)	33			11
Fulton	15	82	77	6	Hicks City Christian Union Church, spire	21		78	6
Gale (M.R.C.) (Ky.)	46			11	High Hill (Mo. R.C.)	63	138		7
Ganahl	20	94		9	High Point	17	86	77	7
Gard (M.R.C.) (Ill.)	40	120		12	High Point Tobo	16	83	77	6, 7
Garrett (M.R.C.)	51			11	Hines (Ill.)	27	99		10
Gasconade	18	88	78	8	Hofner = B.M. 94 (M.R.C.)	38	116		10, 11
Gayosa (M.R.C.)	51			11	Holden Methodist Church, spire	22		78	6
Geller	29	104		10	Holst	29	105		9, 10
Gessler (M.R.C.) (Ill.)	55			9	Homeland	70	146		15, 16
Geyer	18	88	77	8, 17	Hop Hollow (M.R.C.) (Ill.)	56	128		9
Gibbs	31	111		9	Hosford (Ill.)	32	114		12
Gillan (M.R.C.) (Ill.)	55			9	Howard (Mo. R.C.)	40	119		9
Gillham (M.R.C.) (Ill.)	41	121		12	Howe	75	155		17
Glassworks (M.R.C.) (Ill.)	56			9	Hubbard	16	85	77	7
Gold (M.R.C.)	49			11	Hubbard (M.R.C.)	47			11
Goose Island (M.R.C.) (Ill.)	43			10, 11	Hufendick (Ill.)	31	113		12
Grafton (M.R.C.) (Ill.)	57	128		9	Hughes (Crawford County)	74	154		17
Grafton east base (M.R.C.)	57			9	Hughes (Morgan County)	16	85	77	7
Grafton west base (M.R.C.)	57			9	Hughes (M.R.C.) (Iowa)	59	131		12
Grampus (M.R.C.) (Tenn.)	48			11	Hull (M.R.C.) (Ill.)	56	128		9
Grand Chain = B.M. 104 (M.R.C.)	42	123		10	Hunter latitude	23			7
Gratio (Tenn.)	27	101		11	Hunter (Versailles south base)	17	85	77	7
Greenfield (U.S.L.S.) (Ill.)	43			11	Hutton Mound	15	83	77	6
Green Ridge Congregational Church, chimney	22			7					
Gress (Ill.)	30	108		9, 12					
Grogan	75	155		17					
Gulf pump station, south of Steelville, water tank	76			17					

Index to Positions, Descriptions, Elevations, and Sketches—Continued

Station	Position	Description	Elevation	Sketch	Station	Position	Description	Elevation	Sketch
	Page	Page	Page	Figure		Page	Page	Page	Figure
Iamo.....	66	144		13	Keokuk upper base (M.R.C.) (Iowa).....	60	132		12
Idalia.....	72	150		11	Kessler.....	19	93		9
Independence, courthouse, high cupola or tower.....	21		78	6	Kidd (Ill.).....	39	118		9
Indian Creek (M.R.C.).....	41	122		10	Kidd (M.R.C.) (Ill.).....	39	118		9
Ingram (M.R.C.).....	50			11	Kilham (M.R.C.).....	58	129		9
Insane asylum.....	19	92		9	Killion (M.R.C.).....	39	117		10
Irene (M.R.C.).....	45			11	Kingsville Public School.....	22		78	6
Irma.....	65	143		16	Kleinschmidt.....	19	92		9
Iron Bank (M.R.C.) (Ky.).....	45			11	Kleinschmidt 2.....	20	94		9
Island No. 1 (U.S.L.S.) (Ky.).....	44			11	Knicht.....	65	142		15
Island No. 2 (M.R.C.) (Ky.).....	45			11	Knob Noster.....	16	83	77	6, 7
Island No. 3 (M.R.C.) (Ky.).....	45			11	Knox (M.R.C.).....	40	120		9
Island No. 6 (M.R.C.).....	45			11	Koeltzown, spire.....	23	95	78	8
Island No. 8 (M.R.C.) (Ky.).....	47			11	Kuhlman (Ill.).....	31	111		12
Island No. 11 (M.R.C.).....	49			11	La Grange.....	31	113		12
Island No. 11 (M.R.C.).....	49			11	La Grange (M.R.C.).....	59	131		12
Island No. 15 (M.R.C.) (Tenn.).....	51			11	La Grange College.....	41	121		12
Island No. 16 (M.R.C.).....	51			11	La Grange College (M.R.C.).....	61	133		
