

DEPARTMENT OF THE INTERIOR

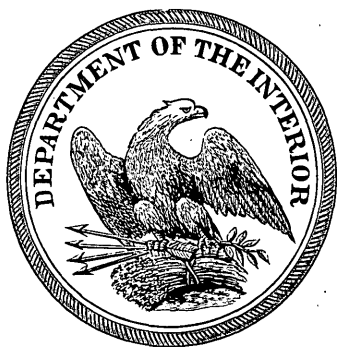
BULLETIN

OF THE

UNITED STATES

GEOLOGICAL SURVEY

No. 122



WASHINGTON
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1894

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UNITED STATES GEOLOGICAL SURVEY

J. W. POWELL, DIRECTOR

RESULTS
OF
PRIMARY TRIANGULATION

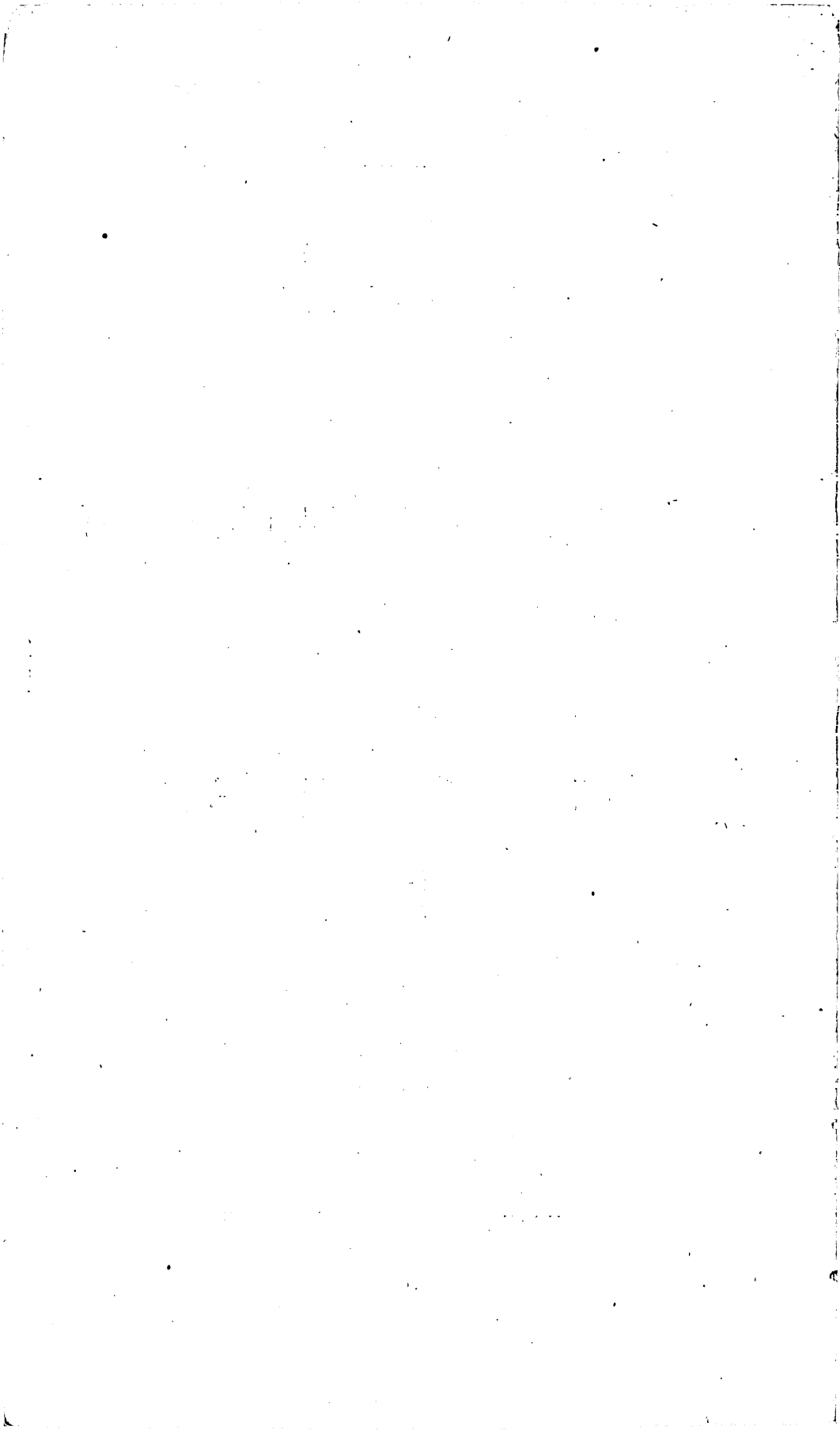
BY

HENRY GANNETT



WASHINGTON
GOVERNMENT PRINTING OFFICE,
1894

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
U. S. GEOLOGICAL SURVEY, DIVISION OF GEOGRAPHY,
Washington, D. C., June 30, 1894.

SIR: I have the honor to transmit herewith, in form for publication, the results of the primary triangulation executed by the U. S. Geological Survey during the past twelve years—that is, since the commencement of work upon the topographic atlas of the United States.

The work of compiling this bulletin has been executed by Messrs. H. M. Wilson, R. U. Goode, and S. S. Gannett.

Very respectfully submitted,

HENRY GANNETT,
Chief Topographer.

Hon. J. W. POWELL,
Director U. S. Geological Survey.

RESULTS OF PRIMARY TRIANGULATION.

By HENRY GANNETT.

INTRODUCTION.

The triangulation of the U. S. Geological Survey is executed solely for the primary control of topographic work upon scales not exceeding 1:62500. The extreme of accuracy has therefore not been sought, but only such a degree of accuracy as to insure that the maximum accumulated error be imperceptible upon the maps.

Wherever work has been done by other organizations, which is of sufficient accuracy for the control of the maps of this organization, such work has been utilized both immediately for the location of topographic work and also for the extension of triangulation therefrom by this organization. The work of the U. S. Coast and Geodetic Survey has been largely used in this manner, especially in the eastern part of the country. The maps in New England, New York, New Jersey, and Pennsylvania rest in large part directly upon the points determined by this organization, while in the Appalachian region, triangulation has been extended by this organization from points determined by the U. S. Coast and Geodetic Survey. The work of the U. S. Lake Survey and also that of the New York State survey has been extensively utilized in a similar manner, as is fully set forth in the descriptions accompanying the different groups of results. In the interior of the country and in the Far West, work has been done ab initio by this Survey. Astronomical determinations of positions have been made, base lines have been measured and expansions effected by it.

The results have been arranged in chapters by geographical groups, the arrangement being as natural as possible, and as an introduction to each chapter there is given a description of the work, outlining the methods employed and instruments used, and stating by whom the work was done.

The groups into which the work is arranged are as follows:

NEW ENGLAND:

The triangulation of the U. S. Coast and Geodetic Survey covers the entire coast of Maine and extends far inland. It covers most of New Hampshire and much of Vermont, while practically the entire areas of the remaining States of this group are covered by its primary stations.

In Massachusetts the numerous stations of the Borden survey have been adjusted by the U. S. Coast and Geodetic Survey to agreement with its own positions, and have thus become available for use. Outside of Massachusetts the stations of the U. S. Coast and Geodetic Survey are, as a rule, far apart, and much work of a supplementary character has been found necessary, in order to obtain enough points for instituting plane-table triangulation. This work of supplementing the triangulation of the U. S. Coast and Geodetic Survey has been executed by Messrs. S. S. Gannett and R. U. Goode.

NEW YORK, NEW JERSEY, AND PENNSYLVANIA:

In New York a large amount of triangulation has been executed by the U. S. Coast and Geodetic Survey. Its work extended from New York Harbor up the Hudson and through Lake Champlain and up the Mohawk Valley to a connection with the U. S. Lake Survey near Oswego. Triangulation has been extended along the shores of Lakes Erie and Ontario by the U. S. Lake Survey. The New York State survey, under Mr. J. T. Gardiner, starting from points near the Hudson, determined by the U. S. Coast and Geodetic Survey, has been extended westward to the foot of Lake Erie and southward across the middle of the State to the Pennsylvania line.

The entire area of New Jersey has been closely covered by triangulation by the U. S. Coast and Geodetic Survey, and the New Jersey Geological Survey.

The work of the U. S. Coast and Geodetic Survey extends over a large part of eastern Pennsylvania.

In New York and Pennsylvania it has been found necessary to execute much supplementary triangulation, both for the purpose of supplying more points in areas already covered by triangulation and in the extension of triangulation into new areas. In all this work, as in New England, the work of other organizations, above specified, has furnished the base lines. The work in these States has been executed by Mr. S. S. Gannett.

SOUTHERN APPALACHIAN REGION:

The U. S. Coast and Geodetic Survey has carried a belt of large figures from the head of Chesapeake Bay southwestward to central Alabama, along the east front of the Appalachian Mountain system. The lines of this belt have served as a series of base lines for the extension of triangulation by the U. S. Geological Survey westward and northward over the mountain region. This work has been going forward for a number of years and has been executed by several different men. It was instituted by Prof. W. C. Kerr, while most of it has been done by Mr. S. S. Gannett. Others who have contributed to it are Prof. J. H. Gore, Mr. C. M. Yates, Mr. W. T. Griswold, and Mr. F. J. Knight.

The text accompanying the descriptions and positions of points in New England, New York, New Jersey, and Pennsylvania, and the southern Appalachian region has been prepared by Mr. S. S. Gannett.

MICHIGAN:

A small area of triangulation has been executed by Mr. F. J. Knight upon the upper peninsula of Michigan, extending westward from Marquette. It rests upon two stations determined by the U. S. Lake Survey near Marquette.

ARKANSAS:

The work in Arkansas depends upon two baselines located respectively near Fort Smith and Little Rock. It was executed by Messrs. S. S. Gannett and G. T. Hawkins. A description has been prepared by the first-named gentleman.

KANSAS:

The work in Kansas consists practically of two belts of triangulation running westward in different latitudes nearly across the State. They depend upon stations in western Missouri and eastern Kansas in the transcontinental belt of triangulation of the U. S. Coast and Geodetic Survey. The work was executed by Messrs. R. U. Goode, J. H. Renshaw, and H. L. Baldwin, and the text has been prepared by Mr. Baldwin.

TEXAS:

The work in Texas is in two isolated parts. One extended area occupies the central part of the State, while the other, much more restricted, is in the Trans-Pecos region. The first rests upon two base lines, one near Austin, the other near Cisco. This triangulation was executed by Messrs. R. U. Goode, E. M. Douglas, and C. F. Urquhart.

That in the Trans-Pecos region rests upon a base near El Paso. The work was done by Messrs. R. U. Goode, A. P. Davis, and C. F. Urquhart. The text relating to the Texas work has been prepared by Mr. Goode.

BLACK HILLS OF SOUTH DAKOTA:

This body of triangulation rests upon a base measured near Rapid City. The work was done by Mr. E. M. Douglas, who has prepared the text relating to it.

ASPEN, COLO.:

A little triangulation has been done in the neighborhood of this mining camp, resting upon points determined by the Hayden Survey. The work was done by Messrs. E. M. Douglas and Morris Bien.

WYOMING:

In southern Wyoming a little triangulation has been done for the control of work in the neighborhood of Laramie. This was extended from a measured base by Mr. Frank Tweedy.

MONTANA:

The triangulation in Montana and northwestern Wyoming rests upon a base line measured near Bozeman. From this base triangulation has been extended southward over the Yellowstone Park and the country east thereof, and westward over the upper waters of the Mis-

souri River. The work was done by Messrs. J. H. Renshaw, E. M. Douglas, and Frank Tweedy. The descriptive text has been written by Mr. Tweedy.

IDAHO:

A base measured near Boise serves as the beginning of this work. The triangulation has been done by Mr. W. T. Griswold and the description of it was written by Mr. E. T. Perkins.

CALIFORNIA:

The work in California is in two parts, an extended area in central and northern California, extending northward into southwest Oregon, and a much smaller area in the neighborhood of Los Angeles and San Diego. The former of these areas rests upon stations of the U. S. Coast and Geodetic Survey. The work has been executed by a number of different men, Messrs. Gilbert Thompson, Mark B. Kerr, H. M. Wilson, E. M. Douglas, and H. E. C. Feusier. This work has been described by Mr. Douglas.

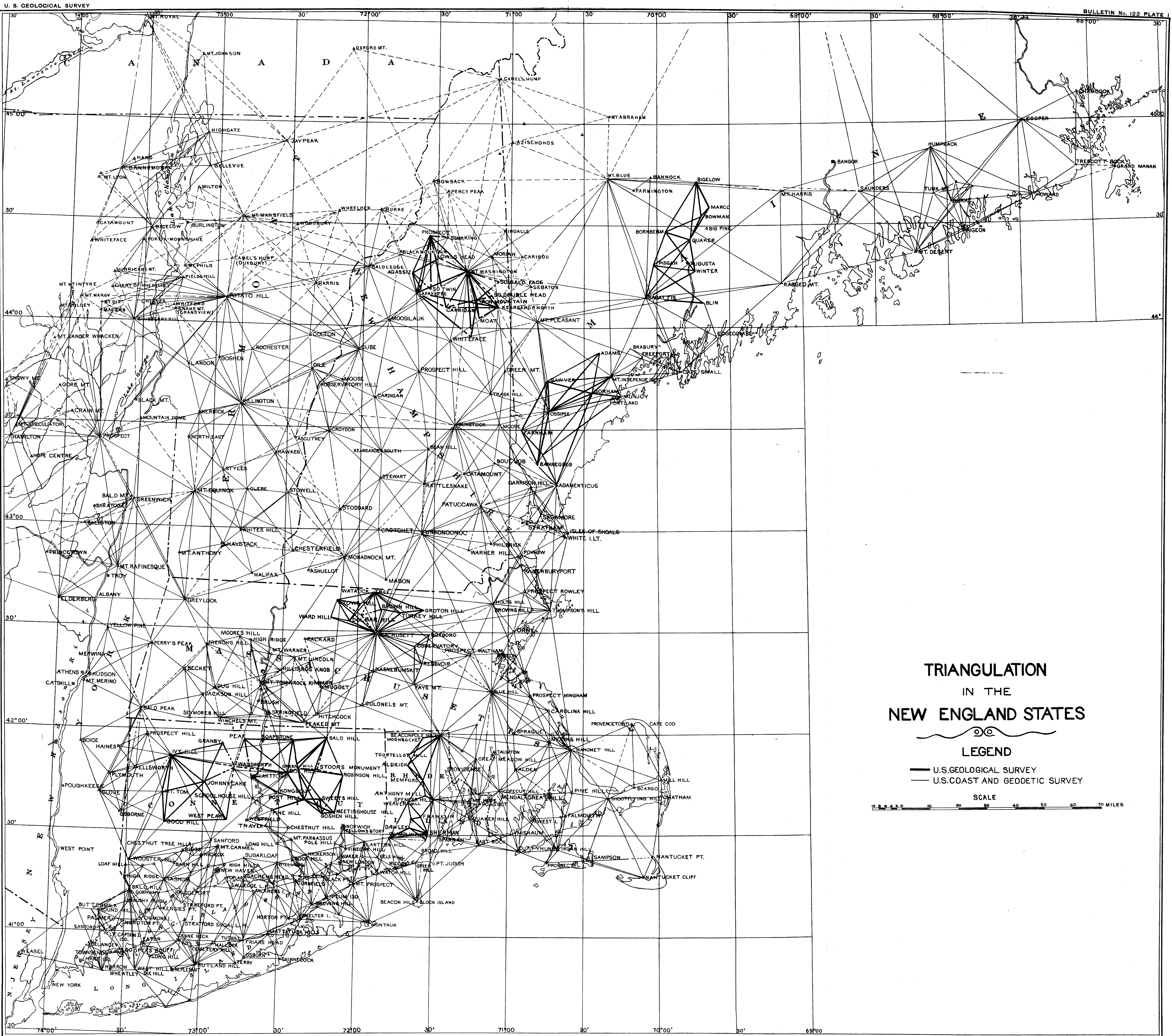
The work in southern California rests upon a base measured by the U. S. Coast and Geodetic Survey. It has been executed by Mr. A. P. Davis, and is described by him.

THE PLATEAU REGION:

The work in the Plateau region of New Mexico and Arizona rests upon a base measured near Fort Wingate, whence it has been extended eastward and westward. This work was done by Messrs. Gilbert Thompson, A. P. Davis, F. J. Knight, and H. M. Wilson. The description was prepared by Mr. Davis.

The triangulation executed by early surveys in the West, known as the Hayden, the Powell, and the Wheeler surveys, has been utilized to some extent for the control or initiation of work; that of the Wheeler but little, and that of the Hayden to a greater extent, especially in Colorado. That of the Powell survey, the results of which have never heretofore been published, has been used very largely, inasmuch as the maps prepared by that organization have been published as atlas sheets by this Survey. These cover nearly all of Utah and northern Arizona, and it has seemed proper in this publication to include a description of this work and the positions of the points determined by it in extenso. A description of this work will be found in its proper place, written by Mr. A. H. Thompson, who, with Mr. G. K. Gilbert, executed the work.

All positions herewith presented are referred to the Clarke spheroid of revolution of 1866; the unit of length is the iron committee meter brought to this country by Hassler, and now in the possession of the Bureau of Weights and Measures. In the Northeastern States, the positions are referred to the mean positions of the U. S. Coast and Geodetic Survey; elsewhere they are, as stated in the text accompanying the various groups of work, referred to isolated astronomical determinations, which are, of course, subject to unknown station errors.



TRIANGULATION
IN THE
NEW ENGLAND STATES

LEGEND

- U.S. GEOLOGICAL SURVEY
- - - U.S. COAST AND GEODETIC SURVEY

SCALE

0 10 20 30 40 50 60 70 MILES

NEW ENGLAND.

METHODS OF WORK.

MAINE.

The triangulation in southwestern Maine executed in 1888 was based upon two stations of the U. S. Coast and Geodetic Survey, Ossipee and Independence; a third, Agamenticus, was occupied, but the station mark could not be identified and a new point was established. From these stations thirteen others in York and Cumberland counties, distributed over seven atlas sheets, were located.

In 1890 a system of quadrilaterals was extended from Sabattus-Blin, stations of the U. S. Coast and Geodetic Survey, up the Kennebec Valley about 45 miles; twelve stations, distributed over five atlas sheets, were located. Isolated, bare hills favorably located for topographic purposes were generally utilized. A tripod signal of simple form was used, the materials for which were generally obtainable at the nearest farmhouse.

Angles were measured by S. S. Gannett with a Fauth 8-inch theodolite, reading by micrometer microscopes to two seconds of arc. Local or station adjustment was made in most cases, but figure adjustment was not considered necessary and has not been made.

NEW HAMPSHIRE.

In 1892 the triangulation of the U. S. Coast and Geodetic Survey in the White Mountain region was supplemented by erecting in additional points. Mounts Washington, Kearsarge, and Lafayette were used as initial points, and three other stations were occupied; altogether, eleven points, furnishing control for four atlas sheets, were located.

Angles were measured with a Fauth 8-inch theodolite by S. S. Gannett and B. C. Washington, jr. Adjustment of figures by least squares was not made.

MASSACHUSETTS.

Eleven new stations, controlling four atlas sheets, were located in Worcester County in 1887 by Mr. R. U. Goode. The lines Wachusett-Watatic and Wachusett-Fay, established by the U. S. Coast and Geodetic Survey, were used as bases.

Lone trees on bare hills were utilized as signals.

Angles were measured with the Gambey 11-inch theodolite, reading by verniers to ten seconds. This work was not adjusted.

RHODE ISLAND.

The western portion of Rhode Island was controlled during 1888 by triangulation extended from the lines of the U. S. Coast and Geodetic Survey, Beaconpole-Spencer, Spencer-Sherman, and Sherman-Champlin. This work was slow and difficult. The hills being of about the same height and heavily wooded, the building of high scaffolds was necessary. A tall tree was usually selected, its branches cut off, and the trunk used as one leg of a triangular scaffold.

Angles were measured with a light 6-inch theodolite mounted on its own tripod on the floor of the scaffold from 40 to 60 feet above the ground.

This work was done by Mr. R. U. Goode and Mr. C. F. Urquhart. No least square adjustments were made.

CONNECTICUT.

Control for north central Connecticut was obtained by extending triangulation from the U. S. Coast and Geodetic Survey stations Good Hill, Mount Tom, and Ivy, in Litchfield and Hartford counties, and from Box Hill and Bald Hill in Tolland, Windham, and New London counties.

Seventeen stations, controlling ten atlas sheets, were located in 1889. Isolated, cleared hills were usually available, and were selected as stations. Various forms of signals were used, the usual form being a tripod under which the theodolite was centered.

Angles were measured with a Fauth 8-inch theodolite, reading by micrometer to two seconds, by S. S. Gannett.

A least square adjustment of the angles was made at each station, but no figure adjustment was made.

DESCRIPTIONS AND POSITIONS OF STATIONS.

BIGELOW.

Four miles south of the village of Skowhegan, Somerset Co., Me., on land owned by J. W. Packard. Summit entirely cleared of trees.

Permanent mark: Iron bolt in solid ledge.

[Latitude, $44^{\circ} 42' 47''$.91. Longitude, $69^{\circ} 43' 39''$.72.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|---------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bowman..... | 353° 10' 30.0 | 173° 11' 42.8 | 4.282315 |
| Quaker..... | 6° 59' 15.0 | 186° 57' 15.0 | 4.492396 |
| Hornbeam..... | 34° 02' 10.9 | 213° 52' 45.1 | 4.502702 |
| Marco..... | 335° 05' 23.8 | 155° 08' 47.5 | 4.181320 |

MARCO.

Situated in pasture owned by Peter Marco, on highest part of hill, $2\frac{1}{2}$ miles north-northwest of Waterville, in southern edge of town of Fairfield, Somerset Co., Me.

Permanent mark: A pole 25 feet high with flag at top and four boards nailed across 12 to 15 feet from ground.

[Latitude, $44^{\circ} 35' 21''$.72. Longitude, $69^{\circ} 38' 49''$.84.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bowman..... | 38 09 29.4 | 218 07 18.3 | 3.824352 |
| Bigelow | 155 08 47.5 | 335 05 23.8 | 4.181320 |
| Quaker | | | 4.298319 |

BOWMAN.