Island No. 18 (M.R.C.).....	52			11	La Grange, municipal water tank.....	37			12
Island No. 21 (M.R.C.) (Tenn.).....	53			11	Lainonte, Campbellite Church, spire.....	22			7
Jacobs.....	18	89	78	8, 17	Larrison (Ill.).....	26	97		10, 11
Jacobs 2.....	74	152		17	Larry (M.R.C.) (Ill.).....	60	133		12
Jefferson Barracks, flagstaff (M.R.C.).....	61	133		9	La Rue.....	30	109		12
Jefferson City astronomic.....	23	95	78	8	Lassar (M.R.C.) (Ill.).....	42	123		10, 11
Jefferson City, Capitol, rod on dome.....	23			8	Lazalla (M.R.C.).....	49			11
Joe Eckles (M.R.C.) (Tenn.).....	50			11	Le Duke (M.R.C.) (Tenn.).....	41			11
Johanna (Ill.).....	29	106		9	Lee County Poor Farm, water tank (Iowa).....	37			12
Johann (M.R.C.).....	51			11	Lee's Summit, South Meth- odist Church, cupola.....	21		78	6
Junction.....	71	149		16	Leslie, Zion Presbyterian Church, spire tip.....	75			17
Kansas City:					Lester (M.R.C.) (Ky.).....	48			11
Astronomical station.....	21	95		6	Levan (Ill.).....	27	99		10
Catholic Cathedral, Eleventh Street bet- ween Broadway and Washington.....	21		78	6	Lovings (Ill.).....	26	98		10
Second Presbyterian Church, spire.....	21			6	Lewis.....	75	155		17
Kaskaskia (M.R.C.) (Ill.).....	39	117		10	Lima Lake (M.R.C.) (Ill.).....	41	121		13
Kaskaskia (U.S.E.) (Ill.).....	39	117		10	Lindale (M.R.C.).....	52			11
Kaskaskia Catholic Church (M.R.C.) (Ill.).....	60			10	Linwood (M.R.C.) (Tenn.).....	51			11
Kase (M.R.C.) (Ky.).....	47			11	Little Obion—P.B.M. 6/2 (M.R.C.) (Ky.).....	46	125		11
Keel (M.R.C.) (Ill.).....	57	129		9	Long (Ill.).....	30	109		13
Kelser (M.R.C.) (Ky.).....	47			11	Long (M.R.C.) (Ill.).....	58	129		12
Kendrick.....	16	84	77	7	Longtown, Lutheran Church, spire.....	34			10
Kennedy.....	17	87	77	8	Louisiana.....	30	110		12
Kennetts Castle (M.R.C.).....	61			9	Louisiana (M.R.C.).....	58	130		12
Kentuck (M.R.C.) (Tenn.).....	48			11	Louisiana inner base (M.R.C.) (Ill.).....	58	130		12
Keokuk (M.R.C.) (Iowa).....	60	132		12	Louisiana outer base (M.R.C.) (Ill.).....	58	130		12
Keokuk:					L'Ours Creek, spire.....	23	95		8
Homo of Standard 4 tire, water tank (Iowa).....	37			12	Lovall (M.R.C.).....	47			11
Post office, clock tower (Iowa).....	37			12	Lucas (M.R.C.).....	45			11
Presbyterian Church, spire (M.R.C.) (Iowa).....	01	133		12	Lynch.....	18	91		9
St. Peters Catholic Church, spire (Iowa).....	37			12	Madrid.....	27	100		11
Unitarian Church, spire (M.R.C.) (Iowa).....	61	133		12	Magnolia (M.R.C.).....	54	127		9, 10
Keokuk lower base (M.R.C.) (Iowa).....	60	132		12	Manskear (M.R.C.) (Ill.).....	53	126		10
					Marblehead 2 (Ill.).....	40	121		12
					Marblehead (M.R.C.) (Ill.).....	59	130		12
					Marceline:				
					City water tank.....	67			13
					Tall masonry smoke- stack.....	68			13
					Marshall:				
					City water plant, smokestack.....	68			7
					City water tank.....	69			7

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Station	Position	Description	Elevation	Sketch	Station	Position	Description	Elevation	Sketch
Marshall—Continued	Page	Page	Page	Figure	New York (M. R. C.)	Page	Page	Page	Figure
Gas plant, smokestack	69			7	(Tenn.)	49			11
International Shoe Co., water tank	69			7	Nicholson (M. R. C.)	56			9
Saline County, courthouse	69			7	Nimbus (M. R. C.) (Ill.)	43	124		10, 11
Marshfield	65	141		14	Norfolk (M. R. C.)	44			11
Marshfield, water tower	69			14	Normal	16	83	77	6
Martin	71	149		11, 16	Northwest Corner 36	23	95		9
Marty (Kans.)	15	81		6	Obion (Tenn.)	28	101		11
Mathis (Ky.)	20	96		11	Obion = P. B. M. 32 (M. R. C.) (Tenn.)	53	126		11
Maybee (U. S. L. S.)	44			11	O'Brien (M. R. C.)	45			11
McAllister No. 2 (M. R. C.) (Tenn.)	52			11	O'Fallon, municipal water tank	73			9
McDaniel	17	87	77	8	O'Harrish (M. R. C.) (Ill.)	39	117		10
McLean (M. R. C.)	58	130		12	Ohio (U. S. L. S.) (Ky.)	43			11
Meadville	63	136		13	Old J. B. (M. R. C.) (Ky.)	48			11
Medlock	17	86	77	7, 8	Olive	62	134		13
Meramec = B. M. (M. R. C.)	48/4	54	127	9	Orf.	29	107		9
Meyers (M. R. C.) (see Myers (M. R. C.) (Tenn.))				11	Painter	65	142		15
Michell = B. M. 30/2 (M. R. C.) (Tenn.)	53	126		11	Palmer	30	108		9
Milan:					Palmyra:				
Catholic Church, spire	66			13	Catholic Church spire	36			12
City standpipe	67			13	Municipal water tank	36			12
Miles (Ill.)	28	102		10	Parker (M. R. C.)	46			11
Miller (Ill.)	31	112		12	Parker (M. R. C.) (Tenn.)	52			11
Minoma	19	92		9	Parsons (M. R. C.) (Ky.)	45			11
Missouri	63	137		7, 13	Patterson	19	93		9
Missouri (M. R. C.)	52			11	Payson (Ill.)	31	111		12
Missouri (U. S. L. S.) (Ill.)	43			11	Payson, church spire (Ill.)	36			12
Missouri-Kansas State line 1, stone	21			6	P. B. M. 10 = 4/2 (M. R. C.) (Ky.)	38	116		11
Missouri-Kansas State line 2, stone	21			6	P. B. M. 17/4 (M. R. C.) (Tenn.)	38	116		11
Missouri-Kansas State line 3, stone	21			6	P. B. M. 21/1 (M. R. C.) (Tenn.)	38	116		11
Missouri River (M. R. C.)	55			9	P. B. M. north base (M. R. C.) (Cottonwood north base)	52	125		11
Missouri School of Mines, Rolla, power plant, stack	76			17	P. B. M. south base (M. R. C.) (Cottonwood south base)	38	116		11
Missouri School of Mines, water tank	76			17	P. B. M. Wickliffe (M. R. C.) (Ky.)	38	115		11
Missouri Sister (M. R. C.)	43	124		10, 11	Peets (M. R. C.) (Ill.)	58	129		9
Mitcham (M. R. C.) (Ky.)	48	125		11	Penrod	76	155		17
Mitchells Point (M. R. C.) (Tenn.)	52			11	Perkins	74	164		17
Moccasin Springs (M. R. C.)	41	122		10	Perkins (M. R. C.) (Tenn.)	51			11
Montay	71	148		16	Perryville:				
Montrose (Iowa)	32	114		12	Courthouse spire	34			10
Moore (Ill.)	29	104		9, 10	International Shoe Co., water tower	34			10
Moore (M. R. C.) (Ill.)	55			9	Municipal water tower	34			10
Moreau	17	86	77	7, 8	St. Mary's Seminary, water tower	34			10
Morehouse, Leaming Lumber Co., stack	73			11	Peters	18	90		8
Morgan	10	93		9	Pettingill (M. R. C.) (Ill.)	55			9
Morgan, silver water tower	36			9	Phillippo (M. R. C.)	48			11
Morley	72	151		11	Phillips (M. R. C.)	49			11
Mott (M. R. C.)	51	125		11	Phillips Landing (M. R. C.)	48			11