In Oakland, Kennebec Co., Me., on a flat, cleared hill, $1\frac{1}{2}$ miles east of village. Land owned by Mr. Bowman, who lives one-eighth of a mile from triangulation point.

Permanent mark: A pole 25 feet high, with white flag at top and boards nailed across just above braces.

[Latitude, $44^{\circ} 32' 31''$.67. Longitude, $69^{\circ} 41' 56''$.60.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Quaker..... | 27 08 44.9 | 207 05 32.9 | 4.123305 |
| Hornbeam..... | 69 55 40.1 | 249 45 02.9 | 4.330181 |
| Marco | 218 07 18.3 | 38 09 29.4 | 3.824352 |
| Bigelow | 173 11 42.8 | 353 10 30.0 | 4.282315 |

HORNBEAM.

In Kennebec Co., Me., on a cleared hill $2\frac{1}{2}$ miles southeast of the village of Mount Vernon and 14 miles from Augusta, a few trees standing on eastern edge of the hill. Station not on highest part of hill, but on ground 4 or 5 feet lower than and 200 feet south of highest part.

Permanent mark: A rock pile 4 feet high.

[Latitude, $44^{\circ} 28' 32''$.84. Longitude, $69^{\circ} 57' 05''$.58.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Quaker..... | 287 31 48.4 | 107 39 14.7 | 4.168100 |
| Winter..... | 322 02 14.2 | 142 11 04.1 | 4.436338 |
| Pisgah | 17 08 40.6 | 197 05 37.3 | 4.294608 |
| Bowman..... | 249 45 02.9 | 69 55 40.1 | 4.330181 |
| Bigelow | 213 52 45.1 | 34 02 10.9 | 4.502702 |

QUAKER.

In Sidney, Kennebec Co., Me., on a high cleared ridge, 10 miles from Augusta. An old schoolhouse stands on top of ridge, 174.2 feet south of station. Station is on highest part, on land owned by L. B. Ward. A wagon road passes 50 feet east of station.

Permanant mark: Iron bolt in soft rock, arrowheads cut in ledge pointing to center.

[Latitude, $44^{\circ} 26' 08''$.63. Longitude, $69^{\circ} 46' 30''$.63.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Winter | 350 57 38.6 | 170 59 04.4 | 4.238470 |
| Pisgah | 54 10 38.3 | 234 00 11.0 | 4.389549 |
| Sabattus | | | 4.607323 |
| Hornbeam | 107 39 14.7 | 287 31 48.4 | 4.168100 |
| Bowman | 207 05 32.9 | 27 08 44.9 | 4.123305 |
| Bigelow | 186 57 15.0 | 6 59 15.0 | 4.492396 |

PISGAH.

In Kennebec Co., Me., on a high bare hill in southwestern part of Winthrop. C. B. Stanton lives on south end of hill, 4 miles from Winthrop village and 1 mile from triangulation point.

Permanent mark: A rock cairn 10 feet high, on most northern and highest summit.

[Latitude, $44^{\circ} 18' 22''$.67. Longitude, $70^{\circ} 01' 27''$.66.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sabattus | 13 34 24.4 | 193 32 07.7 | 4.268767 |
| Hornbeam | 197 05 37.3 | 17 08 40.6 | 4.294608 |
| Blin | 306 48 44.1 | 127 03 05.6 | 4.535429 |
| Winter | 276 45 46.0 | 96 57 38.1 | 4.357368 |
| Quaker | 234 00 11.0 | 54 10 38.3 | 4.389549 |

WINTER.

Triangulation station of the U. S. C. & G. S. in Chelsea, Kennebec Co., Me., 4 miles by road southeast of Augusta. Trees stand on northern and eastern sides of hill, with an unobstructed view in other directions.

Permanent mark: Copper bolt in ledge.

[Latitude, $44^{\circ} 16' 54''$.54. Longitude, $69^{\circ} 44' 27''$.94.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sabattus | 60 31 18.9 | 240 17 11.1 | 4.491934 |
| Pisgah | 96 57 38.1 | 276 45 46.0 | 4.357368 |
| Hornbeam | 142 11 04.1 | 322 02 14.2 | 4.436338 |
| Quaker | 170 59 04.4 | 350 57 38.6 | 4.238470 |

SABATTUS.

Triangulation station of the U. S. C. & G. S. in Androscoggin Co., Me., 4 miles from Leeds Junction, and in the town of Wales. Summit is bare with the exception of a few trees on eastern edge.

Permanent mark : Copper bolt in solid ledge.

[Latitude, $44^{\circ} 08' 37''$.83. Longitude, $70^{\circ} 04' 43''$.74.] . .

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blin | 274 28 12.85 | 94 44 49.62 | 4.5041408 |
| Independence | 24 31 22.95 | 204 21 18.70 | 4.6713784 |
| Pisgah | 193 32 07.70 | 13 34 24.40 | 4.268767 |
| Winter | 240 17 11.10 | 60 31 18.90 | 4.491934 |
| Monks Hill | 212 56 34.00 | 33 04 45.00 | 4.45716 |

BLIN.

Triangulation station of the U. S. C. & G. S. in Dresden, Lincoln Co., Me. It is on a flat hill owned by Zina Blin, timbered on eastern side and view to north interrupted by orchard and buildings.

Permanent mark : Hole drilled in ledge and rock piled around.

[Latitude, $44^{\circ} 07' 14''$.72. Longitude, $69^{\circ} 40' 52''$.26.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pisgah | 127 03 05.60 | 306 48 44.10 | 4.535429 |
| Sabattus | 94 44 49.62 | 274 28 12.85 | 4.5041408 |
| Monks Hill | 148 47 48.00 | 328 39 20.00 | 4.49292 |

MONKS HILL.

Not occupied. A high bare hill in Readfield, Kennebec Co., Me., 7 miles northwest of Augusta. A chestnut tree still standing on western edge of summit.

Permanent mark : A pile of rocks.

[Latitude, $44^{\circ} 21' 36''$.25. Longitude, $69^{\circ} 53' 00''$.15.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blin | 328 39 20 | 148 47 48 | 4.49292 |
| Sabattus | 33 04 45 | 212 56 34 | 4.45716 |

ADAMS.

In West Gray, Cumberland Co., Me. Station is on roof of house of Silas Adams. on a flat cleared ridge.

Permanent mark: Center of white cupola of house.

[Latitude, $43^{\circ} 52' 53''$. Longitude, $70^{\circ} 23' 28''$.51.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gorham | 11 25 34 | 191 23 15 | 4.357428 |
| Sawyer | 62 34 11 | 242 19 08 | 4.517042 |

INDEPENDENCE.

Triangulation station of the U. S. C. & G. S. in Falmouth, Cumberland Co., Me., 8 miles north of Portland; hill entirely cleared of timber.

Permanent mark: An earthen cone buried about 3 feet below surface.

[Latitude, $43^{\circ} 45' 33''$. Longitude, $70^{\circ} 19' 14''$.34.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sabattus | 204 21 18.70 | 24 31 22.95 | 4.6713784 |
| Pleasant | 126 33 00.63 | 306 12 07.39 | 4.6999260 |
| Agamenticus | 26 55 50.74 | 206 40 29.47 | 4.824134 |
| Ossipee | 60 54 23.53 | 240 36 58.50 | 4.5894007 |
| Sawyer | 87 28 35.00 | 267 10 37.00 | 4.542959 |
| Munjoy | 330 56 38.00 | 150 59 37.00 | 4.076807 |

MUNJOY.

Station in the observatory, 80 feet high, on Munjoy Hill, Portland, Cumberland Co., Me., owned by John W. York.

Permanent mark: Center of observatory.

[Latitude, $43^{\circ} 39' 55''$. Longitude, $70^{\circ} 14' 55''$.64.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ossipee | 78 02 09 | 257 41 46 | 4.608904 |
| Independence | 150 59 37 | 330 56 38 | 4.076807 |

GORHAM.

Normal school, Gorham, Cumberland Co., Me.

Permanent mark: Center of tallest tower on building.

[Latitude, $43^{\circ} 40' 50''$. Longitude, $70^{\circ} 26' 49''$.96.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ossipee | 66 44 49 | 246 32 39 | 4.412059 |
| Sawyer | 106 10 11 | 285 57 29 | 4.409907 |
| Adams | 191 23 15 | 11 25 34 | 4.357428 |

SAWYER.

In York Co., Me. A bald and grassy ridge on line between Limington and Limerick, owned by A. W. Sawyer, who lives one-fourth of a mile below summit on southwest side.

Permanent mark: A rock cairn 7 feet square at base, tapering to 3 feet square at top, and 14 feet high.

[Latitude, 43° 44' 41"-00. Longitude, 70° 45' 13"-06.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Independence | 267 10 37 | 87 28 35 | 4·542959 |
| Ossipee | 356 38 25 | 176 38 56 | 4·240003 |
| Gorham | 285 57 29 | 106 10 11 | 4·409907 |
| Adams | 242 19 08 | 62 34 11 | 4·517042 |

OSSIPEE.

Triangulation station of the U. S. C. & G. S. in York Co., Me., 2 miles from Waterboro. Summit cleared of timber. Land owned by Thomas Smith, who lives on side of mountain one-half mile from triangulation point.

Permanent mark: A copper bolt in solid rock.

[Latitude, 43° 35' 18"-87. Longitude, 70° 44' 27"-66.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Agamenticus | 354 26 44·96 | 174 28 45·04 | 4·6101160 |
| Independence | 240 36 58·50 | 60 54 23·53 | 4·5894007 |
| Bauneg Beg | 8 59 31·00 | 188 57 41·00 | 4·361474 |
| Farnham | 57 42 32·00 | 237 34 44·00 | 4·256611 |
| Sawyer | 176 38 56·00 | 356 38 25·00 | 4·240003 |
| Gorham | 246 32 39·00 | 66 44 49·00 | 4·412059 |
| Munjoy | 257 41 46·00 | 78 02 09·00 | 4·608904 |

FARNHAM.

On a ridge owned by Horace Farnham, in town of Acton, about midway between Milton Mills and South Acton, York Co., Me.

Permanent mark: A tall Lombardy poplar tree in field south of barn.

[Latitude, 43° 30' 05"-77. Longitude, 70° 55' 47"-06.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ossipee | 237 34 44 | 57 42 32 | 4·256611 |
| Bauneg Beg | 318 04 47 | 138 10 44 | 4·243370 |

BAUNEG BEG.

In the town of North Berwick, York Co., Me., 7 miles northwest from the depot. The station is on the highest of the three summits. Several acres of timber were cut down, but much is still standing on the western side of the hill.

Permanent mark: A pine tree, shaped like a lyre; trimmed up.

[Latitude, $43^{\circ} 23' 03''$. 18. Longitude, $70^{\circ} 47' 07''$. 26.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ossipee | 188 57 41 | 8 59 31 | 4·361474 |
| Agamenticus | 337 03 22 | 157 07 12 | 4·287596 |
| Farnham | 138 10 44 | 318 04 47 | 4·243370 |
| Tare Shirt | 23 13 31 | 203 11 59 | 3·882960 |

AGAMENTICUS.

Triangulation station of the U. S. C. & G. S., about 12 miles from Portsmouth, N. H., in York Township, about midway between York Corner and North Berwick, York Co., Me. Summit cleared of timber except on west and northwest sides.

Permanent mark: A rock cairn 8 feet square, 15 feet high, 28 feet northwest of signal.

[Latitude, $43^{\circ} 13' 24''$. 63. Longitude, $70^{\circ} 41' 32''$. 91.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Independence | 206 40 29·47 | 26 55 50·74 | 4·824134 |
| Bauneg Beg | 157 07 12·00 | 337 03 22·00 | 4·287596 |
| Ossipee | 174 28 45·04 | 354 26 44·96 | 4·610160 |
| Tare Shirt | 135 48 57·00 | 315 43 36·00 | 4·18023 |

TARE SHIRT.

Not occupied. A long, flat ridge, partly in cultivation, in Berwick, York Co., Me.; on land owned by George Guptill.

Permanent mark: The tallest tree in a clump of pines.

[Latitude, $43^{\circ} 19' 15''$. 90. Longitude, $70^{\circ} 49' 20''$. 85.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bauneg Beg | 203 11 59 | 23 13 31 | 3·88296 |
| Agamenticus | 315 43 36 | 135 48 57 | 4·18023 |

PROSPECT HILL.

Three miles south of Lancaster Coos Co., N. H., reached by wagon road to summit. An abandoned hotel on top of hill was used as signal. A flag pole on roof over front door was sighted. Instrument was mounted on railing on south edge of roof over front door.

[Latitude, $44^{\circ} 27' 05''$. 88. Longitude, $71^{\circ} 34' 16''$. 80.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mount Washington (obs'y). | 313 14 03·2 | 133 25 16·6 | 4·467167 |
| Lafayette | 10 19 21·2 | 190 16 16·2 | 4·516447 |

STARR KING.

Triangulation station of the U. S. C. & G. S. in Coos Co., N. H. A bridle path from road near the Wannebec House, Jefferson village, leads to station. Summit clear. Land owned by N. R. Perkins of Jefferson. Permanent mark: A bolt and triangle.

[Latitude, $44^{\circ} 28' 04''$.5. Longitude, $71^{\circ} 25' 59''$.8.]

| To station. | Azimuth. | Back Azimuth. | Log. dist. |
|------------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bald Ledge | 69 34 02 | 249 11 16 | 4·6647814 |
| Lafayette..... | 29 03 44 | 208 54 52 | 4·5417566 |

AGASSIZ.

Reached by wagon road from Bethlehem, Grafton Co., N. H. (2 miles). Theodolite was mounted on roof of first floor of observatory. Flagstaff marks center of station.

[Latitude, $44^{\circ} 15' 58''$.17. Longitude, $71^{\circ} 40' 38''$.05.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mount Washington (obs'y). | 268 55 40·7 | 89 11 19·1 | 4·474540 |
| Lafayette..... | 347 32 26·2 | 167 33 47·4 | 4·078725 |

LAFAYETTE.

Triangulation station of the U. S. C. & G. S. in Grafton Co., N. H. Reached from Profile House (4 miles) by a steep trail too rough for horses. Station of U. S. C. & G. S. was probably identified by an iron bolt.

Permanent mark: Rock cairn 10 feet high was erected over center.

[Latitude, $44^{\circ} 09' 38''$.92. Longitude, $71^{\circ} 38' 41''$.66.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mount Washington (obs'y). | 245 46 44·0 | 66 01 00·3 | 4·4751569 |
| Prospect Hill | 190 16 16·2 | 10 19 21·2 | 4·516447 |
| Agassiz | 167 33 47·4 | 347 32 26·2 | 4·078725 |
| Starr King | 208 54 52·0 | 29 03 44·0 | 4·5417566 |
| Carrigain | 295 12 30·2 | 115 20 45·2 | 4·24251 |
| Kearsarge, north | 277 42 15·5 | 98 05 14·6 | 4·6479026 |

MOUNT WASHINGTON.

Triangulation station of the U. S. C. & G. S. in Coos Co., N. H. Two stations were occupied, the first one 102.75 feet southeast of large kitchen chimney or Quimby U. S. C. & G. S. point, to which sights taken to signals east and south were reduced. The second station was the old tripod and observatory over Bache's U. S. C. & G. S. point, from which the western stations were sighted.

Chimney.

[Latitude, 44° 16' 14''-44. Longitude, 71° 18' 11''-49.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Kearsarge, north. | 317 37 35.3 | 137 46 18.3 | 4.3937849 |
| Iron | 341 27 24.7 | 161 30 04.2 | 4.2040230 |

Observatory.

[Latitude, 44° 16' 14''-06. Longitude, 71° 18' 13''-65.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Lafayette..... | 66 01 00.3 | 245 46 44.0 | 4.4751569 |
| Carrigain..... | 30 20 50.7 | 210 14 50.3 | 4.3573200 |

SOUTH BALDFACE.

On a hill in Coos Co., N. H. Reached from George Chandler's house, North Chatham (4 miles) by well-defined path. Summit cleared, giving a good view.

Permanent mark: Bolt in solid ledge covered with a pile of loose rocks.

[Latitude, 44° 13' 51''-46. Longitude, 71° 04' 42''-45.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Mount Washington (chimney) | 103 53 13.7 | 283 43 49.1 | 4.20682 |
| Kearsarge, north | 5 21 26.5 | 185 20 45.3 | 4.14492 |

CARRIGAIN.

Four and a half miles by path from Livermore (Sawyers) Mills, Grafton Co., N. H. Station on eastern of two distinct summits. Some scrub spruce trees still standing.

Permanent mark: Pile of stones.

[Latitude, 44° 05' 37''-23. Longitude, 71° 26' 50''-87.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Mount Washington (observatory) | 210 14 50.3 | 30 20 50.7 | 4.35732 |
| Lafayette | 115 20 45.2 | 295 12 30.2 | 4.24251 |

IRON.

Three miles west-southwest of Jackson, Carroll Co., N. H., on highest part of summit near south end.

Permanent mark: Iron bolt in solid ledge.

[Latitude, $44^{\circ} 08' 03''$.02. Longitude, $71^{\circ} 14' 22''$.65.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mount Washington (chimney) | 161 30 04.2 | 341 27 24.7 | 4.204023 |
| Kearsarge, north | 285 07 50.7 | 105 13 53.8 | 4.079743 |
| Moat | 349 05 24.3 | 169 06 25.1 | 4.01234 |

KEARSARGE NORTH.

A triangulation station of the U. S. C. & G. S., 5 miles by road and trail north northeast of North Conway, Carroll Co., N. H. Station marks left by U. S. C. & G. S. could not be identified. All observations were referred to hole in ledge, said by Mr. Eastman, keeper of the house on top of mountain, to be the place where Prof. Quimby set his theodolite.

[Latitude, $44^{\circ} 06' 21''$.06. Longitude, $71^{\circ} 05' 41''$.12.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mount Washington (chimney) | 137 46 18.3 | 317 37 35.3 | 4.3937849 |
| Lafayette | 98 05 14.6 | 277 42 15.5 | 4.6479026 |
| Iron | 105 13 53.8 | 285 07 50.7 | 4.0797431 |
| South Baldface | 185 20 45.3 | 5 21 26.5 | 4.14492 |
| Moat | 54 16 53.6 | 234 11 51.7 | 4.07566 |

MOAT.

In Carroll Co., N. H., on north summit of mountain, a bare rocky ridge running north and south and about 3 miles long. Station on bare, rocky knob. Ascended from end of highway near Diana's Bath, about 2 miles west of North Conway.

Permanent mark: Iron bolt in solid rock.

[Latitude, $44^{\circ} 02' 35''$.70. Longitude, $71^{\circ} 12' 55''$.18.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Iron | 169 06 25.1 | 349 05 24.3 | 4.01234 |
| Kearsarge, north | 234 11 51.7 | 54 16 53.6 | 4.07566 |

WATATIC.

An old Borden station on Watatic Mountain, Worcester Co., Mass. The description of station says that there is a copper bolt, but it could not be found; a hole apparently drilled was found and it is probable

that this hole held the bolt. A tree 36 feet distant was used as center and signal in triangulation.

Tree.

[Latitude, $42^{\circ} 41' 48'' \cdot 47$. Longitude $71^{\circ} 53' 34'' \cdot 40$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Groton Hill..... | 289 05 37 | 109 19 14 | 4 46377 |
| Turkey Hill..... | 308 13 30 | 128 20 52 | 4 27752 |
| Brown Hill..... | 336 03 12 | 156 05 09 | 3 98767 |
| Wachusett (chimney)..... | 358 54 24 | 178 54 37 | 4 36285 |
| Ward Hill..... | 58 38 41 | 238 27 17 | 4 43117 |
| Dolbar Hill..... | 39 05 42 | 218 58 58 | 4 33375 |
| Town Hill..... | 48 59 17 | 228 53 33 | 3 99996 |

Borden station.

[Latitude, $42^{\circ} 41' 48'' \cdot 55$. Longitude, $71^{\circ} 53' 34'' \cdot 87$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wachusett C. S. station... | 358 48 56 | 178 49 10 | 4 36320 |

TOWN HILL.

A station situated on Town Hill about 6 miles west of Ashburnham Center and 4 miles north of Gardner, Worcester Co., Mass.

Permanent mark: A tree that stands about 200 or 300 feet northeast of summit of hill.

[Latitude, $42^{\circ} 38' 15'' \cdot 54$. Longitude, $71^{\circ} 59' 05'' \cdot 39$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Watatic..... | 228 53 33 | 48 59 17 | 3 99996 |
| Brown Hill..... | 281 20 34 | 101 26 10 | 4 06886 |
| Wachusett (chimney)..... | 334 06 35 | 154 10 32 | 4 26291 |
| House on hill..... | 359 26 11 | 179 26 13 | 3 79814 |
| Dolbar Hill..... | 30 42 47 | 210 39 50 | 4 07328 |

WARD HILL.

A station on Ward Hill in pasture one-half mile south of Templeton and Athol road, at point about 3 miles from Athol, Worcester Co., Mass.

Permanent mark: Large dead tree that stands near summit of hill.

[Latitude, $42^{\circ} 34' 12'' \cdot 13$. Longitude, $72^{\circ} 10' 24'' \cdot 85$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Two tree..... | 194 27 36 | 14 28 47 | 3 97883 |
| Watatic..... | 238 27 17 | 58 38 41 | 4 43117 |
| Dolbar Hill..... | 285 43 47 | 105 48 23 | 3 99224 |
| Wachusett (chimney)..... | 290 48 11 | 110 59 47 | 4 40066 |

DOLBAR HILL.

About half a mile south of Templeton, Worcester Co., Mass., on summit of hill in pasture.

Mark: Stone + U. S. G. S.

[Latitude, $42^{\circ} 32' 45''$.62. Longitude, $72^{\circ} 03' 30''$.40.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Town Hill..... | 210 39 50 | 30 42 47 | 4.07328 |
| Watatic..... | 218 58 58 | 39 05 42 | 4.33375 |
| Wachusett (chimney).... | 294 07 07 | 114 14 03 | 4.18739 |
| Ward Hill..... | 105 48 23 | 285 43 47 | 3.99224 |

BROWN HILL.

This station is on land belonging to Thomas Costello, and is about 4 miles northwest of Fitchburg, Worcester Co., Mass.

[Latitude, $42^{\circ} 37' 00''$.54. Longitude, $71^{\circ} 50' 41''$.31.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Turkey Hill..... | 284 34 42 | 104 40 0.2 | 4.05316 |

TURKEY HILL.

About 1 mile east of Lunenburg, Worcester Co., Mass. on land belonging to Mr. John F. Brown.

[Latitude, $42^{\circ} 35' 28''$.03. Longitude, $71^{\circ} 42' 41''$.63.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Groton Hill..... | 260 12 26 | 80 18 36 | 4.10729 |
| Watatic..... | 128 20 52 | 308 13 30 | 4.27752 |
| Wachusett (chimney).... | 52 00 17 | 231 53 08 | 4.26385 |

GROTON HILL.

On land belonging to Mr. Dodge, about one-half mile west of Groton Center, Middlesex Co., Mass. Station is on top of hill, about 60 feet west from dead tree.

[Latitude, $42^{\circ} 36' 38''$.28. Longitude, $71^{\circ} 33' 28''$.31.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Watatic..... | 109 19 14 | 289 05 37 | 4.46377 |
| Turkey Hill..... | 80 18 36 | 260 12 26 | 4.10729 |
| Wachusett (chimney).... | 63 38 21 | 243 24 58 | 4.48073 |

WACHUSETT (CHIMNEY).

A U. S. C. & G. S. point in Worcester Co., Mass. This was transferred to chimney of Summit Hotel, which was used as center of station.
Mark: Chimney of Summit Hotel.

[Latitude, $42^{\circ} 29' 21''$. Longitude, $71^{\circ} 53' 15''$.13.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Brown Hill | 193 53 44 | 13 55 28 | 4.16433 |
| Turkey Hill | 231 53 08 | 52 00 17 | 4.26385 |
| Groton Hill | 243 24 58 | 63 38 21 | 4.48073 |
| Boxboro | 269 21 38 | 89 36 13 | 4.47099 |
| Observatory | 286 35 16 | 106 45 49 | 4.34969 |
| Reservoir | 300 59 52 | 121 12 47 | 4.48694 |
| Fay Mountain | 322 17 39 | 142 28 07 | 4.54359 |
| Ward Hill | 110 59 47 | 290 48 11 | 4.40066 |
| Dolbar Hill | 114 14 03 | 294 07 07 | 4.18739 |
| Watatic | 178 54 37 | 358 54 24 | 4.36285 |
| Town Hill | 154 10 32 | 334 06 35 | 4.26291 |

C. & G. S. station.

[Latitude, $42^{\circ} 29' 20''$. Longitude, $71^{\circ} 53' 13''$.98.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Fay Mountain.... | 322 18 46 | 142 29 13 | 4.54323 |

BOXBORO.

In belfry of town hall at Boxboro, Middlesex Co., Mass.
Mark: Center of tower.

[Latitude, $42^{\circ} 29' 29''$. Longitude, $71^{\circ} 31' 39''$.96.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Reservoir | 11 42 13 | 191 40 39 | 4.21642 |
| Observatory | 50 42 22 | 230 38 21 | 4.02316 |
| Wachusett (chimney). | 89 36 13 | 269 21 38 | 4.47099 |

OBSERVATORY.

This station is center of observatory in pasture belonging to Mr. Cunningham, and about 4 miles east of Clinton and $1\frac{1}{4}$ miles west of Bolton, Worcester Co., Mass.

[Latitude, $42^{\circ} 25' 53''$. Longitude, $71^{\circ} 37' 37''$.19.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Boxboro | 230 38 21 | 50 42 22 | 4.02316 |
| Reservoir | 332 51 34 | 152 53 36 | 4.02526 |
| Fay Mountain | 00 19 59 | 180 19 50 | 4.32780 |
| Wachusett (chimney). | 106 45 49 | 286 35 16 | 4.34969 |

RESERVOIR.

Center of tower in upper reservoir at Marlboro, Middlesex Co., Mass.

[Latitude, $42^{\circ} 20' 47''$.50. Longitude, $71^{\circ} 34' 05''$.96.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Boxboro | 191 | 40 | 39 | 11 | 42 | 13 | 4.21642 |
| Observatory | 152 | 53 | 36 | 332 | 51 | 34 | 4.02526 |
| Fay Mountain | 22 | 45 | 28 | 202 | 43 | 02 | 4.10846 |
| Wachusett (chimney). | 121 | 12 | 47 | 300 | 59 | 52 | 4.48694 |

FAY MOUNTAIN.

An old Borden station about 2 miles a little west of south from Westboro, Worcester Co., Mass, in pasture, about three-eighths of a mile northwest from Mr. James Hannahan's house.

[Latitude, $42^{\circ} 14' 23''$.79. Longitude, $71^{\circ} 37' 42''$.54.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters |
| Observatory | 180 | 19 | 50 | 00 | 19 | 59 | 4.32780 |
| Reservoir | 202 | 43 | 02 | 22 | 45 | 28 | 4.10846 |
| Wachusett (chimney). | 142 | 28 | 07 | 322 | 17 | 39 | 4.54359 |

BALD HILL.

Triangulation station of the U. S. C. & G. S. in the southwestern portion of the town of Union, Tolland Co., Conn., on the land of Capt. Burke Foster.

Permanent mark: Copper bolt in rock on the summit of hill.

[Latitude, $41^{\circ} 58' 25''$.89. Longitude, $72^{\circ} 11' 55''$.03.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Wachusett (chimney). | 204 | 05 | 01.00 | 24 | 17 | 34.50 | 4.7975447 |
| Mount Tom | 128 | 48 | 17.33 | 308 | 30 | 11.05 | 4.678130 |
| Green Hill | 41 | 57 | 56.00 | 221 | 50 | 22.00 | 4.370084 |
| Soapstone | 84 | 47 | 38.00 | 264 | 39 | 00.00 | 4.252975 |
| Box Hill | 47 | 57 | 32.58 | 227 | 47 | 14.07 | 4.4593537 |
| Storrs Monument | 15 | 56 | 41.00 | 195 | 54 | 15.00 | 4.264726 |
| Post Hill | 19 | 08 | 11.00 | 199 | 02 | 34.00 | 4.551575 |
| Robinson Hill | 333 | 33 | 21.00 | 153 | 38 | 06.00 | 4.344868 |

SOAPSTONE.

In southeastern corner of town of Somers, Tolland Co., Conn., 6 miles from Stafford Springs. Several acres of timber were cut, giving a good view in nearly all directions.

Permanent mark: A large boulder due south of signal; distance $25\frac{1}{2}$ feet.

[Latitude, $41^{\circ} 57' 32''$.50. Longitude, $72^{\circ} 24' 49''$.30.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bald Hill | 264 39 00 | 84 47 38 | 4.252975 |
| Box Hill | 11 14 26 | 191 12 45 | 4.255619 |
| Green Hill ..... | ..... | ..... | 4.202901 |
| Peak | 90 06 25 | 269 53 20 | 4.432218 |

PEAK.

Station on Copper Hill, $1\frac{1}{2}$ miles north-northwest of East Granby village, Hartford Co., Conn., 4 miles north-northeast of Tariffville, one-half mile by path east of old Newgate prison.

Permanent mark: A pine tree near edge of bluff at south extremity of long summit; tree trimmed up.

[Latitude, $41^{\circ} 57' 32''$.48. Longitude, $72^{\circ} 44' 24''$.02.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Soapstone | 269 53 20 | 90 06 25 | 4.432218 |
| Box Hill | 306 45 01 | 126 56 24 | 4.409305 |

ROBINSON HILL.

A perfectly bald hill in town of Hampton, Windham Co., Conn., 2 miles northwest of the village. Land owned by Ralph W. Robinson, who lives one-fourth of a mile from triangulation station, on southeast side. Station on south side of a stone wall running east and west and crossing the hill at highest point.

Permanent mark: Rocks piled at foot of pole.

[Latitude, $41^{\circ} 47' 43''$.61. Longitude, $72^{\circ} 04' 48''$.29.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Box Hill | 91 02 29 | 270 47 27 | 4.494768 |
| Bald Hill | 153 38 06 | 333 33 21 | 4.344868 |
| Storrs Monument ..... | ..... | ..... | 4.177694 |

STORRS MONUMENT.

Not occupied. On a hill back of Storrs Agricultural College, northern central part of town of Mansfield, Tolland Co., Conn. Hill partly covered with trees and birch brush.

Permanent mark: Granite shaft 25 feet high.

[Latitude, $41^{\circ} 48' 52''$.51. Longitude, $72^{\circ} 15' 33''$.98.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Green Hill..... | 91 20 02 | 271 14 55 | 4.026446 |
| Bald Hill..... | 195 54 15 | 15 56 41 | 4.264726 |
| Robinson Hill..... | | | 4.177694 |

GREEN HILL.

A bald hill in the northwest part of the town of Coventry, Tolland Co., Conn. Station in field owned by Samuel Green, on highest part of ridge. Some timber still stands on northwest edge of field. Samuel Green lives one-third of a mile west and Ambrose Royal lives one-third of a mile southeast of triangulation point.

Permanent mark: A chestnut pole 30 feet high.

[Latitude, $41^{\circ} 49' 00''$.26. Longitude, $72^{\circ} 23' 14''$.32.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Box Hill..... | 71 54 38 | 251 51 53 | 3.778222 |
| Bald Hill..... | 221 50 22 | 41 57 56 | 4.370084 |
| Post Hill..... | | | 4.222644 |
| Soapstone..... | | | 4.202901 |
| Storrs Monument..... | 271 14 55 | 91 20 02 | 4.026446 |
| Sweets Hill..... | 321 03 21 | 141 09 37 | 4.317776 |

BOX HILL.

Triangulation station of the U. S. C. & G. S. in the town of Bolton, Tolland Co., Conn. Station is on the highest point directly in line from Bald Hill to Sandford.

Permanent mark: Drill hole, with a copper bolt in rock.

[Latitude, $41^{\circ} 47' 59''$.79. Longitude, $72^{\circ} 27' 21''$.40.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mount Tom..... | 162 03 16.31 | 341 55 31.98 | 4.7127917 |
| Bald Hill..... | 227 47 14.07 | 47 57 32.58 | 4.4593557 |
| Ivy Hill..... | 97 23 00.05 | 276 52 14.77 | 4.3084201 |
| Green Hill..... | 251 51 53.00 | 71 54 38.00 | 3.778222 |
| Peak..... | 126 56 24.00 | 306 45 01.00 | 4.469305 |
| Robinson Hill..... | 270 47 27.00 | 91 02 29.00 | 4.494768 |
| Soapstone..... | 191 12 45.00 | 11 14 26.00 | 4.255019 |
| Post Hill..... | 325 44 53.00 | 145 49 34.00 | 4.238931 |

MEETING HOUSE HILL.

In Franklin township, New London Co., Conn., one-half mile from Franklin depot. Station in field belonging to Mr. Ladd, whose house

is 150 yards north-northwest. Summit, flat; view partly cut off by orchard to northward.

Permanent mark: Flag pole, 15 feet high.

[Latitude, $41^{\circ} 36' 08''$. 68. Longitude, $72^{\circ} 08' 38''$. 97.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Post Hill | 115 11 06 | 295 03 20 | 4.253116 |
| Sweet Hill..... | 136 43 15 | 316 39 49 | 4.020371 |

SWEET HILL.

A partly cleared hill, $3\frac{1}{2}$ miles south-southwest of Willimantic, and in the town of Lebanon, New London Co., Conn. The Willimantic and Lebanon road passes around the hill on the eastern side. Hill owned by Dr. Sweet, Lebanon village. A few oak trees on southeast edge of summit.

Permanent mark: Rocks piled up.

[Latitude, $41^{\circ} 40' 15''$. 88. Longitude, $72^{\circ} 13' 49''$. 55.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Post Hill..... | 89 53 29 | 289 49 10 | 3.955375 |
| Green Hill..... | 141 09 37 | 321 03 21 | 4.317716 |
| Meeting House Hill.. | 316 39 49 | 136 43 15 | 4.020371 |

POST HILL.

Station on land owned by W. C. Robinson, 8 miles southwest of Willimantic, in town of Columbia, Tolland Co., Conn., near Hebron line. Apple trees interfere with the view to the west; no obstructions in other directions.

Permanent mark: A flag pole, 30 feet high.

[Latitude, $41^{\circ} 40' 15''$. 15. Longitude, $72^{\circ} 20' 19''$. 64.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Box Hill..... | 145 49 34 | 325 44 53 | 4.238931 |
| Bald Hill..... | 199 02 34 | 19 08 11 | 4.551575 |
| Green Hill..... | 295 03 20 | 115 11 06 | 4.222644 |
| Meeting House Hill.. | 295 03 20 | 115 11 06 | 4.253116 |
| Sweet Hill..... | 269 49 10 | 89 53 29 | 3.955375 |

GRANBY.

On land owned by A. C. Teeter 2 miles north of North Canton village, and in the southwest corner of Granby township, Hartford Co., Conn. Summit flat and cleared of timber.

Permanent mark: A chestnut tree trimmed up.

[Latitude, $41^{\circ} 55' 57''$.08. Longitude, $72^{\circ} 53' 18''$.88.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Johnny Cake | 23 57 11 | 203 52 56 | 4.337369 |
| Ivy | 76 30 33 | 256 17 06 | 4.457468 |

IVY.

Triangulation station of the U. S. C. & G. S. on the summit at the south end of the ridge known as Ivy Hill in North Goshen, and about 2 miles north from Goshen Center village, Litchfield Co., Conn. The farm immediately south of station is owned by Mr. Dana Bently, and his house is about one-quarter of a mile southwest of station.

Permanent mark: Copper bolt inserted in rock. The head of bolt is one inch in diameter with two lines crossing the center at right angles.

[Latitude, $41^{\circ} 52' 18''$.50. Longitude, $73^{\circ} 13' 27''$.93.]

| To station. | Azimuth. | Back azimuth. | Log. Dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sandford | 333 14 07.82 | 153 25 05.06 | 4.7071382 |
| Granby | 256 17 06.00 | 76 30 33.00 | 4.457468 |
| Box Hill | 276 52 14.77 | 97 23 00.05 | 4.8084201 |
| Johnny Cake | 304 27 26.00 | 124 36 37.00 | 4.364915 |
| Mohawk | 47 08 17.00 | 227 05 23.00 | 3.915723 |
| Wooster | 20 54 59.84 | 200 44 28.82 | 4.7915137 |
| West Peak | 317 28 36.00 | 137 43 47.00 | 4.671544 |
| Ellsworth | 67 57 00.30 | 247 47 50.30 | 4.312546 |

JOHNNY CAKE.

Station on highest part of Johnny Cake or West Mountain, in western central part of Burlington Township, Hartford Co., Conn., on land owned by Frank Recor. Summit entirely cleared. A wagon road crosses the mountain from north to south and passes within 150 yards of triangulation station. John Edwards lives one-fourth of a mile north of triangulation point.

Permanent mark: Hole drilled in solid rock.

[Latitude, $41^{\circ} 45' 12''$.79. Longitude, $72^{\circ} 59' 41''$.01.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Good | 44 17 05 | 224 06 30 | 4.501402 |
| Ivy | 124 36 37 | 304 27 26 | 4.364915 |
| Mount Tom | | | 4.383078 |
| Granby | 203 52 56 | 23 57 11 | 4.337369 |
| Talcott | | | 4.256039 |
| West Peak | | | 4.396534 |

MOUNT TOM.

U. S. C. & G. S. station: Station on highest part of Mount Tom, in Washington Township, Litchfield Co., Conn., on land belonging to Albert Anson. The new road leaves Mount Tom pond to the south a short distance beyond the "Corners." The first road west of the pond gives best ascent to the mountain.

Permanent mark: A hole drilled in ledge, at the extreme southwest end of the summit.

[Latitude, $41^{\circ} 41' 36''$.43. Longitude, $73^{\circ} 16' 25''$.54.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Tashua | 357 39 55.72 | 177 40 51.49 | 4.6823488 |
| Wooster | 25 17 53.27 | 205 09 21.10 | 4.6235632 |
| Mohawk | 172 13 51.00 | 352 12 55.00 | 4.1563950 |
| West Peak | | | 4.5884380 |
| Johnny Cake | | | 4.3830780 |

WEST PEAK.

Five miles by road northwest of the city of Meriden, New Haven Co., Conn. Station on the highest part of bare ledge, 27 feet 2 inches northeast of flagstaff hole, near edge of cliff.

Permanent mark: Hole drilled in solid rock.

[Latitude, $41^{\circ} 33' 34''$.90. Longitude, $72^{\circ} 50' 38''$.78.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Good | 88 08 05 | 267 51 31 | 4.540789 |
| Ivy | 137 43 47 | 317 28 36 | 4.671544 |
| Mount Tom | | | 4.588438 |
| Johnny Cake | | | 4.396534 |

GOOD.

Triangulation station of the U. S. C. & G. S. situated on the highest part of Good Hill, in town of Woodbury, Litchfield Co., Conn. Land owned by Nathan B. Smith. The station is about one-quarter of a mile from Four Corners, in a pasture.

Permanent mark: A flat glass bottle sunk 3 feet in ground, bottom up. Over it are two layers of inch boards, on which rest a large stub reaching to surface; in center of stub a nail.

[Latitude, $41^{\circ} 32' 55''$.52. Longitude, $73^{\circ} 15' 36''$.75.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Tashua | 358 31 27.66 | 178 31 51.09 | 4.5054630 |
| Wooster | 41 03 04.58 | 220 54 00.85 | 4.4635225 |
| Wing | 92 50 42.00 | 272 40 02.00 | 4.3495800 |
| West Peak | 267 51 31.00 | 88 08 05.00 | 4.5407890 |
| Johnny Cake | 224 06 30.00 | 44 17 05.00 | 4.5014020 |

BEACONPOLE.

Triangulation station of the U. S. C. & G. S. in Providence Co., R. I. A 20-foot platform was erected and the Coast Survey signal, which was still standing July, 1888, was used.

[Latitude, $41^{\circ} 59' 42''$.47. Longitude, $71^{\circ} 27' 01''$.26.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Memford..... | 19 08 03.19 | 199 03 53.14 | 4.4218726 |
| Tourtellot..... | 56 38 32.09 | 236 30 20.63 | 4.3072428 |
| Spencer (2)..... | 6 17 11.20 | 186 15 19.12 | 4.5501573 |
| Woonsocket..... | 77 33 33.10 | 257 29 23.12 | 3.9451619 |

WOONSOCKET.

Station on Woonsocket Hill, Providence Co., R. I.

Permanent mark: Copper wire in hole drilled in a large rock 12 feet square.

[Latitude, $41^{\circ} 58' 40''$.81. Longitude, $71^{\circ} 33' 15''$.16.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Tourtellot..... | 41 56 38.02 | 221 52 36.62 | 4.0954877 |
| Beaconpole..... | 257 29 23.12 | 77 33 33.10 | 3.9451619 |

TOURTELLOT.

Station on Tourtellot Hill in town of Glocester, Providence, Co., R. I., about 2 miles southeast from Chepachet.

Permanent mark: Spruce tree denuded of limbs, one side (40-foot observing platform).

[Latitude, $41^{\circ} 53' 40''$.34. Longitude, $71^{\circ} 39' 16''$.43.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Memford..... | 328 52 31.54 | 148 56 32.11 | 4.2071185 |
| Aldrich..... | 371 44 43.62 | 191 44 07.23 | 3.7914820 |
| Beaconpole..... | 236 30 20.63 | 56 38 32.09 | 4.3072428 |
| Woonsocket..... | 221 52 36.62 | 41 56 38.02 | 4.0954877 |

ALDRICH.

Station on north end of Chopmist Hill, in town of Scituate, Providence Co., R. I. A 50-foot observing platform was erected.

Permanent mark: A chestnut tree.

[Latitude, $41^{\circ} 50' 23''$.92. Longitude, $71^{\circ} 40' 11''$.00.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Weaver..... | 358 36 21.73 | 178 36 35.77 | 4.3000474 |
| Memford..... | 308 52 48.54 | 128 57 25.32 | 4.0305367 |
| Tourtellot..... | 191 44 07.23 | 371 44 43.62 | 3.7914820 |

MEMFORD.

An old barn belonging to Mrs. Isaac Memford, in town of Cranston, Providence Co., R. I., and about 10 miles west of the city of Providence.

Permanent mark: A piece of brass set into stone foundation of barn 5 feet 3 inches from top of foundation.

[Latitude, $41^{\circ} 46' 13''$. Longitude, $71^{\circ} 33' 15''$.83.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Spencer (2)..... | 335 07 48.35 | 155 10 05.71 | 4.0552672 |
| Weaver..... | 36 45 54.42 | 216 41 32.19 | 4.1828648 |
| Beaconpole..... | 199 03 53.14 | 19 08 03.19 | 4.4218726 |
| Anthony Mill..... | 355 29 05.38 | 175 29 24.01 | 3.9150112 |
| Aldrich..... | 128 57 25.32 | 308 52 48.54 | 4.0305307 |
| Tourtellot..... | 148 56 32.11 | 328 52 31.54 | 4.207185 |

ANTHONY MILL.

Point was not occupied in 1888. In town of Coventry, Kent Co., R. I., village of Anthony. Point sighted was cupola of new mill in Anthony.

[Latitude, $41^{\circ} 41' 47''$.30. Longitude, $71^{\circ} 32' 47''$.82.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Memford..... | 175 29 24.01 | 355 29 05.38 | 3.9150112 |
| Spencer (2)..... | 297 02 99.97 | 117 04 08.68 | 3.6660774 |

SPENCER (2).

This station is in Mr. Benjamin F. Dawley's pasture, town of Warwick, Kent Co., R. I., just south of his house. A 24-foot platform was erected. Station is 790 feet south $55^{\circ} 46'$ west from U. S. Coast and Geodetic Survey station Spencer and 10 feet west of cross mark cut on rock.

Permanent mark: Cross mark cut on rock.

[Latitude, $41^{\circ} 40' 38''$.87. Longitude, $71^{\circ} 29' 49''$.30.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Spencer (C. & G. S.)..... | | 55 46 30.00 | 2.3816593 |
| Beaconpole..... | 186 15 19.12 | 6 17 11.20 | 4.5501573 |
| Anthony Mill..... | 117 04 08.68 | 297 02 09.97 | 3.6660774 |
| Franklin..... | 31 55 51.02 | 211 53 06.92 | 4.0340647 |
| Memford..... | 155 10 05.71 | 335 07 48.35 | 4.0552672 |
| Weaver..... | 82 14 33.84 | 262 07 54.58 | 4.1468498 |

WEAVER.

On Weaver Hill, Coventry Township, Kent Co., R. I., a 50-foot observing platform was erected.