Mounds City, water tank (Ill.)	32			11	Pilot Knob	17	87	77	8, 17
Mount Bell (M. R. C.) (Ill.)	61			12	Pinwood	71	146		16
Mrs. H. (M. R. C.) (Tenn.)	53			11	Pittman	63	137		7, 13
Mrs. H. W. Sample's house, cupola (M. R. C.) (Iowa)	61	133		12	Pleasant	27	100		11
M. S. M.	76	157		17	Point Landing (M. R. C.) (Ill.)	57	128		9
Murray (M. R. C.) (Ill.)	43			10, 11	Point Pleasant (M. R. C.)	49			11
Muscavally (M. R. C.) (Ky.)	46			11	Polemann's house	23	95		8
Myers (M. R. C.) (Tenn.)	51	125		11	Pomona	70	145		15, 16
Nall (M. R. C.) (Tenn.)	49			11	Poor	72	160		11
Nelson (M. R. C.)	59	130		12	Poplar Bluff:				
New Madrid, water tank	33			11	Municipal water tank	73			11
					Stack	73			11
					Standpipe	73			11
					Portage (M. R. C.)	57	128		11

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Portageville, water tank.....	33			11	Rozler (M.R.C.).....	53	127		10
Porter (M.R.C.).....	47			11	Ruddy.....	63	135		13
Pourie (M.R.C.).....	57			9	Ruma, Catholic Church, spire (Ill.).....	35			9
Powers Island (M.R.C.).....	42	124		10, 11	Russell (M.R.C.) (Ill.).....	56			9
Prairie (southwest base).....	26	95		11	St. Charles, Catholic Church, spire.....	25			9
Preston.....	64	139		14	St. Gertrude's Church.....	23			8
Price.....	74	153		17	St. James (M.R.C.).....	47			11
Price (U.S.L.S.).....	44	124		11	St. James: Hospital, water tank.....	76			17
Primary traverse station no. 108 (U.S.G.S.).....	76	157		17	Municipal water tank.....	70			17
Princeton, primary school.....	66			13	St. Louis: Bohemian Church.....	24			9
Promised Land (M.R.C.) (Ill.).....	43			10, 11	Centenary Methodist Church.....	24			9
Pumphouse (M.R.C.) (Iowa).....	61			12	Church, corner Man- chester and Ballas Roads.....	24			9
Purdin.....	63	135		13	Church, corner Smith Street and Ballas Road.....	23			9
Putney (M.R.C.) (Ky.).....	45			11	Continental Life Insur- ance Co., beacon.....	25			9
Quincy (M.R.C.) (Ill.).....	59	130		12	Courthouse.....	25			9
Quincy: Catholic Church, spire (M.R.C.) (Ill.).....	61	133		12	First Presbyterian Church.....	24			9
Courthouse (M.R.C.) (Ill.).....	41	121		12	Holy Cross Church.....	24			9
Municipal water tank (Ill.).....	36			12	International Shoe Co., smokestack.....	25			9
St. Peters Catholic Church spire (Ill.).....	37			12	Marine Hospital.....	24			9
W.C.U. Building, pent- house (Ill.).....	37			12	Sacred Heart Convent.....	24			9
Rapids (M.R.C.) (Ill.).....	60	132		12	St. Francis Church.....	24			9
Ray (M.R.C.).....	47			11	St. John's Church.....	25			9
Raymore Hill, Butler's barn.....	21			6	Second Presbyterian Church.....	25			9
Reagan (M.R.C.) (Ill.).....	54			10	Smokestack (M.R.C.).....	61			9
Red Bud: Catholic Church, spire (Ill.).....	35			9	Standpipe.....	25	95		9
Lutheran Church, spire (Ill.).....	35			9	Tower, corner Grand Street and LaFayette Avenue.....	23			9
Municipal water tower (Ill.).....	35			9	U.S. Veterans' Hos- pital, water tank.....	25			9
Red House (M.R.C.).....	59	130		12	St. Michael (Ill.).....	31	112		12