Permanent mark: Spruce tree from which nearly all of the limbs were cut and which formed one side of triangular observing platform.

[Latitude, $41^{\circ} 39' 37''$.21. Longitude, $71^{\circ} 39' 49''$.84.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Spencer (2) | 262 | 07 | 54.48 | 82 | 14 | 33.84 | 4.1468498 |
| Franklin | 311 | 36 | 54.71 | 131 | 40 | 29.54 | 4.0394200 |
| Aldrich | 178 | 36 | 35.77 | 358 | 36 | 21.73 | 4.3000474 |
| Memford | 216 | 41 | 32.19 | 36 | 45 | 54.42 | 4.1828648 |

FRANKLIN.

Near Franklin Corner, in the town of Exeter, Washington Co., R. I., a 60-foot observing platform was erected.

Permanent mark: Oak tree (part of platform).

[Latitude, $41^{\circ} 35' 41''$.35. Longitude, $71^{\circ} 33' 56''$.30.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Spencer (2) | 211 | 53 | 06.92 | 31 | 55 | 51.02 | 4.0340647 |
| Sherman | 337 | 20 | 31.00 | 157 | 22 | 30.46 | 4.0351512 |
| Weaver | 131 | 40 | 29.54 | 311 | 36 | 34.71 | 4.0394200 |

DAWLEY.

On rocky point northwest of highest point of what is known as the mountain road, in town of Richmond, Washington Co., R. I., a 50-foot observing platform was erected.

Permanent mark: Cross and U. S. G. S. cut in solid rock.

[Latitude, $41^{\circ} 32' 12''$.06. Longitude, $71^{\circ} 33' 02''$.68.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Sherman | 287 | 25 | 44.38 | 107 | 31 | 06.89 | 4.0728640 |
| Kingston Church Steeple | 300 | 59 | 33.79 | 121 | 04 | 31.44 | 4.0847784 |
| Champlin | 63 | 19 | 28.22 | 243 | 14 | 19.37 | 4.0819936 |

SHERMAN.

Triangulation station of the U. S. C. & G. S. in Washington Co., R. I. A 24-foot observing platform and tripod was erected at a point $2^{\circ} 10'$ north of west from U. S. Coast and Geodetic Survey station Sherman, and 13 feet distant.

Permanent mark: Same as made by U. S. C. & G. S.

[Latitude, $41^{\circ} 30' 16'' \cdot 94$. Longitude, $71^{\circ} 30' 56'' \cdot 19$.]

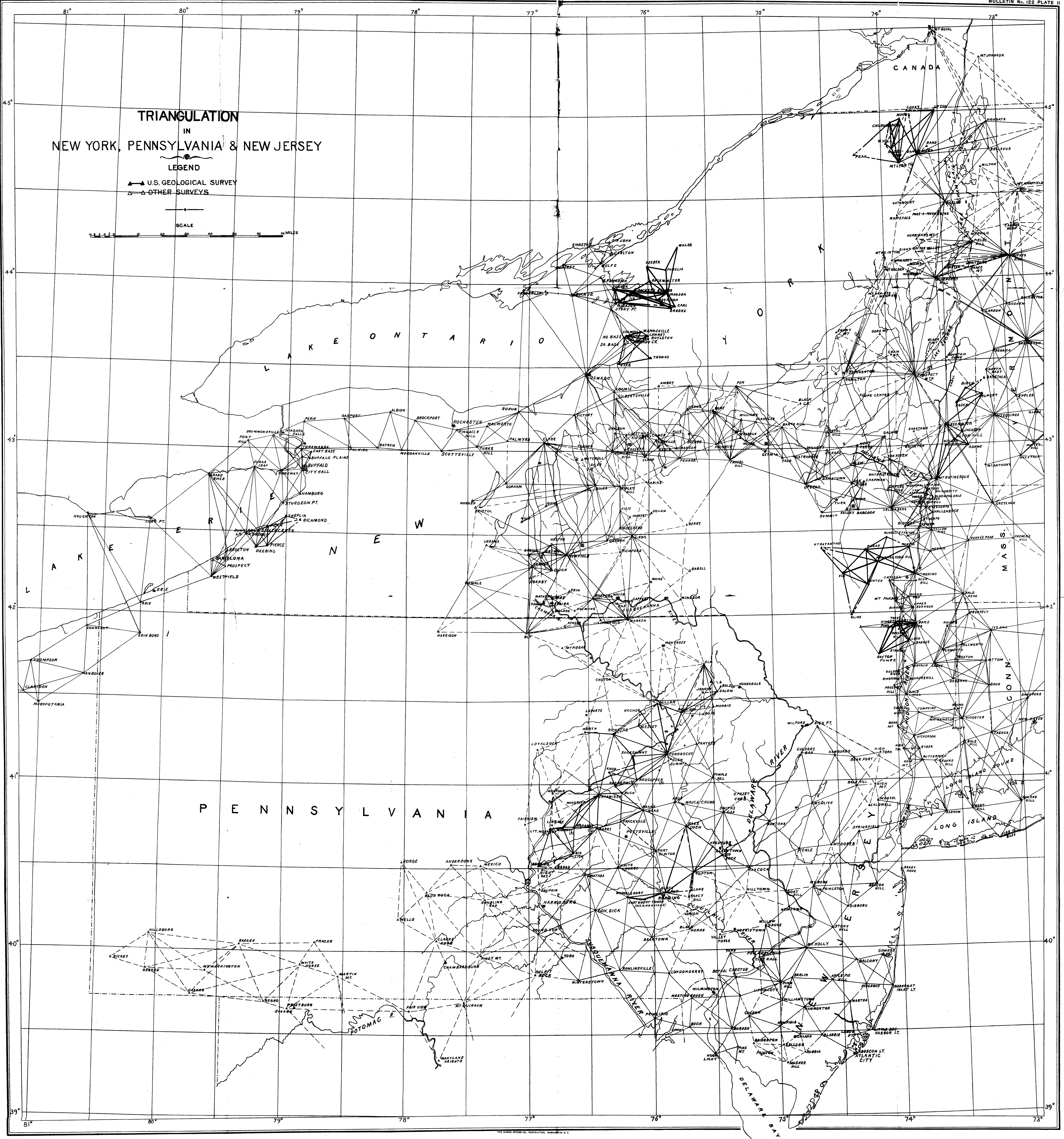
| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Spencer (2) | 184 | 36 | 35·54 | 4 | 37 | 19·94 | 4·2844114 |
| Pine Hill | 131 | 20 | 35·94 | 311 | 16 | 07·86 | 4·0959827 |
| Franklin | 157 | 22 | 30·46 | 337 | 20 | 31·00 | 4·0351512 |
| Dawley | 107 | 31 | 06·89 | 287 | 25 | 44·38 | 4·0728640 |

CHAMPLIN.

Station is about $1\frac{3}{4}$ miles due north of Hopkinton, Washington Co., R. I. A 24-foot observing platform and tripod was erected at a point $10^{\circ} 14'$ south of east from Coast Survey station, Champlin Hill, distant 11 feet 3 inches; the latter is marked by iron spikes in two rocks.

[Latitude, $41^{\circ} 29' 16'' \cdot 04$. Longitude, $71^{\circ} 46' 47'' \cdot 91$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Dawley | 243 | 14 | 19·37 | 63 | 19 | 28·22 | 4·0819936 |



NEW YORK AND PENNSYLVANIA.

METHODS OF WORK.

NEW YORK.

A comparatively small amount of triangulation has as yet been necessary in addition to that of other organizations. The State is about half covered by triangulation, including the work of the U. S. Lake Survey, along the Great Lakes and St. Lawrence River; that of the U. S. Coast and Geodetic Survey along the Hudson River, Lake Champlain, and the Mohawk Valley; and that of the New York State survey in the central and southern portions of the State. The work in certain areas was supplemented by the U. S. Geological Survey during 1892 and 1893. In June, 1892, a small belt was extended northeastward through Washington County, starting from stations Greenwich, Rafinesque, of the U. S. Coast and Geodetic Survey. Nine stations, controlling four atlas sheets, were occupied. Stations were located on bare hills, though they were not always the highest in the locality, to avoid erection of expensive scaffolds, or heavy damages for destruction of timber.

Later in the season of 1892 a system of quadrilaterals was started across the Catskill region from Powell-Merino, stations of the U. S. Coast and Geodetic Survey in the Hudson Valley near Coxsackie. Seven stations, controlling three atlas sheets, were located. Old observatories were found on many of the wooded mountain summits and were sighted as signals and occupied with the theodolite.

During 1893 work was extended across Clinton County from the line Lyon-Dannemora, of the U. S. Coast and Geodetic Survey. The northern border of the State is very difficult to triangulate, there being no well-defined points after leaving the high rocky peaks of the Adirondack region, the ridges being flat and heavily wooded. Eight stations within three atlas sheets were located.

The work in Oswego and Jefferson counties was based upon stations of the U. S. Lake Survey, Sandy Creek-Mannsville being used as a base in Oswego County and Cooper-Gleason in Jefferson County. Eighteen stations were occupied in this portion of the State, furnishing control for five atlas sheets.

A few stations in addition to those of the U. S. Lake Survey were located in Chautauqua and Erie counties. The line Silver Creek-Dunkirk light-house was used as a base from which the positions of five stations were determined.

In October, 1893, four stations were located in Ulster County, southwest of Kingston; these were based upon Terry, Prospect, and Lloyd, stations of the U. S. Coast and Geodetic Survey on the banks of the Hudson near Rondout.

All of the work of the U. S. Geological Survey in New York has been done by S. S. Gannett, assisted by B. C. Washington, jr. A Fauth 8-inch theodolite has been used, angles having been read, in most cases, by the method of directions. No least square figure adjustment has been made.

PENNSYLVANIA.

Triangulation of the U. S. Coast and Geodetic Survey in the anthracite coal region was supplemented during the years 1889, 1890, and 1891. Twenty-five points were located, furnishing control for fifteen atlas sheets.

The location of stations on flat, wooded, mountain summits in many cases necessitated the elevation of the theodolite from 10 to 50 feet above the ground, an interior tripod for the support of the instrument being built with an exterior structure for the observer.

In August, 1892, a few stations were added to those already located in the vicinity of Reading and Allentown. Angles were measured with a Fauth 8-inch theodolite. No figure adjustment has been made.

DESCRIPTIONS AND POSITIONS OF STATIONS.

DEERING.

Station located on north end of high ridge, in town of Arkwright, Chautauqua Co., N. Y., about one-eighth of a mile south of Sheridan line, 175 yards west of main north and south road. Louis Deering owner of property.

Permanent mark: Copper bolt in bowlder.

[Latitude, 42° 25' 49''-50. Longitude, 79° 14' 19''-03.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Dunkirk, L. H. | 126 32 17.5 | 306 27 36.1 | 4.07358 |
| Brooks (chimney) . | 130 51 26.9 | 310 47 59.1 | 3.96816 |
| Pierce | 265 43 43.8 | 85 47 06.4 | 3.83766 |
| Dean | 209 02 04.8 | 29 05 29.7 | 4.15428 |
| Silver Creek | 186 44 32.3 | 6 45 07.2 | 4.00268 |

SHEFLIN.

Two miles south southeast of Angola Depot, in town of Evans, Erie Co., N. Y., about 75 yards north of Brant line or road: One-fourth of a mile east of north and south road. Station in pasture on highest ground owned by Jacob Sheflin.

Permanent mark: Stone monument 4 feet long, copper bolt stamped U. S. G. S., 459, N. Y.

[Latitude, 42° 36' 38''·41. Longitude, 79° 00' 30''·72.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pierce | 31 45 15·2 | 211 39 18·2 | 4·36053 |
| Dean | 57 47 53·1 | 237 41 58·0 | 4·15089 |
| Richmond | 283 07 13·0 | 103 12 33·2 | 4·04439 |

RICHMOND.

Not occupied, situated in Erie Co., N. Y. Station on land owned by Nathaniel Richmond, in North Collins, 1½ miles west of Langford, just north of main east and west road; just north of and 75 yards distant from house of Charles Cook, 10 feet northeast of old well.

Permanent mark: Stone monument, copper bolt No. 458, U. S. G. S., N. Y.

[Latitude, 42° 35' 16''·65. Longitude, 78° 52' 37''·69.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pierce | 53 28 02·2 | 233 16 45·7 | 4·45452 |
| Shefin | 103 12 33·2 | 383 07 13·0 | 4·04439 |

DEAN.

One mile east of Silver Creek depot, Chautauqua Co., N. Y., just outside of corporation limits, on highest ground in immediate vicinity. Station about 150 feet north of main east and west road on line running east and west, separating property of George Dean and Dr. Evarts.

Permanent mark: Stone monument, copper bolt stamped U. S. G. S., 460, N. Y.

[Latitude, 43° 32' 33·61''. Longitude, 79° 09' 15·62'']

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pierce | 0 21 05·2 | 180 21 03·0 | 4·07774 |
| Deering | 29 05 29·7 | 209 02 04·8 | 4·15428 |
| Shefin | 237 41 58·0 | 57 47 53·1 | 4·15089 |

SILVER CREEK.

Triangulation point of the U. S. Lake Survey in Sheridan Township, Chautauqua Co, N. Y., 3 miles west of village of Silver Creek, three-quarters of a mile east of Sheridan railroad station. A new railroad has cut through primary station, destroying center mark. A new

station was established about 75 feet south of railroad track in open field.

Permanent mark: Stone monument marked U. S. Reference stone, monument north $58^{\circ} 08'$ east, 2s3.9 feet.

[Latitude, $42^{\circ} 31' 13''$.34. Longitude, $79^{\circ} 13' 27''$.28.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Deering | 6 45 07.2 | 186 44 32.3 | 4.00268 |
| Brooks (chimney) .. | 64 31 29.4 | 244 27 26.9 | 4.95879 |
| Dunkirk, L. H. | 74 38 49.2 | 254 33 33.0 | 4.045157 |
| Pierce | 329 04 40.7 | 149 07 28.5 | 4.04343 |

PIERCE.

Station on a knoll in cultivated field, in town of Villenova, Chautauqua Co., N. Y., about 50 yards south of Hanover line, close by main road to Forestville. L. J. Pierce, owner. L. W. Geer lives on place.

Permanent mark: Cut marble post 8 by 8 by 30 inches flush with ground. Copper bolt stamped U. S. G. S., 457, N. Y.

[Latitude, $42^{\circ} 26' 06''$.00. Longitude, $79^{\circ} 09' 18''$.82.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Deering | 85 47 06.4 | 275 43 43.8 | 3.83766 |
| Silver Creek | 149 07 28.5 | 329 04 40.7 | 4.04343 |
| Richmond | 233 16 45.7 | 53 28 02.2 | 4.45452 |
| Shedin | 211 39 18.2 | 31 45 15.2 | 4.36053 |
| Dean | 180 21 03.0 | 0 21 05.2 | 4.07774 |

DUNKIRK, LIGHT-HOUSE.

Triangulation point of the U. S. Lake Survey, situated $1\frac{1}{4}$ miles northwest of city of Dunkirk, Chautauqua Co., N. Y. Instrument on iron platform about 35 feet above ground.

Permanent mark: Center of brick tower.

[Latitude, $42^{\circ} 29' 37''$.80. Longitude, $79^{\circ} 21' 15''$.80.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Silver Creek | 254 33 33.0 | 74 38 49.2 | 4.045157 |
| Deering | 306 27 36.1 | 126 32 17.5 | 4.07358 |

COOPER.

Triangulation point of the U. S. Lake Survey. Station one-quarter of a mile from end of Peninsula Point, Jefferson Co., N. Y., and nearly west of Sacketts Harbor in cultivated field.

Permanent mark: Hole drilled in stone post 1 foot below surface.

Reference post, south 68° west 36.0 meters.

Reference post, north 73° east 52.0 meters.

Reference post, north 24° east 62.5 meters.

[Latitude, $43^{\circ} 57' 48''$.2. Longitude, $76^{\circ} 16' 41''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Horse Island | 281 57 39.4 | 102 03 11.5 | 4.037713 |
| Hovey | 338 51 49.1 | 158 53 34.2 | 3.972121 |
| Greene | 287 34 30.3 | 107 53 46.9 | 4.591839 |

GLEASON.

Triangulation point of the U. S. Lake Survey. Station 4 miles northeast of Stony Point light-house, about $1\frac{1}{2}$ miles southwest of the west end of Snowshoe Bay, Jefferson Co., N. Y.

Permanent mark: Triangular hole drilled in bed rock 1 foot below surface. A surface stone is planted directly over it.

[Latitude, $43^{\circ} 52' 48''$.9. Longitude, $76^{\circ} 15' 32''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Horse Island | 232 38 31.0 | 52 43 15.0 | 4.060565 |

HOVEY.

In town of Henderson, Jefferson Co., N. Y., on flat bluff on west side of Henderson Bay, in cleared pasture, with fringe of timber around edge of bluff. Land owned by Mr. Hovey, who lives half a mile northeast of station. The mark is a hole drilled in solid rock 1 foot below surface. Surface mark, a boulder set over center with a cross cut a half-inch deep on its top.

[Latitude, $43^{\circ} 53' 04''$.77. Longitude, $76^{\circ} 14' 09''$.99.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Johnson | 256 04 34.99 | 76 20 57.66 | 4.512470 |
| Horse Island | 228 21 33.99 | 48 25 20.75 | 3.989328 |
| Cooper | 158 53 34.19 | 338 51 49.10 | 3.972121 |
| Greene | 275 10 40.49 | 95 28 11.39 | 4.531514 |
| Carl | 274 03 13.99 | 94 22 06.34 | 4.563231 |

CARL.

A round bare hill three-fourths of a mile northeast of Cronk Corners, Lewis Co., N. Y., owned by Thomas Carl.

Permanent mark: Stone monument, copper bolt stamped U. S. G. S., 449, N. Y. Stones piled around monument.

[Latitude, $43^{\circ} 51' 37''$.67. Longitude, $75^{\circ} 46' 56''$.10.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Greene | 79 54 50.30 | 259 53 28.80 | 3.426238 |
| Johnson | 155 07 25.60 | 335 04 55.00 | 4.061204 |
| Boynton | 109 35 50.80 | 289 29 46.90 | 4.094678 |
| Hovey | 94 22 06.34 | 274 03 13.99 | 4.563231 |

GREENE.

A cleared ridge in town of Pinckney, Lewis Co., N. Y., in lot 30, Franklin Greene owner, $2\frac{1}{2}$ miles east-southeast of Whitesville.

Permanent mark: Stonemonument, in which is a copper bolt stamped U. S. G. S., 448, N. Y.

[Latitude, $43^{\circ} 51' 22''$.53. Longitude, $75^{\circ} 48' 53''$.76.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cooper | 107 53 46.90 | 287 34 30.30 | 4.591839 |
| Johnson | 168 29 45.60 | 348 28 36.50 | 4.046701 |
| Carl | 259 53 28.80 | 79 54 50.30 | 3.426238 |
| Hovey | 95 28 11.39 | 275 10 40.49 | 4.531514 |

BOYNTON.

Station on cleared ridge, 5 miles south of Watertown, Jefferson Co., N. Y., owned by Lester Boynton. Highest land within 6 or 8 miles.

Permanent mark: Stone monument 4 feet long; in which is a copper bolt stamped U. S. G. S., 450, N. Y.

[Latitude, $43^{\circ} 53' 52''$.46. Longitude, $75^{\circ} 55' 41''$.02.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Carl | 289 29 46.9 | 109 35 50.8 | 4.094678 |
| Buckminster | 160 34 41.1 | 340 32 05.0 | 4.177686 |
| Horse Island | 106 05 15.3 | 285 56 12.8 | 4.258931 |
| Johnson | 227 29 42.6 | 47 33 16.1 | 3.968754 |

LOOMIS.

Triangulation point of the U. S. C. & G. S. Station is situated near the village of Palermo, Oswego Co., N. Y., about four-fifths of a mile south-southwest from "Jennings Corner" or "Palermo Center," on land owned by Mr. J. W. K. Loomis.

Permanent mark: An apothecary's short-neck bottle filled with ashes 30 inches below surface; a marble post 30 inches long rests on the bottle with letters U. S. C. S. upon its top. Four other posts are set with centers, each 5 feet north, south, east, and west (true) from the station.

[Latitude, 43° 21' 18''-46. Longitude, 76° 17' 10''-37.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Florence..... | 265 44 53·68 | 86 10 41·57 | 4·7064895 |
| Fenner | 314 53 10·34 | 135 15 27·12 | 4·7960549 |

JOHNSON.

A bare summit on edge of table-land, 4 miles southeast of Watertown, Jefferson Co., N. Y.

Permanent mark: Copper bolt in solid rock, stamped U. S. G. S., 451 N. Y.

[Latitude, 43° 57' 16''-05. Longitude, 75° 50' 33''-36.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Carl | 335 04 55·00 | 155 07 25·60 | 4·061204 |
| Greene | 348 28 36·50 | 168 29 45·60 | 4·046701 |
| Boynton | 47 33 16·10 | 227 29 42·60 | 3·968754 |
| Seeber | 140 59 02·60 | 320 51 50·60 | 4·341508 |
| Miller | 192 18 14·20 | 12 21 50·70 | 4·510670 |
| Pamelia | 169 50 50·70 | 349 49 26·30 | 4·185362 |
| Buckminster | 123 44 54·60 | 303 38 44·70 | 4·154169 |
| Horse Island | 87 05 51·00 | 266 53 14·70 | 4·386219 |
| Hovey | 76 20 57·66 | 256 04 34·99 | 4·512470 |

HORSE ISLAND.

Light-house on Horse Island, Sacketts Harbor, Jefferson Co., N. Y., one-half mile from village. Instrument on iron platform about 80 feet above ground, outside of lenses.

Permanent mark: Center of brick tower.

[Latitude, 43° 56' 34''-70. Longitude, 76° 08' 43''-00.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Johnson | 266 53 14·7 | 87 05 51·0 | 4·386219 |
| Boynton | 285 56 12·8 | 106 05 15·3 | 4·258931 |
| Hovey | 48 25 22·8 | 228 21 36·0 | 3·989328 |
| Buckminster | 233 26 50·1 | 53 33 17·1 | 4·188920 |
| Cooper | 102 03 11·5 | 281 57 39·4 | 4·037713 |
| Gleason | 52 43 15·0 | 232 38 31·0 | 4·060565 |

BUCKMINSTER.

Two miles north of Brownville, Jefferson Co., N. Y., on highest land within several miles.

Permanent mark: Stone monument 3 feet long set in shale rock 2 feet east of stone fence.

[Latitude, $44^{\circ} 01' 32''$.44. Longitude, $75^{\circ} 59' 25''$.80.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Johnson | 303 38 44.7 | 123 44 54.6 | 4.154169 |
| Boynton | 340 32 05.0 | 160 34 41.1 | 4.177686 |
| Horse Island | 53 33 17.1 | 233 26 50.1 | 4.188920 |
| Seeber | 167 46 24.7 | 347 45 22.9 | 3.970462 |

PAMELIA.

Station in field north of road leading west from Pamela Four Corners, Jefferson Co., N. Y., about one-third of a mile from the Corners on land belonging to David Countryman.

Permanent mark: Copper bolt in boulder.

Station to hickory tree (blazed) northeast, 55.8 feet.

Station to hickory tree (blazed) east, 27.8 feet.

Station to arrowhead in boulder northwest, 12.0 feet.

Station to arrowhead in boulder west, 8.0 feet.

[Latitude, $44^{\circ} 05' 24''$.76. Longitude, $76^{\circ} 52' 34''$.78.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Miller | 210 03 54.8 | 30 08 56.2 | 4.282475 |
| Johnson | 349 49 26.3 | 169 50 50.7 | 4.185362 |
| Seeber | 100 02 30.5 | 279 56 42.5 | 4.052824 |

SEEBER.

In Clayton Township, $2\frac{1}{2}$ miles west of Stone Mills, 3 miles north of Perch River, Jefferson Co., N. Y., 400 yards north of house of Walter Seeber, just inside of fence on east side of road and on edge of grain field.

Permanent mark: Stone monument, copper bolt, distance to small tree near rail fence to northward, 264 feet.

[Latitude, $44^{\circ} 06' 28''$.26. Longitude, $76^{\circ} 00' 54''$.81.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pamelia | 279 56 42.5 | 100 02 30.5 | 4.052824 |
| Johnson | 320 51 50.6 | 140 59 02.6 | 4.341508 |
| Buckminster | 347 45 22.9 | 167 46 24.7 | 3.970462 |

MILLER.

Three miles northeast of Theresa village, Jefferson Co., N. Y., on highest land within many miles.

Permanent mark: Copper bolt in boulder.

[Latitude, $44^{\circ} 14' 21''$.87. Longitude, $75^{\circ} 45' 22''$.13.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Johnson | 12 21 50.7 | 192 18 14.2 | 4.510670 |
| Pamela | 30 08 56.2 | 210 03 54.8 | 4.282475 |

COLWELL.

In Ellisburg, Jefferson Co., N. Y., 4 miles southwest of Ellisburg village, three-fourths mile east of Lake Ontario, on land owned by Hamilton Colwell, jr., 150 yards west of his residence.

Permanent mark: Cut marble post 8 by 8 by 30 inches set flush with surface. Copper bolt No. 437.

[Latitude, $43^{\circ} 41' 40''$.56. Longitude, $76^{\circ} 11' 10''$.78.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lowrey | 269 08 15.4 | 89 16 01.5 | 4.179368 |
| Sandy Creek | 304 57 33.7 | 125 01 07.4 | 3.917406 |
| Dyke | 13 13 00.3 | 193 10 46.5 | 4.270942 |
| Thomas | 308 20 09.4 | 128 28 37.7 | 4.323686 |

MANNSVILLE.

Triangulation point of the U. S. Lake Survey, situated in Mannsville, Jefferson Co., N. Y., one-half mile northeast of the village of Mannsville; in lot 177, Ellisburg Township, on highest ground in the vicinity.

Permanent mark: Marble post $1\frac{1}{2}$ feet below surface. Reference posts—one north $67^{\circ} 48'$ east, distant 91.79 meters; one south $54^{\circ} 10'$ east, distant 107.84 meters; one south $34^{\circ} 06'$ west, distant 393.1 meters.

[Latitude, $43^{\circ} 12' 54''$.41. Longitude, $76^{\circ} 03' 14''$.61.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sandy Creek | 29 01 23.36 | 208 59 23.34 | 3.904569 |
| Oswego | 51 05 31.07 | 230 46 29.63 | 4.679876 |
| South Base | 52 25 20.85 | 232 19 23.89 | 4.164962 |
| North Base | 71 10 47.73 | 251 04 43.36 | 4.096264 |
| Stony Point | 127 29 58.81 | 307 20 08.21 | 4.380805 |
| Colwell | 77 58 48.70 | 257 53 19.70 | 4.037532 |
| Lowrey | 294 55 22.20 | 114 57 39.50 | 3.690725 |

LOWREY.

In Oswego Co., N. Y., one-half mile south of Jefferson Co. line, 4 miles from Mannsville, 6 miles from Sandy Creek, in field of James E. Lowrey, one-third of a mile south of his house.

Permanent mark: Dressed stone with copper bolt in center of top, No. 439.

[Latitude, $43^{\circ} 41' 47''$.37. Longitude, $75^{\circ} 59' 55''$.94.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mannsville | 114 57 39.5 | 294 55 22.2 | 3.690725 |
| Colwell | 89 16 01.5 | 269 08 15.4 | 4.179366 |
| Sandy Creek | 59 20 57.2 | 239 16 40.0 | 3.986883 |
| Dyke | 46 10 02.4 | 226 00 03.6 | 4.432104 |

SANDY CREEK.

Triangulation point of the U. S. Lake Survey. Station in Sandy Creek Township, Oswego Co., N. Y., 1 mile northwest of village of Sandy Creek. Land owned by Jacob Hadley, who lives 300 feet east of station.

Permanent mark: Dressed stone 1 foot below surface.

[Latitude, $43^{\circ} 39' 06''$.93. Longitude, $76^{\circ} 06' 08''$.40.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lowrey | 239 16 40.00 | 59 20 57.20 | 3.986883 |
| Colwell | 125 01 07.40 | 304 57 38.70 | 3.917406 |
| Mannsville | 208 59 23.34 | 29 01 23.36 | 3.904569 |

THOMAS.

Station on cleared hill three-fourths of a mile east of Orwell village, Oswego Co., N. Y., 300 yards south of main east and west road, in a cultivated field belonging to George Thomas, hotel-keeper at Orwell.

Permanent mark: Dressed stone set 8 inches below surface. White ash tree north $13^{\circ} 34'$ west 117.3 feet; dressed stone north $83^{\circ} 48'$ east 241.8 feet.

[Latitude, $43^{\circ} 34' 36''$.42. Longitude, $75^{\circ} 58' 54''$.09.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Dyke | 75 26 38.1 | 255 15 56.9 | 4.334257 |
| Colwell | 128 28 37.7 | 308 20 09.4 | 4.323686 |

DYKE.

In town of Mexico, Oswego Co., N. Y., 4 miles from the village, in a cleared field on shores of Mexico Bay, 100 yards from water's edge, and about 100 yards from Richland town line. Denny Dyke owner of land.

Permanent mark: Stone set 2 feet in ground; projects 6 inches; copper bolt in stone, No. 436.

[Latitude, 43° 31' 39''-54. Longitude, 76° 14' 24''-76.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Colwell | 193 10 46.5 | 13 13 00.3 | 4.279942 |
| Lowrey | 226 00 03.6 | 46 10 02.4 | 4.432104 |
| Thomas | 255 15 56.9 | 75 26 38.1 | 4.334257 |

MOORE.

Seven miles northwest of Ellenburg Depot, Clinton Co., N. Y., 1 mile east of Clinton Mills, in field of James Moore, one-fourth of a mile north of his house. Summit of hill flat.

Permanent mark: A copper bolt, 4 inches long and 1 inch in diameter, sunk in solid rock; top of bolt stamped U. S. G. S., 431, N. Y.

[Latitude, 44° 57' 53''-71. Longitude, 73° 51' 36''-52.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Haseltine | 20 31 03.6 | 200 27 59.8 | 4.212828 |
| Churubusco | 78 18 11.1 | 258 15 08.9 | 3.762444 |
| West Hill | 36 43 00.5 | 216 38 07.9 | 4.182583 |
| Dannemora | 335 16 43.9 | 152 22 49.9 | 4.436154 |
| Lyon | 0 31 50.1 | 180 31 50.5 | 4.461256 |

CHURUBUSCO.

Station in center of tower of St. Philominus Catholic Church, Churubusco, Clinton Co., N. Y. Tower is solid masonry. Instrument in belfry about 55 feet above ground.

Permanent mark: A copper bolt let into a timber of floor of belfry, stamped U. S. G. S., 434, N. Y.

[Latitude, 44° 57' 15''-63. Longitude, 73° 55' 15''-03.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Haseltine | 0 10 13.2 | 180 10 11.9 | 4.149718 |
| West Hill | 17 14 52.7 | 197 13 02.6 | 4.062777 |
| Moore | 258 15 08.9 | 78 18 11.1 | 3.762444 |
| Lyon | 348 56 32.3 | 168 59 25.9 | 4.451317 |

WEST HILL.

Not occupied. In Ellenburg township, $3\frac{1}{2}$ miles west of Ellenburg Center, Clinton Co., N. Y. Station on highest part of flat wooded summit, on land owned by Peter Kent, near a pile of loose rock 4 feet high, 15 feet in diameter.

Permanent mark: Stone monument of usual form. U. S. G. S., 433, N. Y.

[Latitude, $44^{\circ} 51' 18''$. 11. Longitude, $73^{\circ} 58' 31''$. 08.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Moore | 216 38 07.9 | 36 43 00.5 | 4.182583 |
| Haseltine | 312 16 33.6 | 132 18 22.4 | 3.660504 |
| Churubusco | 197 13 02.6 | 17 14 52.7 | 4.062777 |

HASELTINE.

In Clinton Co., N. Y., $3\frac{1}{2}$ miles southwest of Ellenburg Center, on land owned by heirs of Jon. W. Haseltine, one-half mile south of house of Adin Haseltine. Summit is rounded and clear of timber.

Permanent mark: Stone monument 4 feet long, 6 inches square at top; copper bolt in top stamped U. S. G. S., 432, N. Y.

[Latitude, $44^{\circ} 49' 38''$. 34. Longitude, $73^{\circ} 55' 56''$. 95.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Upton | 237 35 34.6 | 57 52 30.7 | 4.572074 |
| Lyon | 338 09 06.9 | 158 12 01.6 | 4.166817 |
| Moore | 200 27 59.8 | 20 31 03.6 | 4.212828 |
| Churubusco | 180 10 11.9 | 0 10 13.2 | 4.149718 |
| West Hill | 132 18 22.4 | 312 16 33.6 | 3.660504 |
| Covey | 208 04 53.1 | 28 10 50.9 | 4.372419 |

DANNEMORA.

Triangulation point of the U. S. C. & G. S. Station on eastern summit of Dannemora Mountain, Clinton Co., N. Y., $1\frac{1}{2}$ miles north-east of village of Dannemora. The broad summit was cleared of timber except to the northwest. Theodolite was elevated on tripod 22 feet high.

Permanent mark: An iron bolt in solid rock 1 foot below surface of ground.

[Latitude, $44^{\circ} 44' 30''$. 04. Longitude, $73^{\circ} 42' 57''$. 60.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Moore | 155 22 49.9 | 335 16 43.9 | 4.436154 |
| Covey | 168 51 38.1 | 348 48 25.8 | 4.489897 |
| Upton | 206 07 47.9 | 26 15 33.6 | 4.516202 |
| Lyon | 70 39 32.1 | 250 33 18.3 | 4.093158 |

UPTON.

Two miles west northwest of Perry Mills, Clinton Co., N. Y., one-half mile north of schoolhouse, where north and south road crosses international boundary line between New York and Canada.

Permanent mark: Iron boundary post projecting $3\frac{1}{2}$ feet above ground.

[Latitude, $45^{\circ} 00' 24''$. 10. Longitude, $73^{\circ} 31' 57''$. 65.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lyon | 38 02 33.5 | 217 48 33.4 | 4.628909 |
| Covey | 92 30 06.6 | 272 19 06.8 | 4.310466 |
| Haseltine..... | 57 52 30.7 | 237 35 34.6 | 4.572074 |
| Dannemora..... | 26 15 33.6 | 206 07 47.9 | 4.516202 |

COVEY.

Not occupied. One mile north of international boundary line between New York and Canada, 2 miles west of Covey Hill. Station on south-east end of ridge, 200 feet lower than summit, 300 yards south of main east and west road, in field 500 feet southeast of house of John Wad-dell.

Permanent mark: A pole in center of a pile of rocks 5 feet high and 30 feet in diameter.

[Latitude, $45^{\circ} 00' 51''$. 89. Longitude, $73^{\circ} 47' 30''$. 18.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lyon | 9 23 27.7 | 189 20 25.2 | 4.542663 |
| Haseltine..... | 28 10 50.9 | 208 04 53.1 | 4.372419 |
| Upton | 272 19 06.8 | 92 30 06.6 | 4.310466 |
| Dannemora..... | 348 48 25.8 | 168 51 38.1 | 4.489897 |

LYON.

Triangulation station, Mount Lyon (2), of the U. S. C. & G. S. Station on northeast rocky bluff of summit. The broad wooded summit cuts off the view to the southwest. The top was reached by trail from Lyon Mountain station, Clinton Co., N. Y., a distance of $3\frac{1}{2}$ or 4 miles.

Permanent mark: A copper bolt in solid rock, marked V. C., Adirondack Survey, 1876.

[Latitude, $44^{\circ} 42' 16''$. 74. Longitude, $73^{\circ} 51' 43''$. 74.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Haseltine..... | 158 12 01.6 | 338 09 06.9 | 4.166817 |
| Churubusco | 168 59 25.9 | 348 56 32.3 | 4.451317 |
| Moore | 180 31 50.5 | 0 31 59.1 | 4.461256 |
| Dannemora..... | 250 33 18.3 | 70 39 32.1 | 4.093158 |
| Upton | 217 48 33.4 | 38 02 33.5 | 4.628909 |
| Covey..... | 189 20 25.2 | 9 23 27.7 | 4.542663 |

BIRCH.

In northwest corner of town of Hebron, Washington Co., N. Y., 8 miles southwest of Granville, 1 mile northwest of North Hebron. Station on land owned by John Brown, living on west side of hill. Summit flat, but cleared of timber.

[Latitude, $43^{\circ} 20' 18''$.49. Longitude, $73^{\circ} 20' 11''$.01.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rupert | 287 06 54.5 | 107 12 31.1 | 4.063265 |
| Rascal | 32 37 24.3 | 212 34 36.5 | 4.010145 |

RASCAL.

In western part of town of Hebron, Washington Co., N. Y., very close to Argyle line, a cleared summit of ridge, giving a good view in all directions except northwest. Land owned by James A. McNeil, who lives on west side. Station 10 miles from Salem, 4 miles northwest of West Hebron.

[Latitude, $43^{\circ} 15' 39''$.49. Longitude, $73^{\circ} 24' 15''$.68.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rupert | 252 28 52.8 | 72 37 16.9 | 4.239952 |
| Jackson | 358 56 28.7 | 178 56 40.0 | 4.307820 |
| Birch | 212 34 36.5 | 32 37 24.3 | 4.010145 |

GREENWICH.

Triangulation station of the U. S. C. & G. S. Station $4\frac{1}{2}$ miles north of village of Greenwich, Washington Co., N. Y. Local name is Bald Mountain. Owner is Dennis Sullivan, who lives north of triangulation point. Summit wooded on east and west sides. A comparatively low hill and not a good station.

Permanent mark: Iron bolt in solid rock.

[Latitude, $43^{\circ} 07' 35''$.12. Longitude, $73^{\circ} 31' 30''$.61.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Adams | 315 06 51.1 | 135 14 05.0 | 4.303497 |
| Tilton | | | 4.108687 |
| Jackson | 297 40 19.6 | 117 45 28.1 | 4.061951 |
| Rafinesque | 11 15 46.8 | 191 12 03.2 | 4.581978 |
| Rupert | 232 32 11.5 | 52 45 32.8 | 4.521466 |

JACKSON.

In central part of town of Jackson, Washington Co., N. Y., 4 miles northwest of Cambridge, from which place it is best reached, 7 miles east of the village of Greenwich. Station on highest cleared summit of ridge, on land owned by Robert Allen, who lives one-fourth of a mile southeast.

[Latitude, 43° 04' 41''-28. Longitude, 73° 23' 59''-08.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Tilton | 40 32 45.9 | 220 29 54.4 | 3.942186 |
| Greenwich | 117 45 28.1 | 297 40 19.6 | 4.061951 |
| Rascal | 178 56 40.0 | 358 56 28.7 | 4.307820 |
| Rupert | 212 22 47.2 | 32 30 59.1 | 4.480633 |

TILTON.

Seven miles south of Greenwich, Washington Co., N. Y., 1 mile east of Summit railroad station. Mr. Thomas, owner, lives on north side. Leonard Tingue lives on south side. Top is entirely cleared of timber.

[Latitude, 43° 01' 05''-64. Longitude, 73° 28' 10''-40.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Adams | 283 03 51.0 | 103 08 41.8 | 3.996239 |
| Rafinesque | 25 16 47.3 | 205 10 47.6 | 4.449087 |
| Greenwich | | | 4.108687 |
| Jackson | 220 29 54.4 | 40 32 45.9 | 3.942186 |

RUPERT.

A bald summit, 4 miles north of Rupert village, Rutland Co., Vt., and $3\frac{1}{2}$ miles south of Pawlet; 10 miles southeast of Granville, via Pawlet; road from Pawlet to Rupert passes just east of station. Land owned by James Jennings, who lives one-third of a mile south of station.

Signal: A small tree with tuft of brush at top and white flag below.

[Latitude, 43° 18' 28''-33. Longitude, 73° 12' 00''-46.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Jackson | 32 30 59.1 | 212 22 47.2 | 4.480633 |
| Greenwich | 52 45 32.8 | 232 32 11.5 | 4.521466 |

ADAMS.

In town of White Creek, Washington Co., N. Y.; local name, Mount Tom. James Adams, owner. Sullivan Center lies one-half mile north-

east of station, which is in a cleared field on highest part of summit. Some timber on south end of hill. Best reached from Cambridge.

[Latitude, $42^{\circ} 59' 52'' \cdot 82$. Longitude, $73^{\circ} 21' 04'' \cdot 00$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rafinesque | 43 08 13·3 | 222 57 23·4 | 4·501584 |
| Becker | 90 45 39·5 | 270 38 25·4 | 4·158979 |
| Greenwich | 135 14 05·0 | 315 06 51·1 | 4·303497 |
| Tilton | 103 08 41·8 | 283 03 51·0 | 3·996239 |

BECKER.

In town of Easton, Washington Co., N. Y., 8 miles south of Greenwich, 3 miles west of Summit station. Owner, James E. Becker, living on west side; summit cleared of timber, except a fringe on southern edge.

[Latitude, $42^{\circ} 59' 58'' \cdot 51$. Longitude, $73^{\circ} 31' 40'' \cdot 60$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Adams | 270 38 25·4 | 90 45 39·5 | 4·158979 |
| Rafinesque | | | 4·382452 |

RAFINESQUE.

Triangulation station, Mount Rafinesque, of the U. S. C. & G. S., 4 miles northeast of Lansingburg, Rensselaer Co., N. Y.; local name, Bald Mountain. Summit bald. Jacob Hayner lives on south side.

Permanent mark: Hole drilled in rock.

[Latitude, $42^{\circ} 47' 21'' \cdot 15$. Longitude, $73^{\circ} 36' 58'' \cdot 81$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Greenwich | 191 12 03·2 | 11 15 46·8 | 4·581978 |
| Tilton | 205 10 47·6 | 25 16 47·3 | 4·449087 |
| Adams | 222 57 23·4 | 43 08 13·3 | 4·501584 |
| Becker | | | 4·388452 |

MOUNT MERINO.

Primary triangulation station of the New York State survey and also of the U. S. C. & G. S. Situated in Greenport town, Columbia Co., N. Y., on a high hill 2 miles southwest of Hudson.

Permanent mark: Stone monument.

[Latitude, $42^{\circ} 14' 05'' \cdot 06$. Longitude, $73^{\circ} 49' 03'' \cdot 54$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Powell | 167 25 35·3 | 347 23 42·8 | 4·244611 |
| Windham | 108 26 58·6 | 288 13 49·8 | 4·451936 |

SLIDE.

Not occupied. On the highest peak in the Catskill Mountains in Shandaken town, Ulster Co., N. Y., 8 miles south of Shandaken post-office. Point sighted is an observatory.

[Latitude, $41^{\circ} 59' 56''$.97. Longitude, $74^{\circ} 23' 10''$.94.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Vly..... | 170 34 05.6 | 350 31 52.4 | 4.443943 |
| Windham | 209 42 44.8 | 29 52 31.9 | 4.606561 |

VLY.

A high, flat, heavily-wooded summit, 5 miles west of Lexington, Greene Co., N. Y. Instrument mounted on a large birch tree on south-east side of summit, about 50 feet lower than the highest part of summit. From here can be had a good view in all directions, excepting westward.

Permanent mark: Large birch tree.

[Latitude, $42^{\circ} 14' 45''$.50. Longitude, $74^{\circ} 26' 29''$.60.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pisgah | 227 50 09.8 | 47 58 05.3 | 4.338470 |
| Windham | 252 35 58.1 | 72 48 00.2 | 4.410953 |
| Hunter | | | 4.279210 |
| Slide | 350 31 52.4 | 170 34 05.6 | 4.443943 |
| Utsayantho..... | 144 18 50.3 | 324 12 50.5 | 4.321234 |

HUNTER.

A high, flat, wooded summit, 4 miles by trail south of Hunter, Greene Co., N. Y. An old observatory, 55 feet high, was strengthened and used to mount theodolite on.

[Latitude, $42^{\circ} 10' 39''$.50. Longitude, $74^{\circ} 13' 49''$.31.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Vly..... | | | 4.279210 |
| Pisgah..... | 176 49 01.9 | 356 48 25.5 | 4.347139 |
| Windham | 205 10 28.1 | 25 13 58.6 | 4.226756 |

UTSAYANTHO.

Not occupied. Situated in town of Stamford, Delaware Co., N. Y.

Point sighted is the new observatory and probably is some distance from the New York Survey station.