Reel Foot (M.R.C.) (Tenn.).....	49			11	St. Peters, All Saints Cath- olic Church, spire.....	25			9
Rohling (Ill.).....	29	106		9	St. Genevieve: Catholic Church spire.....	35	115		10
Reid.....	64	138		7	Municipal water tower.....	35			10
Reihl (M.R.C.) (Ill.).....	56			9	Salem: Municipal water tank, final.....	76			17
Renault (Ill.).....	29	105		9	Municipal water tank, light.....	76			17
Rich (M.R.C.) (Ill.).....	41	122		10	Salmon Landing (M.R.C.) (Ky.).....	46			11
Ridge.....	64	139		7	Salt Bluff (Ill.).....	39	119		9
Ridgely, water tank (Tenn.).....	33			11	Salt Bluff (M.R.C.) (Ill.).....	39	119		9
Ridgeway, city water tank.....	66			11	Salt peter (M.R.C.).....	40	120		9, 12
Riley (M.R.C.) (Tenn.).....	50			11	Salt River (M.R.C.).....	58	130		12
Ringing (M.R.C.) (Ill.).....	55			9	Sancamper (Ill.).....	30	107		9
River Bed (M.R.C.) (Tenn.).....	50			11	Sand Bar (M.R.C.).....	52			11
River Mouth (M.R.C.) (Ill.).....	57	128		9	Sandusky (M.R.C.) (Iowa).....	60	132		12
Robinson (M.R.C.).....	55	127		9	Santa Fe (M.R.C.) (Ill.).....	42	124		10, 11
Rockport (M.R.C.) (Ill.).....	40	120		12	Sawmill (M.R.C.) (Ill.).....	56			9
Rogersville east base.....	65	142		14	Scheltgen (Ill.).....	29	104		10
Rogersville west base.....	65	141		14, 15	Schilling (Ill.).....	29	105		9
Rolla, Missouri School of Mines, power plant, stock.....	76			17	Sohnackenburg.....	16	84	77	7
Rolla, Missouri school of Mines, water tank.....	76			17	School (Ark.).....	28	102		11
Romance.....	70	145		15	Schroeder.....	81	112		12
Ross.....	64	139		7, 14	Scudder (M.R.C.) (Ill.).....	43			10, 11
Rouse (M.R.C.).....	43	124		10, 11	Sealock (M.R.C.) (Ill.).....	30	108		9
Rover.....	70	146		16					
Royal Bill (M.R.C.) (Tenn.).....	50			11					

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Sedalia:					Thebes (M.R.C.) (Ill.)	42	123		10
Church, spire	22			7	Thebes north base (M.R.C.)	42	123		10
City electric power plant, tallest smokestack	69			7	Thebes south base (M.R.C.)	42	123		10
Missouri-Kansas-Texas R. R. shops, stack	69			7	Thomson	65	143		15
Sacred Heart Catholic Church, tallest spire	69			7	Thompson (M.R.C.) (Ill.)	40	119		9
See Horn (M.R.C.) (Ill.)	59	130		7	Thorn (M.R.C.) (Ky.)	45	124		11
Sewal (Iowa)	62	133		13	Thornton	15	82	77	6
Sextons (M.R.C.) (Ill.)	41	123		10	Tloga, church spire (Ill.)	37			12
Shackle	63	138		7	Tipton, church spire	23			7
Shinn (Ill.)	30	110		12	Tiptonville (M.R.C.) (Tenn.)	49			11
Shirley (M.R.C.)	55			9	Tiptonville, stack, silver	33			11
Shoemaker's house, cupola, lightning rod	22			6, 7	Tomlin's house, southeast chimney	22			7
Short Stop (M.R.C.) (Ky.)	46			11	Tram	71	147		16
Sikeston	72	161		11	Transmission tower, east bank of Ohio River (Ky.)	32			11
Sikeston:					Transmission tower, west bank of Ohio River (Ill.)	32			11
Municipal water tank	73			11	Trenton:				
Scott Milling Co., stack	73			11	Chicago, Rock Island & Pacific Ry. shops, smokestack	67			13
Sillca (M.R.C.)	41	122		10	Courthouse	67			13