[Latitude, $42^{\circ} 23' 56''$.72. Longitude, $74^{\circ} 35' 24''$.02.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pisgah | 274 42 04.4 | 94 56 00.8 | 4.454553 |
| Vly | 324 12 50.5 | 144 18 50.3 | 4.321234 |

WINDHAM.

Station 7 miles east of Windham Center, Greene Co., N. Y. Best reached by trail, 2 miles long, from house of M. E. Sherman, who lives on west side. An old observatory, 22 feet high, was used to elevate instrument, as the summit of the mountain is flat and heavily wooded.

Permanent mark: Hole drilled in rock with arrowheads cut in rock pointing to center.

[Latitude, $42^{\circ} 18' 53''$.78. Longitude, $74^{\circ} 08' 36''$.22.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hunter | 25 13 58.6 | 205 10 28.1 | 4.226756 |
| Pisgah | 129 39 04.2 | 309 34 56.9 | 4.037701 |
| Rundell | 206 04 13.1 | 26 07 56.1 | 4.236302 |
| Vly | 72 48 00.2 | 252 35 58.1 | 4.410953 |
| Powell | 250 13 26.5 | 70 24 43.9 | 4.388157 |
| Slide | 29 52 31.9 | 209 42 44.8 | 4.606561 |

PISGAH.

Seven miles by wagon road north of Windham Center, Greene Co., N. Y., and 7 miles west-southwest of Durham. Summit entirely bare of timber. Instrument set up in front of hotel and angles reduced to center of cupola.

[Latitude, $42^{\circ} 22' 39''$.18. Longitude, $74^{\circ} 14' 43''$.27.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Powell | 267 32 25.1 | 87 47 50.3 | 4.497277 |
| Mount Merino | | | 4.587360 |
| Windham | 309 34 56.9 | 129 39 04.2 | 4.037701 |
| Rundell | | | 4.257658 |
| Hunter | 356 48 25.5 | 176 49 01.9 | 4.347139 |
| Vly | 47 58 05.3 | 227 50 09.8 | 4.338470 |
| Utsayantho | 94 56 00.8 | 274 42 04.4 | 4.454553 |

RUNDELL.

One and a half miles northwest from Westerlo, Albany Co., N. Y. H. H. Rundell lives on southeast side. O. A. Mabey, owner of land, lives on west side.

[Latitude, $42^{\circ} 27' 15''$.-27. Longitude, $74^{\circ} 03' 04''$.-84.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Windham..... | 26 07 56.5 | 206 04 13.1 | 4.236302 |
| Pisgah..... | | | 4.257658 |
| Powell..... | 295 06 06.3 | 115 13 41.1 | 4.231191 |

POWELL.

Primary triangulation station of the U. S. C. & G. S., situated on a hill in New Baltimore town, Greene Co., N. Y., about 3 miles northwest of West Coxsackie. Point well known by residents near there.

Permanent mark: Iron cone 18 inches below surface. Pile of rocks above cone.

[Latitude, $42^{\circ} 23' 20''$.-60. Longitude, $73^{\circ} 51' 50''$.-69.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Windham..... | 70 24 43.9 | 250 13 26.5 | 4.388157 |
| Rundell..... | 115 13 41.1 | 295 06 06.3 | 4.231191 |
| Mount Merino.... | 347 23 42.8 | 167 25 35.3 | 4.244611 |

SKY TOP TOWER.

Not occupied. The tower standing on most elevated ground near Lake Mohawk, Ulster Co., N. Y., about 15 miles south-southwest of Kingston.

Permanent mark: Center of tower.

[Latitude, $41^{\circ} 45' 49''$.-76. Longitude, $74^{\circ} 09' 23''$.-64.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pink..... | 210 55 12.2 | 30 59 36.8 | 4.259418 |
| Kingston City Hall... | 216 10 16.1 | 36 16 40.1 | 4.351719 |
| Boice..... | 235 43 38.3 | 55 56 53.8 | 4.521707 |
| Lloyd..... | 253 57 07.3 | 74 07 53.3 | 4.366992 |

KINGSTON CITY HALL.

City Hall, between Kingston and Rondout, Ulster Co., N. Y. Instrument mounted on tripod, 7 feet high, inside of top of tower.

Permanent mark: Center of tower.

[Latitude, $41^{\circ} 55' 37''\cdot 46$. Longitude, $73^{\circ} 59' 47''\cdot 90$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Boice | 267 47 03·4 | 87 53 55·4 | 4·152789 |
| Lloyd | 322 13 30·2 | 142 17 53·0 | 4·171246 |
| Sky Top Tower | 36 16 40·1 | 216 10 16·1 | 4·351719 |
| Pink | 55 12 23·8 | 235 10 24·2 | 3·701074 |

TRAVER.

Triangulation station of the U. S. C. & G. S., on land owned by Mr. Traver, $2\frac{1}{2}$ miles southeast of Rhinebeck village, Dutchess Co., N. Y. Highest hill in the vicinity.

Permanent mark: Iron cone 2 feet below surface.

[Latitude, $41^{\circ} 55' 05''\cdot 04$. Longitude, $73^{\circ} 52' 41''\cdot 44$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Burhans | 147 55 31·8 | 327 52 29·6 | 4·072213 |
| Upper Red Hook | 193 22 23·8 | 13 23 44·7 | 4·080424 |

TERRY.

A triangulation station of the U. S. C. & G. S., in northeast part of city of Kingston, Ulster Co., N. Y., one-fourth of a mile west of river and 309 feet above it, 100 yards from edge of bluff.

Permanent mark: Stone monument 1 foot square projecting 2 feet above ground.

[Latitude, $41^{\circ} 56' 22''\cdot 29$. Longitude, $73^{\circ} 58' 19''\cdot 53$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lloyd | 331 44 29·4 | 151 47 53·7 | 4·172793 |
| Prospect | 354 36 18·5 | 174 36 38·3 | 3·861053 |
| Boice | 273 56 11·9 | 94 02 04·9 | 4·086314 |

PROSPECT.

Triangulation station of the U. S. C. & G. S., in Ulster Co., N. Y., on a rounded hill, wooded on west side, and cleared on east side, situated 3 miles south of Rondout and east of the northern Esopus ponds. Amaziah Niese, owner of land.

Permanent mark: Iron cone with rock piled around it.

[Latitude, $41^{\circ} 52' 27''\cdot 96$. Longitude, $73^{\circ} 57' 49''\cdot 92$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Terry | 174 36 38·3 | 354 36 18·5 | 3·861053 |
| Lloyd | 312 44 37·6 | 132 47 41·6 | 3·937784 |
| Boice | 240 54 40·1 | 61 00 13·0 | 4·118791 |
| Barnes | 309 37 05·2 | 129 41 38·0 | 4·088583 |

BOICE.

In Dutchess Co., N. Y., in southwest corner of town of Milan. Station on high, bare hill, one-half mile north of Enterprise, almost on Rhinebeck town line; 6 miles by road east of Rhinebeck village.

Permanent mark of U. S. C. & G. S. could not be found.

Reference mark: Blazed chestnut tree south $1^{\circ} 15'$ west (true) 109.3 feet.

[Latitude of new station, $41^{\circ} 55' 54''$.81. Longitude, $73^{\circ} 49' 31''$.30.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Prospect..... | 61 | 00 | 13.0 | 240 | 54 | 40.1 | 4.118791 |
| Terry..... | 94 | 02 | 04.9 | 273 | 56 | 11.9 | 4.086314 |
| Lloyd..... | 22 | 45 | 13.4 | 202 | 42 | 44.6 | 4.123825 |
| Kingston City Hall... | 87 | 53 | 55.4 | 267 | 47 | 03.4 | 4.152789 |
| Hussey Hill..... | 69 | 59 | 36.5 | 249 | 52 | 49.4 | 4.17470 |
| Sky Top Tower..... | 55 | 56 | 53.8 | 235 | 43 | 38.3 | 4.521707 |
| Pink..... | 79 | 33 | 25.4 | 259 | 24 | 33.9 | 4.270619 |

LLOYD.

Triangulation station of the U. S. C. & G. S. in Dutchess Co., N. Y., in eastern part of town of Hyde Park, $3\frac{1}{2}$ miles northeast of village, and 8 miles southeast of Staatsburg.

Permanent mark: Iron cone just below surface.

[Latitude, $41^{\circ} 49' 17''$.24. Longitude, $73^{\circ} 53' 14''$.19.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Prospect..... | 132 | 47 | 41.6 | 312 | 44 | 37.6 | 3.937784 |
| Boice..... | 202 | 42 | 44.6 | 22 | 45 | 13.4 | 4.123825 |
| Terry..... | 151 | 47 | 53.7 | 331 | 44 | 29.4 | 4.172733 |
| Kingston City Hall... | 142 | 17 | 53.0 | 322 | 13 | 30.2 | 4.171246 |
| Hussey Hill..... | 128 | 42 | 24.5 | 308 | 38 | 06.6 | 4.05768 |
| Sky Top Tower..... | 74 | 07 | 53.3 | 253 | 57 | 07.3 | 4.366992 |

PINK.

In town of Hurley, Greene Co., N. Y., one-eighth of a mile southwest of corner of Ulster and Rosendale. Three miles southwest of Kingston, on highest land in vicinity. Summit nearly cleared of timber. J. M. Pink, owner of land.

Permanent mark: Stone monument; copper bolt stamped U. S. G. S., 463, N. Y.

Distance to large chestnut tree southwest, 29 feet; distance to property line southward, 17.7 feet.

[Latitude, $41^{\circ} 54' 64''$.50. Longitude, $74^{\circ} 02' 46''$.89.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Kingston City Hall... | 235 | 10 | 24.2 | 55 | 12 | 23.8 | 3.701074 |
| Boice..... | 259 | 24 | 33.9 | 79 | 33 | 25.4 | 4.270619 |
| Hussey Hill..... | 291 | 52 | 47.9 | 111 | 54 | 52.3 | 3.66530 |
| Sky Top Tower..... | 30 | 59 | 36.8 | 210 | 55 | 12.2 | 4.250418 |

HUSSEY HILL.

Not occupied. In Ulster Co., N. Y., about 2 miles south of Rondout. A high, wooded ridge, with some timber cut down on summit.

Permanent mark: A lone tree in gap in timber.

[Latitude, $41^{\circ} 53' 08''$.54. Longitude, $73^{\circ} 59' 40''$.69.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pink | 111 54 52.5 | 291 52 47.9 | 3.66530 |
| Boice | 249 52 49.4 | 69 59 36.5 | 4.17470 |
| Lloyd | 308 38 06.6 | 128 42 24.5 | 4.05768 |

WOMELSDORF.

Triangulation station of the U. S. C. & G. S. in Lebanon Co., Pa., $4\frac{1}{2}$ miles southwest of Womelsdorf, a station on the Phil. and Reading R. R., Pa. Summit of mountain was covered with a growth of saplings 15 to 20 feet high, some of which were cut down, giving view east and south.

Permanent mark: Bolt in rock.

[Latitude, $40^{\circ} 19' 28''$.25. Longitude, $76^{\circ} 11' 44''$.69.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wernersville East Tower | 282 42 59.5 | 102 47 42.5 | 4.024894 |
| Wernersville West Tower | 286 46 46.5 | 106 50 34.8 | 3.939816 |
| Black Spot Tower | 264 06 01.5 | 84 17 24.4 | 4.398460 |
| Port Clinton | 209 08 23.76 | 29 16 21.97 | 4.5511773 |

KREUTZER.

A hill 3 miles west-northwest of Allentown, Lehigh Co., Pa. John Kreutzer, owner, lives on north side one-eighth of a mile from station. Summit cleared, except on west end.

Permanent mark: Three blazes near foot of large chestnut tree.

[Latitude, $40^{\circ} 37' 15''$.58. Longitude, $75^{\circ} 31' 42''$.05.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Big Rock | 309 05 05.7 | 129 08 37.6 | 3.994259 |
| Topton | 39 22 00.6 | 219 15 59.0 | 4.315038 |

BAKE OVEN.

Triangulation station of the U. S. C. & G. S. in the northern part of Heidelberg Township, Lehigh Co., Pa., on a very prominent peak known as Bake Oven. It is 7 miles west-northwest from Slatington, on

the Lehigh Valley Railroad, and about 4 miles north from Germansville, on the Schuylkill and Lehigh branch of the Reading Railroad. Station is about 6 feet from the edge of the precipice near the highest point of the peak.

Permanent mark: A foxtail bolt driven into the rock in a trench 2 feet below surface. The letters U. S. C. S., 1875, are cut on the rock to south of station, and also an arrow pointing to center.

[Latitude, $40^{\circ} 44' 54''$. Longitude, $75^{\circ} 44' 02''$.22.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Port Clinton..... | 53 42 39.16 | 233 32 35.87 | 4.3513333 |
| Topton | 351 48 49.1 | 171 50 48.9 | 4.483350 |
| Bears Head..... | 111 19 09.8 | 291 05 36.1 | 4.495771 |

TOPTON.

Triangulation station of the U. S. C. & G. S. Station is about 3 miles south of Topton Railroad Station, Berks Co., Pa.; identified by iron bolt in huge boulder. Nearly all the timber is now cut down (August, 1892).

[Latitude, $40^{\circ} 28' 37''$.49. Longitude, $75^{\circ} 40' 58''$.25.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bake Oven..... | 171 50 48.9 | 351 48 49.1 | 4.483350 |
| Long | 6 39 49.2 | 186 39 06.7 | 4.124723 |
| Fancy Hill..... | 8 57 50.3 | 188 56 36.5 | 4.236914 |
| Big Rock | 244 45 03.9 | 64 54 36.8 | 4.360514 |
| Kreutzer | 219 15 59.0 | 39 22 00.6 | 4.315038 |

BIG ROCK.

Triangulation station of the U. S. C. & G. S. Three and one-half miles south of Allentown, Lehigh Co., Pa. This station was identified by a bolt in solid rock. Summit is now cleared of timber.

[Latitude, $40^{\circ} 33' 53''$.73. Longitude, $75^{\circ} 26' 16''$.42.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Topton | 64 54 36.8 | 244 45 03.9 | 4.360514 |
| Kreutzer | 129 08 37.6 | 309 05 05.7 | 3.994259 |

BLACK SPOT TOWER.

At Reading, Berks Co., Pa. Summit of mountain leveled off and lowered about 10 feet and all marks of U. S. C. & G. S. destroyed. A stone hotel, tower, and other buildings have been erected on summit. Instrument was mounted on roof of stone tower 50 feet above ground.

Permanent mark: Center of tower.

[Latitude, $40^{\circ} 20' 50'' \cdot 32$. Longitude, $75^{\circ} 54' 09'' \cdot 73$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Womelsdorf | 84 17 24.4 | 264 06 01.5 | 4.398460 |
| Long | 266 01 09.8 | 86 08 59.8 | 4.234802 |
| Fancy Hill | 279 17 43.5 | 99 25 02.1 | 4.209785 |

FANCY HILL.

In southern central part of Earl Township, Berks Co., Pa., 15 miles by road east of Reading. A good view to be had in all directions except east.

Permanent mark: A tall, lone tree on western edge of woods.

[Latitude, $40^{\circ} 19' 24'' \cdot 89$. Longitude, $75^{\circ} 42' 52'' \cdot 13$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Black Spot Tower | 99 25 02.1 | 279 17 43.5 | 4.209785 |
| Topton | 188 56 36.5 | 8 57 50.3 | 4.236914 |

LONG.

A flat ridge in northeast portion of Earl Township, one-fourth of a mile south of Shanesville, Berks Co., Pa. John Kuser lives on south-east side.

Permanent mark: A pile of rocks S. 40° E. (Mag.) 70 feet distant from a large hickory tree.

[Latitude, $40^{\circ} 21' 28'' \cdot 35$. Longitude, $75^{\circ} 42' 03'' \cdot 79$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Black Spot Tower | 86 08 59.8 | 266 01 09.8 | 4.234802 |
| Topton | 186 39 06.7 | 6 39 49.2 | 4.124723 |

MONTOUR.

Triangulation station of the U. S. C. & G. S. Station is on Montour ridge, Northumberland Co., Pa., $3\frac{1}{2}$ miles north of the town of Northumberland.

Permanent mark: A stone monument.

[Latitude, $40^{\circ} 56' 29'' \cdot 82$. Longitude, $76^{\circ} 49' 00'' \cdot 42$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Catawissa | 270 23 03 | 90 38 25 | 4.517488 |
| Barry | 304 32 18 | 124 47 32 | 4.600208 |

WOODRUFF.

On a cleared ridge owned and cultivated by Mr. Woodruff, 2 miles northwest of Elysburg, Northumberland Co., Pa., and 3 miles north of Reeds Station (Reading Railroad). Mr. Woodruff lives on north side of ridge and from his house a wagon can be taken to station.

Permanent mark: A sharp-pointed rock buried in ground, top just above surface.

[Latitude, 40° 52' 45''-62. Longitude, 76° 34' 33''-03.]

| To station | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Catawissa | 242 17 45 | 62 23 39 | 4·154306 |
| Mahanoy (1)..... | 42 59 36 | 222 54 00 | 4·247612 |
| Mahanoy (3)..... | 4 59 42 | 184 59 09 | 4·139748 |

WHITE HORSE.

Triangulation station of the U. S. C. & G. S. is on the Blue ridge, near the boundary line between Bethel Township, Berks Co., and Washington Township, Schuylkill Co., Pa.; station about 4½ miles south of Rock, a station on the Schuylkill and Susquehanna branch of the Reading railroad.

Permanent mark: A two-quart earthen jar buried base upward 2 feet below surface; 2 inches above jar is a flat stone, 15 by 18 inches, with a hole drilled in upper surface exactly over center of jar; above stone is a monument 2 feet long, which projects 8 inches above ground.

[Latitude, 40° 30' 55''-19. Longitude, 76° 17' 33''-95.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Port Clinton | 248 47 23·41 | 68 59 09·65 | 4·4376100 |
| Governor Dick..... | 24 55 46·04 | 204 49 25·64 | 4·5175295 |
| Barry..... | 155 06 50·0 | 335 01 32·00 | 4·4348730 |

KNOB (2).

Not occupied. A well defined summit in the northeastern corner of Center Township, Columbia Co., Pa. Samuel H. Sitler lives on south side three-fourths of a mile from top.

Permanent mark: A very tall pine trimmed up.

[Latitude, 41° 05' 44''-16. Longitude, 76° 20' 46''-41.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bald | 233 16 20·0 | 53 39 52 | 4·792642 |
| Penobscot | 256 11 39·0 | 76 30 20 | 4·611840 |

WYOMING.

Not occupied. A partly cleared summit 2 miles north of Wyoming, Luzerne Co., Pa., in southwest part of Exeter Township. Land owned by Hannah Whip. John S. Allen lives near triangulation station, 2 miles north of Wyoming and one-half mile southeast of camp ground.

Permanent mark: A pile of rocks.

[Latitude, $41^{\circ} 20' 54''$. 16. Longitude, $75^{\circ} 50' 39''$. 69.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bald | 221 15 31 | 41 19 12 | 4.071414 |
| Penobscot | 7 21 54 | 187 20 47 | 4.268823 |

PORT CLINTON.

Triangulation station of the U. S. C. & G. S. Is on the second of the Blue Ridge Mountains, 5 miles northeast of Port Clinton, Schuylkill Co., Pa., a station on the Philadelphia and Reading Railroad.

Permanent mark: A square-headed bolt wedged between the rocks about 1 foot below the surface. Twelve feet north of station is a precipice; west of station about 200 feet are hemlock trees. Four holes are drilled in neighboring rocks, so that lines joining opposite holes intersect over station.

[Latitude, $40^{\circ} 36' 15''$. 05. Longitude, $75^{\circ} 59' 27''$. 82.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Black Spot (C. S. Sta.) .. | 345 14 45.21 | 165 18 11.61 | 4.4693132 |
| Womelsdorf | 29 16 21.97 | 209 08 23.76 | 4.5511773 |
| Bake Oven | 233 32 35.87 | 53 42 39.16 | 4.3313333 |
| White Horse | 68 59 09.65 | 248 47 23.41 | 4.4376100 |
| Barry | 111 58 44.00 | 291 41 38.00 | 4.600257 |
| Frackville | | | 4.463389 |
| Bears Head | 164 40 37.60 | 344 37 08.90 | 4.452562 |

NESCOPECK (2).

On Nescopeck Mountain, Luzerne Co., Pa., 1 mile east of gap where Berwick and Hazleton pike crosses and $7\frac{1}{2}$ miles east of Berwick; summit long and narrow and timbered with oak and hickory.

Permanent mark: Three blazes on trunk of lone hickory tree near ground.

[Latitude, $41^{\circ} 02' 13''$. 91. Longitude, $76^{\circ} 05' 03''$. 40.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shickshinny | 158 16 57 | 338 14 16 | 4.189199 |
| Penobscot | 227 40 47 | 47 49 08 | 4.380321 |

BROAD.

Not occupied. Station is situated on the highest point of Broad Mountain, Jackson town, Dauphin Co., Pa., about 5 miles southwest of Elizabethville. Station is marked by a pine tree.

[Latitude, $40^{\circ} 30' 39'' \cdot 46$. Longitude, $76^{\circ} 46' 13'' \cdot 36$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Little Mahanoy .. | 168 31 17 | 348 28 52 | 4·420220 |
| Big Lick..... | 234 04 32 | 54 10 30 | 4·203452 |

DAUPHIN.

Triangulation station of the U. S. C. & G. S. on the second Blue Mountain, 2 miles east of the village of Dauphin, Dauphin Co., Pa.

Permanent mark: A bottle 3 feet below surface, a stone over this, and monument on the stone. Four holes are drilled in neighboring rocks, so that lines joining opposite ones intersect over station. Bearings and distance from holes to station are north $43\frac{1}{2}^{\circ}$ east 3·89 feet; north $69\frac{1}{2}^{\circ}$ west 6·46 feet; south $43\frac{1}{2}^{\circ}$ west 10·4 feet; south $69\frac{1}{2}^{\circ}$ east 6·03 feet.

[Latitude, $40^{\circ} 21' 59'' \cdot 05$. Longitude, $76^{\circ} 54' 32'' \cdot 71$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Governor Dick.... | 288 56 30·03 | 109 14 05·46 | 4·6103552 |
| Round Top | 2 51 18·42 | 182 50 38·75 | 4·4655097 |

BERRIES.

Station on Berries Mountain, about 2 miles southeast of Millersburg, Dauphin Co., Pa., one-third of a mile east of Lovers Rock. A wagon can be taken to triangulation station. Summit, long and narrow; three acres of timber cut down, giving a good view north and south, but not east or west.

Permanent mark: Blazes on three sides of lone tree.

[Latitude, $40^{\circ} 31' 37'' \cdot 24$. Longitude, $76^{\circ} 55' 54'' \cdot 36$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Little Mahanoy.... | 199 16 15 | 19 20 08 | 4·405435 |
| Big Lick..... | 254 00 02 | 74 12 17 | 4·442001 |

BIG LICK.

On Big Lick Mountain, just north of Williamstown colliery, Dauphin Co., Pa. The station is on a slight rise of the long, straight, and nearly level mountain top.

Permanent mark: Stump 5 feet high, 6 inches diameter, with rocks piled round it.

[Latitude, $40^{\circ} 35' 42''$.05. Longitude, $76^{\circ} 37' 03''$.20.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mahanoy (1) | 155 21 02 | 335 19 05 | 4.311132 |
| Barry | 225 16 56 | 45 24 20 | 4.351990 |
| Little Mahanoy .. | 132 11 30 | 312 03 06 | 4.388997 |
| Berries | 74 12 17 | 254 00 02 | 4.442001 |

MAHANAY (3).

Not occupied. A knob of the Mahanoy Mountain 3 miles, S. 44° W. (mag.) from Shamokin, Northumberland Co., Pa., and in plain view from the city. About an acre of timber cut down.

Permanent mark: Tree blazed near foot.

[Latitude, $40^{\circ} 45' 20''$.08. Longitude, $76^{\circ} 35' 24''$.24.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Woodruff | 184 59 09 | 4 59 42 | 4.159748 |
| Catawissa | 214 09 39 | 34 16 06 | 4.391414 |

KOCHER.

A high summit of the Alleghany or North Mountain, 3 miles (air line) west of Harvey Lake, in northern central part of Lake Township, Luzerne Co., Pa. Land owned by J. W. Kocher, who lives near Harvey Lake, on west side. Station reached by following a log road from Sylvester Kocher's to edge of summit; thence through woods to station. Timber cut from 2 or 3 acres.

Permanent mark: Rocks piled at foot of tripod near root of tree.

[Latitude, $41^{\circ} 21' 28''$.05. Longitude, $76^{\circ} 07' 04''$.75.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ricketts | 71 16 43 | 251 09 07 | 4.229097 |
| Miller | 223 26 10 | 43 32 44 | 4.303396 |
| Penobscot | 313 21 50 | 133 31 32 | 4.451850 |

LITTLE MAHANOEY.

Station on high peak at extreme western end of Mahanoy Mountain 3 miles (air line) north of Herndon, Northumberland Co., Pa. Timber cut down, giving a fine view in all directions except eastward. Sides are steep and rocky, making ascent difficult.

Permanent mark: Tree blazed; also a pile of rocks 23 feet east of tree.

[Latitude, 40° 44' 35''-47. Longitude, 76° 49' 56''-57.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mahanoy (1)..... | 257 12 18 | 77 16 45 | 3.993262 |
| Big Lick..... | 312 03 06 | 132 11 30 | 4.388997 |
| Berries..... | 19 20 08 | 199 16 15 | 4.405435 |

MAHANOEY (2).

On the Mahanoy range, 4 miles southeast of Trevorton, Northumberland Co., Pa., and 5 miles southwest of Shamokin, in Coal Township. Station on west end of a long, sharp, and nearly level summit heavily timbered. Charles Kramer lives on southeast side of mountain, one-half mile from triangulation station.

Permanent mark: Blazes on foot of tree.

[Latitude, 40° 45' 28''-87. Longitude, 76° 37' 07''-88.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mahanoy (1)..... | 93 36 31 | 273 32 36 | 3.926584 |
| Catawissa..... | 218 56 35 | 39 04 09 | 4.412599 |

MAHANOEY (1).

A prominent knob on the Mahanoy Mountain, 3 miles west southwest of Trevorton, Northumberland Co., Pa. The station can be reached by driving west from Trevorton 2 miles, then turning south up an old wood road, and then walking up the steep mountain side three-fourths of a mile. Summit nearly clear of timber.

Permanent mark: Blaze on foot of tree.

[Latitude, 40° 45' 45''-95. Longitude, 76° 43' 07''-20.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Catawissa..... | 231 30 32 | 51 42 01 | 4.498371 |
| Barry..... | 276 24 18 | 96 35 40 | 4.392270 |
| Mahanoy (2)..... | 273 32 36 | 93 36 31 | 3.926584 |
| Little Mahanoy..... | 77 16 45 | 257 12 18 | 3.993262 |
| Woodruff..... | 222 54 00 | 42 59 36 | 4.247612 |
| Big Lick..... | 335 10 05 | 155 21 02 | 4.311132 |

BARRY.

Triangulation station of the U. S. C. & G. S., on the highest part of the Mahantango Mountain, $6\frac{1}{2}$ miles southwest of Ashland, Schuylkill Co., Pa. Summit flat and partly timbered. Instrument elevated 10 feet.

Permanent mark: Hole drilled in rock 5 by 5 by 36 inches.

[Latitude, $40^{\circ} 44' 15'' \cdot 39$. Longitude, $76^{\circ} 25' 42'' \cdot 12$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Port Clinton..... | 291 | 41 | 38 | 111 | 58 | 44 | 4'600257 |
| White Horse..... | 335 | 01 | 32 | 155 | 06 | 50 | 4'434873 |
| Mahanoy (1)..... | 96 | 35 | 40 | 276 | 24 | 18 | 4'392270 |
| Catawissa..... | 180 | 32 | 26 | 0 | 32 | 32 | 4'349496 |
| Big Lick..... | 45 | 24 | 20 | 225 | 16 | 56 | 4'351990 |
| Montour..... | 124 | 47 | 32 | 304 | 32 | 18 | 4'600208 |
| Frackville..... | 256 | 11 | 37 | 76 | 18 | 18 | 4'171151 |

FRACKVILLE.

On the crest of the Broad Mountain $2\frac{1}{2}$ miles southwest of Frackville, Butler Township, Schuylkill Co., Pa. A wagon can be taken within one-fourth of a mile of triangulation point. Tripod, 12 feet high, erected on highest part and 52 feet southwest of partly dead pine tree; summit flat and covered with bushes about 10 feet high.

Permanent mark: Rocks piled up at foot of tree and tree blazed.

[Latitude, $40^{\circ} 46' 09'' \cdot 67$. Longitude, $76^{\circ} 15' 28'' \cdot 06$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Barry..... | 76 | 18 | 18 | 256 | 11 | 37 | 4'171151 |
| Bears Head..... | 239 | 00 | 13 | 59 | 07 | 12 | 4'243035 |
| Port Clinton..... | | | | | | | 4'463389 |
| Buck..... | 182 | 51 | 34 | 2 | 52 | 02 | 4'302861 |

BEARS HEAD.

Triangulation station of the U. S. C. & G. S. In Rush Township, Schuylkill Co., Pa., 1 mile from Delano on Lehigh Valley Railroad. Summit flat and covered with pine trees. Instrument elevated 35 feet.

Permanent mark: Monument, 5 by 14 inches on top, 3 feet long.

[Latitude, $40^{\circ} 51' 01'' \cdot 35$. Longitude, $76^{\circ} 04' 47'' \cdot 65$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Port Clinton..... | 344 | 37 | 08.9 | 164 | 40 | 37.6 | 4'452562 |
| Bake Oven..... | 291 | 05 | 36.1 | 111 | 19 | 09.8 | 4'495771 |
| Catawissa..... | 108 | 45 | 38.0 | 288 | 32 | 03.0 | 4'488122 |
| Buck..... | 128 | 23 | 43.0 | 308 | 17 | 12.0 | 4'251213 |
| Shickshinny..... | 170 | 09 | 41.0 | 350 | 06 | 50.0 | 4'551844 |
| Frackville..... | 59 | 07 | 12.0 | 239 | 00 | 13.0 | 4'243035 |

CATAWISSA.

Triangulation station of the U. S. C. & G. S. Two miles (air line) southeast of town of Catawissa, Columbia Co., Pa. Summit very broad and much timber still standing. Ascent difficult, as no road runs near triangulation point. Instrument elevated 15 feet.

Permanent mark: Hole drilled in rock.

[Latitude, $40^{\circ} 56' 20''$.28. Longitude, $76^{\circ} 25' 33''$.10.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Bears Head | 288 | 32 | 03 | 108 | 45 | 38 | 4.488122 |
| Barry | 0 | 32 | 32 | 180 | 32 | 26 | 4.349496 |
| Mahanoy (3) | 34 | 16 | 06 | 214 | 09 | 39 | 4.391414 |
| Mahanoy (2) | 39 | 04 | 09 | 218 | 56 | 35 | 4.412599 |
| Mahanoy (1) | 51 | 42 | 01 | 231 | 30 | 32 | 4.498371 |
| Woodruff | 62 | 23 | 39 | 242 | 17 | 45 | 4.154306 |
| North | 165 | 40 | 23 | 345 | 35 | 18 | 4.639609 |
| Montour | 90 | 38 | 25 | 270 | 23 | 03 | 4.517488 |

BUCK.

Not occupied. In eastern part of Beaver Township, 3 miles east of Beaver Valley, Columbia Co., Pa. Summit flat and round; the edges covered with a scattering growth of pines; a tripod 15 feet high erected near a leaning pine tree on highest part. Abel Smith and Isaac Klingerman (guides) live on northwest side $1\frac{1}{2}$ miles from triangulation point.

Permanent mark: Blaze on foot of tree.

[Latitude, $40^{\circ} 57' 00''$.00. Longitude, $76^{\circ} 14' 46''$.22.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Bears Head | 308 | 17 | 12 | 128 | 23 | 43 | 4.251213 |
| Frackville | 2 | 52 | 02 | 182 | 51 | 34 | 4.302861 |

NESCOPECK (3).

On the Nescopeck mountain, south of Mifflinville, Columbia Co., Pa., half a mile from field of Jonathan Spaid. From Bloomsburg take Berwick road for 6 miles, crossing river at Stonytown Ferry. Summit narrow and rocky; trees are cut down giving a fine view northward.

Permanent mark: Blazes on tree trunk.

[Latitude, $40^{\circ} 59' 08''$.98. Longitude, $76^{\circ} 18' 46''$.16.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Shickshinny | 213 | 50 | 27 | 33 | 56 | 46 | 4.383323 |
| Penobscot | 239 | 16 | 59 | 59 | 34 | 20 | 4.632961 |

NESCOPECK (1.)

Not occupied. On the Nescopeck Mountain, Luzerne Co., Pa., about 1 mile east of where Wilkesbarre and Hazleton turnpike crosses and near the corner of Dorrance, Butler, Dennison, and Wright townships.

Permanent mark : A tall pine near eastern end of summit.

[Latitude, $41^{\circ} 05' 04''$. 29. Longitude, $75^{\circ} 56' 27''$. 47.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shickshinny..... | 117 12 40 | 297 04 19 | 4.300080 |
| Penobscot..... | 207 44 15 | 27 46 57 | 4.089938 |

SHICKSHINNY.

One and a half miles from the town of Shickshinny, Luzerne Co., Pa., and on the range east of the gap known locally as "The Lookout."

Permanent mark : Hole drilled in rock.

[Latitude, $41^{\circ} 09' 59''$. 40. Longitude, $76^{\circ} 09' 08''$. 77.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Penobscot..... | 265 34 07 | 85 45 10 | 4.371794 |
| Bears Head..... | 350 06 50 | 170 09 41 | 4.551844 |
| Nescopeck (1)..... | 297 04 19 | 117 12 40 | 4.300080 |
| Nescopeck (3)..... | 33 56 46 | 213 50 27 | 4.383323 |
| Glen Summit..... | 274 23 47 | 94 36 03 | 4.417360 |

NORTH.

A summit of the North Mountain in western part of Davidson Township, Columbia Co., Pa.; local name, Round Top; 1 mile north of Billy Backbone Mountain. A tripod, with target, was erected by the U. S. & G. S. during 1886 and sighted from Catawissa. Summit about 50 yards across, east and west, and 200 yards long, north and south. It is covered with a scattering growth of bushes and trees from 10 to 20 feet high.

Mark: A + cut in rock.

[Latitude, $41^{\circ} 19' 09''$. 97. Longitude, $76^{\circ} 33' 17''$. 13.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ricketts..... | 273 16 15 | 93 25 58 | 4.313063 |
| Catawissa..... | 345 35 18 | 165 40 23 | 4.639609 |

RICKETTS.

Triangulation station of the U. S. C. & G. S. Is very near the south-east corner of Sullivan Co., Pa., on the North Mountain. The station is from one-half to three-fourths mile from the main road, on the high-

est ground within a distance of 2 or more miles. There is a hotel at foot of the mountain, distance by road 2 miles, and one at Ganoga Lake, distance $3\frac{1}{2}$ miles.

Permanent mark: A stone with hole drilled in it.

Reference mark: Azimuth C. & G. S station to tree 119° ; distance, 74.9 feet.

[Latitude, $41^{\circ} 18' 31''$. Longitude, $76^{\circ} 18' 34''$.67.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bald..... | 253 57 27 | 74 19 34 | 4.68625 |
| Penobscot..... | 290 47 00 | 111 04 17 | 4.59340 |
| Kocher..... | 251 09 07 | 71 16 43 | 4.229097 |
| North..... | 93 25 58 | 273 16 15 | 4.313063 |

GLEN SUMMIT.

Not occupied. Station on the high ridge $1\frac{1}{2}$ miles due east (mag.) of Glen Summit, Luzerne Co., Pa. A station on the Lehigh Valley Railroad. Summit rounded with a few scattering trees standing.

Permanent mark: Blazes on tree near foot.

[Latitude, $41^{\circ} 08' 53''$. Longitude, $75^{\circ} 50' 30''$.80.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shickshinny..... | 94 36 03 | 274 23 47 | 4.417360 |
| Penobscot..... | 145 54 08 | 325 52 55 | 3.664854 |

PENOBSCOT.

Triangulation station of the U. S. C. & G. S. It is on the Wilkesbarre Mountain, in Luzerne Co., Pa., about 3 miles south of Wilkesbarre and three-fourths of a mile from Fairview Station, on the Lehigh Valley Railroad, and same distance from Solomons Gap, on Lehigh and Susquehanna Railroad. Summit entirely bare.

Permanent mark: Hole drilled in rock.

[Latitude, $41^{\circ} 10' 57''$. Longitude, $75^{\circ} 52' 21''$.83.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pimple Hill..... | 299 08 05.0 | 119 22 35.1 | 4.548991 |
| Knob (C. & G. S.)..... | 353 26 55.3 | 173 28 37.9 | 4.506182 |
| Kocher..... | 133 31 32.0 | 313 21 50.0 | 4.451850 |
| Wyoming..... | 187 20 47.0 | 7 21 54.0 | 4.298823 |
| Nescopeck (1)..... | 27 46 57.0 | 207 44 15.0 | 4.089938 |
| Knob (2)..... | 76 30 20.0 | 256 11 39.0 | 4.611840 |
| Glen Summit..... | 325 52 55.0 | 145 54 08.0 | 3.664854 |
| Nescopeck (3)..... | 59 34 20.0 | 239 16 59.0 | 4.632961 |
| Ricketts..... | 111 04 17.0 | 280 47 00.0 | 4.59340 |
| Bald Mountain..... | 200 23 53.0 | 20 28 42.0 | 4.463994 |
| Nescopeck (2)..... | 47 49 08.0 | 227 40 47.0 | 4.380321 |
| Miller..... | 168 56 13.0 | 348 53 03.0 | 4.540332 |
| Shickshinny..... | 85 45 10.0 | 265 34 07.0 | 4.371794 |

MILLER.

Three miles (air line) south of Tunkhannock, Wyoming Co., Pa., and 8 miles by the road. Summit flat, with large trees on southeast side.

Permanent mark: Stone with cross cut in top.

[Latitude, $41^{\circ} 29' 20''$. 95. Longitude, $75^{\circ} 59' 08''$. 86.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Bald Mountain ... | 291 54 08 | 112 02 07 | 4.258096 |
| Penobscot | 348 53 03 | 168 56 13 | 4.540332 |
| Kocher | 43 32 44 | 223 26 10 | 4.303396 |

JERMYN.

Not occupied. A bald ridge in southwest corner of Carbondale Township and west of village of Jermyn, Lackawanna Co., Pa.

Permanent mark: A lone pine tree.

[Latitude, $41^{\circ} 32' 29''$. 01. Longitude, $75^{\circ} 34' 28''$. 58.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Bald Mountain ... | 49 37 20 | 229 30 19 | 4.287687 |
| Elk | 183 22 15 | 3 22 48 | 4.285792 |

SALEM.

Triangulation station of the U. S. C. & G. S. on the top of the mountain, $2\frac{1}{2}$ miles east of Carbondale. Summit entirely bare.

[Latitude, $41^{\circ} 33' 01''$. 48. Longitude, $75^{\circ} 27' 26''$. 00.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Bald Mountain ... | 61 09 36 | 240 57 54 | 4.448229 |
| Elk | 154 43 14 | 334 39 07 | 4.305702 |

BALD MOUNTAIN.

Triangulation station of the U. S. C. & G. S. on the summit of Bald Mountain.

Permanent mark: Cross marks cut in boulders.

[Latitude, $41^{\circ} 25' 41''$. 24. Longitude, $75^{\circ} 45' 04''$. 92.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Panther | 335 42 02 | 155 46 35 | 4.369701 |
| Penobscot | 20 28 42 | 200 23 53 | 4.463994 |
| Bald (3) | 230 13 54 | 50 26 48 | 4.54596 |
| Miller | 112 02 07 | 291 54 08 | 4.258096 |
| Elk | 206 26 04 | 26 33 39 | 4.551398 |
| Ricketts | 74 19 34 | 253 57 27 | 4.68625 |
| Salem | 240 57 54 | 61 09 36 | 4.448229 |
| Jermyn | 229 30 19 | 49 37 20 | 4.287687 |

BALD (3).

Not occupied. In Wayne Co., Pa. On a bald summit of the mountain, about 3 miles north of Fairview, a station on the gravity railroad, in the western central part of Clinton Township.

Permanent mark: A tall, dead tree.

[Latitude, $41^{\circ} 37' 48''$.3. Longitude, $75^{\circ} 25' 37''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bald Mountain ... | 50 26 48 | 230 13 54 | 4.54596 |
| Elk | 130 16 47 | 310 11 27 | 4.16426 |

ELK.

In southwest corner of Herrick Township, Susquehanna Co., Pa., 4 miles from Union Dale. Norris Burdick lives on eastern side of mountain three-fourths of a mile from triangulation station.

Permanent mark: A rock sunk in ground and cross cut in top.

[Latitude, $41^{\circ} 42' 53''$.84. Longitude, $75^{\circ} 33' 39''$.44.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Moosic | 349 15 19 | 169 17 55 | 4.466890 |
| Bald Mountain ... | 26 33 39 | 206 26 04 | 4.551398 |
| Bald (3) | 310 11 27 | 130 16 47 | 4.164260 |
| Salem | 334 39 07 | 154 43 14 | 4.305702 |
| Jermyn | 30 22 48 | 183 22 15 | 4.285792 |

SOUTHERN APPALACHIAN REGION.

METHODS OF WORK.

Portions of Virginia, West Virginia, and Maryland lying north of latitude 39° and between longitudes 78° and 80° were controlled by triangulation in 1884 by W. T. Griswold, assisted by L. C. Fletcher. This work was based upon the line Fork-Marshall of the U. S. Coast and Geodetic Survey. Angles were measured with a Schilling 6-inch theodolite, reading by vernier to 10 seconds.

Triangulation in the southwestern portion of Virginia was commenced in 1883 by Prof. J. H. Gore, assisted by G. F. Wakefield. A series of triangles and quadrilaterals was started at the line Paint-Ivy of the U. S. Coast and Geodetic Survey in Fayette County, W. Va., and extended southwestward for 100 miles through Scott, Wise, Dickinson, Buchanan, and Tazewell counties, Virginia, to the line Chimney-Holston in eastern Tennessee, previously established by triangulation party No. 1 of the Geological Survey.

The instrument used in this work was a Kübel 6-inch theodolite, reading by verniers to 10 seconds.

Two stations of this belt were used for extending triangulation into eastern Kentucky. This was done during 1884 by G. F. Wakefield, using a 6-inch theodolite, reading by verniers to 10 seconds.

All that portion of Virginia lying north and west of the Blue Ridge and west of the peaks of Otter which was without control was triangulated during 1885 and 1886 by S. S. Gannett, using a Fauth 7-inch theodolite, reading by verniers to 10 seconds.