Siloam	70	145		15	Standpipe	67			13
Slater (M.R.C.) (Tenn.) (see Slater (M.R.C.))				11	Turkey (M.R.C.)	50			11
Slater	63	138		7	Turnpike Bluff	18	88	77	8
Slater (M.R.C.) (Tenn.)	53	126		11	Twin	70	145		15
Slater:					Twin Hollow	39	118		9
City water tank	68			7	Twin Hollow (M.R.C.)	39	119		9
Mill & Elevator Co., tall smokestack	68			7	Twin Hollow (U.S.E.)	39	119		9
Snider (Ill.)	30	108		9	Tyler (M.R.C.)	45			11
Soechtig (M.R.C.) (Ill.)	55	128		9	Uncle Joe (M.R.C.)	42	123		10
Solltude (M.R.C.)	60			11	Unionville, power plant smokestack	66			13
Sory	64	139		14	U.S.G.S. 15	28	103		10
Sparta	65	142		15	U.S. Veterans' Hospital, St. Louis, water tank	25			9
Sparta, water tower (Ill.)	35				Utz	63	137		7
Spelse's Mill (M.R.C.) (Ill.)	43			10, 11	Vancill (M.R.C.)	41	122		10
Springfield, City Gas & Electric Co. stack	69			14	Vause (M.R.C.)	54	127		10
Squires	70	144		15	Versailles north base	17	85	77	7
Staley Mound	21		78	6	Versailles south base (Hunter)	17	85	77	7
Standpipe (M.R.C.)	55	127		9	Vineyard = B.M. 112/c (M.R.C.) (Iowa)	60	132		12
Starr (M.R.C.) (Ill.)	57			9	Vogel	64	139		14
State Line 1 (Kans.)	20	94		6	Waggoner (M.R.C.) (Ill.)	60	132		12
State Line 2 (Kans.)	20	94		6	Wallis	74	164		17
State Line 3, stake (Kans.)	20	94		6	Warden (M.R.C.)	51			11
State Line (M.R.C.) (Tenn.)	40	125		11	Warren (M.R.C.) (Ky.)	47			11
Steelville, south of, Gulf pumping station, water tank	76			17	Warrensburg Presbyterian Church, spire	22		78	6
Stegall	75	166		16, 17	Warsaw:				
Stevens (M.R.C.) (Tenn.)	53			11	Methodist Church, spire (M.R.C.) (Ill.)	62	138		12
Stewart	27	101		11	Municipal water tank (Ill.)	37			12
Stewart (M.R.C.)	50			11	Presbyterian Church, spire (M.R.C.) (Ill.)	62	133		12
Strafford	65	141		14	Warsaw (M.R.C.) (Ill.)	59	131		12
Strong (M.R.C.)	56			9	Wartburg, church spire (Ill.)	35			9
Sugar Loaf Mound (Ill.)	19	91		9	Wasp (M.R.C.)	47			11
Sulphur Springs (M.R.C.)	54	127		9	Waterloo:				
Sullivan, municipal water tank, silver	75			17	Catholic Church, spire (Ill.)	35			9
Swallow Rock (M.R.C.) (Ill.)	41	122		10	Lutheran Church, spire (Ill.)	35			9
Syracuse	16	84		7	Municipal water tower (Ill.)	35			9
Taney	65	142		15					
Tavern Rock	20	94		9					
Taylor (M.R.C.)	43			11					
Tennessee (M.R.C.) (Tenn.)	48	125		11					
Terrapin (M.R.C.)	55			9					

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Westport, College of Re-					flagstaff	22		78	6, 7
demptorist Fathers	21		78	6	Winfield (M. R. C.)	57	129		9
Whaley	63	135		13	Winter	18	89	78	8, 17
White house water tower	36			9	Winter 2	74	152		17
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Wickliffe:					(Ky.)	46			11
Courthouse dome (Ky.)	33			11	Woodcock (M. R. C.) (Ky.)	47			11
Water tank (Ky.)	32			11	Worster (M. R. C.) (Ill.)	59	131		12
Wiggins (M. R. C.) (Ky.)	46			11	Worthen (M. R. C.) (Ill.)	63	126		10
Wilcox (Ill.)	31	113		12	Wright's Point (M. R. C.)				
Wilder	29	105		9, 10	(Ark.)	53			11
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