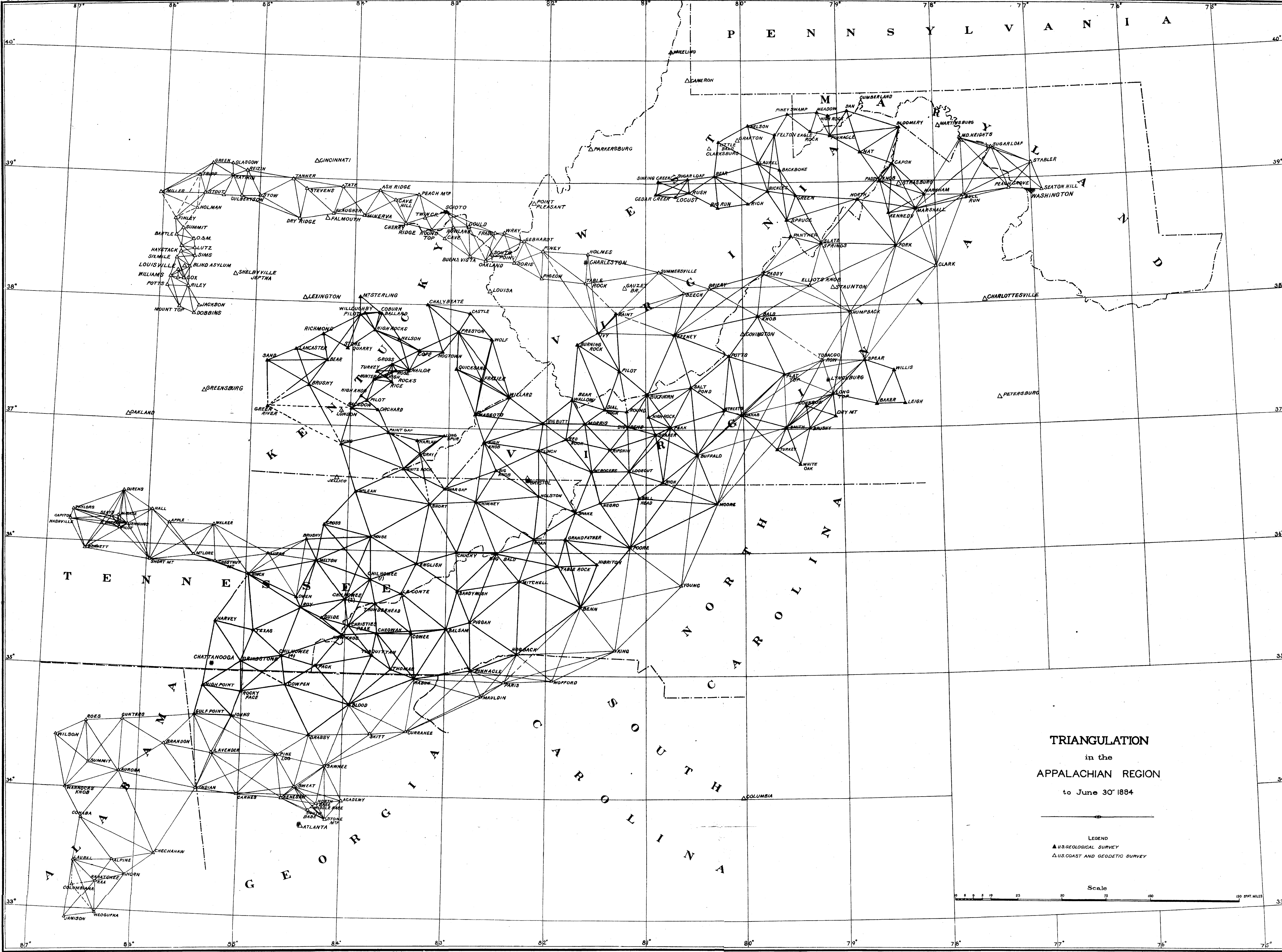
In 1888 portions of the counties of Prince Edward and Buckingham were controlled by F. J. Knight, the work being based upon the U. S. Coast and Geodetic Survey line Smith-Long.

In 1889 Pittsylvania and Campbell counties were triangulated by C. M. Yeates, using a Fauth 7-inch theodolite, reading by verniers to 10 seconds.

In addition to the work previously mentioned as having been done in Kentucky, several stations were located in Harlan and Bell counties during 1885 by F. J. Knight, based upon stations of the Geological Survey, White Rocks-War Gap.

In 1888 and 1890 C. M. Yeates extended triangulation over that portion of Kentucky lying between the parallels of 37° and 38° and between the meridians of 83° and 85° .

The nature of this country made this work most difficult, the hills being of the same height and heavily timbered. Much time was spent



in selecting stations and clearing them of timber, and even then only short lines of sight could be obtained.

A Fauth 7-inch (vernier) theodolite was used during the field season of 1888, and an 8-inch (micrometer) theodolite during 1890.

Triangulation was extended over the mountainous portion of western North Carolina and eastern Tennessee, between the Blue Ridge and the escarpment of the Cumberland Plateau during the field seasons of 1882, 1883, 1884, and 1885. This work was begun by Prof. W. C. Kerr at stations Benn and Poore of the U. S. Coast and Geodetic Survey in October, 1882. It was extended during 1883 by Prof. Kerr, assisted by S. S. Gannett, and further extended by the latter during 1884 and 1885.

A Kübel 6-inch (vernier) theodolite was used at first, which was replaced later by a Fauth 7-inch (vernier) theodolite.

In all of the work in the Appalachian Mountain region a lone tree has been commonly used as a signal. Most of the summits were found to be wooded. All trees obstructing the view were usually cut away. A tall symmetrical tree standing on the highest part of the summit was trimmed up and left as signal and mark. On bald summits a signal was usually made of saplings fastened together a few feet from the top and raised in form of a tripod.

In nearly all of the Appalachian triangulation a least square station and figure adjustment has been made.

DESCRIPTIONS AND POSITIONS OF STATIONS.

SINKING CREEK.

In Gilmer Co., W. Va., about 10 miles northwest of Glenville, at the head of Sinking Creek. Summit nearly cleared.

Permanent mark: Oak tree.

[Latitude, $39^{\circ} 01' 17''\cdot6$. Longitude, $80^{\circ} 51' 56''\cdot8$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sugar Loaf | 266 51 20 | 87 02 45 | 4·41807 |
| Rush | 291 16 25 | 111 28 31 | 4·47475 |

MEADOWS, MD.

On summit.

[Latitude, $39^{\circ} 34' 13''\cdot03$. Longitude, $79^{\circ} 12' 24''\cdot65$.]

NAT, W. VA.

Lone tree on summit.

[Latitude, $39^{\circ} 14' 42''\cdot41$. Longitude, $78^{\circ} 46' 09''\cdot03$.]

BLOOMERY, W. VA.

Signal built on summit.

[Latitude, $39^{\circ} 26' 19''$.00. Longitude, $78^{\circ} 21' 01''$.63.]

KENNEDY, VA.

On summit.

[Latitude, $38^{\circ} 44' 30''$.93. Longitude, $78^{\circ} 29' 16''$.37.]

DAN, MD.

[Latitude, $39^{\circ} 34' 52''$.64. Longitude, $78^{\circ} 53' 49''$.69.]

HIGH ROCK, MD.

[Latitude, $39^{\circ} 32' 38''$.57. Longitude, $79^{\circ} 05' 46''$.38.]

PINNACLE, W. VA.

On summit.

[Latitude, $39^{\circ} 22' 54''$.22. Longitude, $79^{\circ} 04' 40''$.90.]

SUGAR LOAF.

In Lewis Co., W. Va., 10 miles southwest of Weston, at the head of Mullins Creek. Summit cleared on southern edge and wooded on northern edge.

Permanent mark: Oak tree.

[Latitude, $39^{\circ} 02' 02''$.75. Longitude, $80^{\circ} 33' 49''$.7.]

| To station. | Azimuth. | Back azimuth. | Log dist. |
|-------------------|-----------|---------------|-----------|
| | ° ' " | ° ' " | Meters. |
| Bear Knob..... | 263 48 06 | 83 58 27 | 4.377395 |
| Rush..... | 352 30 09 | 172 30 51 | 4.09247 |
| Cedar Creek..... | 64 22 45 | 244 10 08 | 4.50714 |
| Locust..... | 33 34 43 | 213 30 08 | 4.27965 |
| Sinking Creek.... | 87 02 45 | 266 51 20 | 4.41807 |

BEAR KNOB.

Seven miles northwest of Buckhannon, in Upshur Co., W. Va. Sharp knob and a good point. Nearly all timber was cut down.

Permanent mark: Small tree.

[Latitude, $39^{\circ} 03' 25''$.1. Longitude, $80^{\circ} 17' 23''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Laurel..... | 253 55 06.5 | 74 12 34.3 | 4.618122 |

LITTLE BALD.

In Harrison Co., W. Va., 7 miles northeast of Clarksburg and 4 miles north of Bridgeport. Summit entirely bald. Other knobs within 3 miles, of same height.

Permanent mark: None.

[Latitude, $39^{\circ} 20' 09'' \cdot 1$. Longitude, $80^{\circ} 14' 22'' \cdot 7$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bear Knob..... | 8 00 05.8 | 187 58 11.4 | 4.495046 |
| Nelson..... | 241 16 54.2 | 61 28 30.1 | 4.475479 |
| Laurel..... | 298 44 03.7 | 118 59 40.1 | 4.607755 |

LAUREL.

Knob on Laurel hills, 15 miles east of Philippi, in Tucker and Barbour counties, W. Va., by very rough road.

Permanent mark: Tall dead tree standing alone.

[Latitude, $39^{\circ} 09' 34'' \cdot 7$. Longitude, $79^{\circ} 49' 42'' \cdot 5$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Little Bald..... | 118 59 40.1 | 298 44 03.7 | 4.607755 |
| Nelson..... | 164 51 12.4 | 344 47 09.3 | 4.545381 |
| Felton..... | 210 47 31.9 | 30 54 14.2 | 4.472863 |
| Green..... | 310 59 41.7 | 131 14 14.8 | 4.646077 |
| Bickles..... | 341 27 56.0 | 161 31 35.4 | 4.421288 |
| Bear Knob..... | 74 12 34.3 | 253 55 06.5 | 4.618122 |

NELSON.

Twelve miles northeast of Grafton by rough road, at south point of Monongalia Co., W. Va.

Permanent mark: Chestnut tree, trimmed up.

[Latitude, $39^{\circ} 27' 53'' \cdot 3$. Longitude, $79^{\circ} 56' 06'' \cdot 2$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Little Bald..... | 61 28 30.1 | 241 16 54.2 | 4.475479 |
| Felton..... | 288 52 24.2 | 109 03 11.51 | 4.411222 |
| Laurel..... | 344 47 09.3 | 164 51 12.4 | 4.545381 |

FELTON.

On Briery Mountain, 5 miles north of Rowlesburg, on Baltimore and Ohio Railroad, Preston Co., W. Va. Summit partly cleared.

Permanent mark: Locust tree.

[Latitude, $39^{\circ} 23' 21'' \cdot 7$. Longitude, $79^{\circ} 39' 07'' \cdot 1$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Nelson..... | 109 03 11.5 | 288 52 24.2 | 4.411222 |
| Bickles..... | 7 48 01.3 | 187 44 59.8 | 4.707488 |
| Laurel..... | 30 54 14.2 | 210 47 31.9 | 4.472863 |

PADDY KNOB.

Rounded knob on North Mountain, above Van Buren furnace on boundary between Shenandoah Co., Va., and Hardy Co., W. Va.

Permanent mark: Pine tree on State line.

[Latitude, $39^{\circ} 00' 24''$.4. Longitude, $78^{\circ} 33' 47''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Capon | 216 16 29.8 | 36 21 22.2 | 4.274894 |
| Kennedy | 347 26 18.2 | 167 29 07.8 | 4.478791 |
| Mount Marshall.. | 309 12 27.5 | 129 26 02.1 | 4.606572 |

CAPON.

On the line between Hampshire Co., W. Va., and Frederick Co., Va. On North Capon Mountain, on the Virginia and West Virginia State line. Point known as "Pinnacle," near Capon Springs.

Permanent mark: U. S. G. S., cut in rock.

[Latitude, $39^{\circ} 08' 36''$.4. Longitude, $78^{\circ} 26' 3''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kennedy | 5 57 47.0 | 185 55 45.2 | 4.651401 |
| Mount Marshall.. | 333 43 47.0 | 153 52 31.0 | 4.657576 |
| Paddy Knob..... | 36 21 22.2 | 216 16 29.8 | 4.274894 |

SUGAR LOAF.

A triangulation station of the U. S. C. & G. S. on the well known mountain in Frederick Co., Md.

[Latitude, $39^{\circ} 15' 44''$.55. Longitude, $77^{\circ} 23' 36''$.88.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bull Run | 32 29 22.17 | 212 17 38.93 | 4.6995519 |
| Md. Heights..... | 107 29 59.85 | 287 17 43.18 | 4.4654339 |
| Stabler | 293 45 40.15 | 114 01 09.32 | 4.5865133 |
| Peach Grove..... | 339 28 31.78 | 159 34 43.88 | 4.6079571 |

MARYLAND HEIGHTS.

A triangulation station of the U. S. C. & G. S. on the Blue Ridge, north of Harpers Ferry, in Washington Co., Md.

[Latitude, $39^{\circ} 20' 27''$.69. Longitude, $77^{\circ} 42' 59''$.91.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sugar Loaf | 287 17 43.18 | 107 29 59.85 | 4.4654339 |
| Bull Run | 358 43 10.10 | 178 43 39.95 | 4.7077533 |

PEACH GROVE.

A triangulation station of the U. S. C. & G. S. in Fauquier Co., Va.

[Latitude, $38^{\circ} 55' 12''$.74.. Longitude, $77^{\circ} 13' 46''$.77.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bull Run | 84 11 21.12 | 263 53 29.89 | 4.6162546 |

BULL RUN.

A triangulation station of the U. S. C. & G. S., on line between Fauquier and Prince William counties, Va.

[Latitude, $38^{\circ} 52' 53''$.58. Longitude, $77^{\circ} 42' 12''$.61.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Md. Heights | 178 43 30.95 | 358 43 10.10 | 4.7077533 |
| Clark | 22 30 41.44 | 202 19 28.39 | 4.8354456 |
| Sugar Loaf | 212 17 38.93 | 32 29 22.17 | 4.6995519 |
| Peach Grove | 263 53 29.89 | 84 11 21.12 | 4.6162546 |

MOUNT MARSHALL.

A triangulation station of the U. S. C. & G. S. on Blue Ridge, above Brownstown, on line between Warren and Rappahannock counties, Va.
Permanent mark: Copper bolt.

[Latitude, $38^{\circ} 46' 33''$.82. Longitude, $78^{\circ} 12' 10''$.28.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Fork | 29 26 43.21 | 209 18 44.29 | 4.5778087 |
| Kennedy | 81 24 03.30 | 261 13 20.80 | 4.3990680 |
| Paddy Knob | 129 26 02.10 | 309 12 27.50 | 4.6065720 |
| Capon | 153 52 31.00 | 333 43 47.00 | 4.6575760 |
| High Top (C. S.) .. | 212 38 03.00 | 32 41 28.00 | 4.1640430 |
| Clark | 341 17 17.50 | 161 24 45.39 | 4.7358815 |
| North | 100 02 58.10 | 279 40 17.90 | 4.7253930 |

CLARK.

A triangulation station of the U. S. C. & G. S. in Orange Co., Va.

[Latitude, $38^{\circ} 18' 41''$.11. Longitude, $78^{\circ} 00' 11''$.49.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mount Marshall .. | 161 24 45.39 | 341 17 17.50 | 4.7358815 |
| Bull Run | 202 19 28.39 | 22 30 41.44 | 4.8354456 |

FORK.

A triangulation station of the U. S. C. & G. S. in Madison Co., Va., on Blue Ridge, about 5 miles south of crossing of road from Marksville to Criglersville, Va.

Permanent mark : Copper bolt.

[Latitude, $38^{\circ} 28' 44''$.81. Longitude, $78^{\circ} 24' 57''$.47.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kennedy | 167 54 00.82 | 347 51 19.20 | 4.4748290 |
| Mount Marshall..... | 209 18 44.29 | 29 26 43.21 | 4.5778087 |
| North | 141 14 38.10 | 321 00 01.60 | 4.7326430 |
| Rogers (Elliott Knob) .. | 66 26 43.28 | 245 53 17.98 | 4.9338746 |
| Slate Springs..... | 93 09 32.89 | 272 40 51.08 | 4.8268669 |

NORTH.

On the line between Hardy Co., W. Va., and Shenandoah Co., Va., on North Mountain, 200 yards south of road crossing from Orkney Springs to Lost River post-office.

Permanent mark : Lone pine tree.

[Latitude, $38^{\circ} 51' 28''$.9. Longitude, $78^{\circ} 48' 20''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mount Marshall.. | 279 40 17.9 | 100 02 58.1 | 4.725393 |
| Fork..... | 321 00 01.6 | 141 14 38.1 | 4.732643 |
| Spruce..... | 75 41 13.5 | 254 13 53.0 | 4.817057 |
| Green..... | 94 43 04.3 | 274 19 03.3 | 4.744391 |
| Slate Springs | 40 34 29.3 | 220 20 17.1 | 4.705744 |

RICH.

In Randolph Co., W. Va., on Rich Mountain, about 2 miles south of turnpike from Beverly to Buckhannon. Scaffold erected on trees, but partially destroyed by lightning.

[Latitude, $38^{\circ} 50' 01''$.85. Longitude, $79^{\circ} 56' 22''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bear..... | 129 18 34 | 309 05 21 | 4.593183 |
| Bickles..... | 238 12 29 | 58 20 19 | 4.326353 |
| Big Run..... | 81 14 19 | 261 02 20 | 4.447491 |

BIG RUN.

In Upshur Co., W. Va., about $3\frac{1}{2}$ miles (air line) southwest of Alton, on West Virginia and Pittsburg Railroad, at head of Big Run. Instrument on platform 93 feet high.

Permanent mark: Hickory tree.

[Latitude, $38^{\circ} 47' 41''$. Longitude, $80^{\circ} 15' 30''$.15.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bear..... | 174 38 13 | 354 37 02 | 4.465596 |
| Rich..... | 261 02 20 | 81 14 19 | 4.447491 |
| Rush..... | 119 55 48 | 299 45 00 | 4.457860 |

RUSH.

In Lewis Co., W. Va., about 5 miles west of Roanoke (a station on the West Virginia and Pittsburg Railroad), at head of Canoe Run. Summit covered with trees, with gaps cut toward triangulation stations.

Permanent mark: Tree with scaffold around it.

[Latitude, $38^{\circ} 55' 25''$. Longitude, $80^{\circ} 32' 42''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bear..... | 236 07 01 | 56 16 39 | 4.425104 |
| Big Run..... | 299 45 00 | 119 55 48 | 4.457860 |
| Cedar Creek..... | 86 57 21 | 266 44 03 | 4.486370 |
| Locust..... | 73 30 40 | 253 25 23 | 4.102730 |
| Sinking Creek..... | 111 28 31 | 291 16 25 | 4.474750 |
| Sugarloaf..... | 172 30 51 | 352 30 09 | 4.092490 |

LOCUST.

In Gilmer Co., W. Va., sometimes called Hickory Knob, about 5 miles northeast of Stout Mills on Little Kanawha River at head of Sliding Hill Creek. Summit covered with timber. Scaffold was erected around tall tree and occupied as a secondary station.

Permanent mark: Tree.

[Latitude, $38^{\circ} 53' 28''$.15. Longitude, $80^{\circ} 41' 06''$.65.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sugarloaf..... | 213 30 08 | 33 34 43 | 4.27965 |
| Rush..... | 253 25 23 | 73 30 40 | 4.10273 |

CEDAR CREEK.

In Gilmer Co., W. Va., about 10 miles west of Glenville, at the head of Paddy Run, of Cedar Creek, and Spring Fork of Grassy Creek. Summit timbered, with gaps cut through toward triangulation stations.

Permanent mark: Tree with scaffold around it.

[Latitude, $38^{\circ} 54' 30''$.3. Longitude, $80^{\circ} 53' 52''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sugarloaf..... | 244 10 08 | 64 22 45 | 4.56714 |
| Rush..... | 266 44 03 | 86 57 21 | 4.48637 |

GREEN.

On line between Randolph and Pendleton counties, W. Va., on main chain of Alleghany Mountains, near head of Seneca River. Summit a long ridge, heavily timbered with spruce and hemlock. Thomas, on West Virginia Central Railroad, is the nearest railroad station.

Permanent mark: Spruce tree on south end.

[Latitude, $38^{\circ} 53' 50''$.7. Longitude, $79^{\circ} 26' 36''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bickles | 99 22 54.7 | 279 12 02.4 | 4.403926 |
| Laurel | 131 14 14.8 | 310 59 41.7 | 4.646077 |
| North | 274 19 03.3 | 94 43 04.3 | 4.744391 |
| Spruce | 19 35 56.3 | 199 32 33.7 | 4.367376 |
| Panther | 7 02 33.1 | 187 00 34.7 | 4.572369 |
| Slate Springs | 332 16 28.7 | 152 26 11.8 | 4.686270 |

BICKLES.

On Bickles Knob, on Cheat Mountain, in the northern central part of Randolph Co., W. Va. Philippi, 30 miles northwest, is nearest railroad station. Summit well cleared.

Permanent mark: Oak tree.

[Latitude, $38^{\circ} 56' 03''$.4. Longitude, $79^{\circ} 43' 54''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bear Knob | 105 54 26.0 | 285 33 21.6 | 4.701012 |
| Laurel | 161 31 35.4 | 341 27 56.0 | 4.421288 |
| Felton | 187 44 59.8 | 7 48 01.3 | 4.707488 |
| Rich. | 58 20 19.0 | 238 12 29.0 | 4.326353 |
| Green | 279 12 52.4 | 99 22 54.7 | 4.403926 |
| Spruce | 326 25 45.0 | 146 33 13.1 | 4.494699 |

SPRUCE.

On Spruce Mountain, a long, barren, rocky ridge, 4 miles by rough trail from Circleville, Pendleton Co., W. Va.

Permanent mark: None.

[Latitude, $38^{\circ} 41' 58''$.7. Longitude, $79^{\circ} 31' 59''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bickles | 146 33 13.1 | 326 25 45.0 | 4.494699 |
| Green | 199 32 33.7 | 19 35 56.3 | 4.367376 |
| North | 254 13 53.0 | 74 41 13.5 | 4.817057 |
| Panther | 347 52 02.0 | 167 53 25.8 | 4.189382 |
| Slate Springs | 304 36 56.9 | 124 50 00.5 | 4.567880 |

PANTHER.

On Panther Knob, at southwest corner of Pendleton Co., W. Va., near Highland County line.

Permanent mark: Small tree.

[Latitude, $38^{\circ} 33' 48''$.3. Longitude, $79^{\circ} 29' 45''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Spruce..... | 167 53 25.8 | 347 52 02.0 | 4.189382 |
| Green..... | 187 00 34.7 | 7 02 33.1 | 4.572309 |
| Slate Springs..... | 282 14 11.5 | 102 25 50.3 | 4.444144 |
| Paddy..... | 38 32 05.1 | 218 20 53.4 | 4.625148 |

SLATE SPRINGS.

A triangulation station of the U. S. C. & G. S. on Shenandoah Mountain, 10 miles from Rawley Springs, Rockingham Co., Va.

Permanent mark: Marble block, 6 by 6 by 30 inches.

[Latitude, $38^{\circ} 30' 35''$.71. Longitude, $79^{\circ} 11' 03''$.66.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Panther..... | 102 25 50.30 | 282 14 11.50 | 4.4441440 |
| Spruce..... | 124 50 00.50 | 304 36 56.90 | 4.5678830 |
| Green..... | 152 26 11.80 | 332 16 28.70 | 4.6862700 |
| North..... | 220 20 17.10 | 40 34 29.30 | 4.7075440 |
| Fork..... | 272 40 51.08 | 93 09 32.89 | 4.8268669 |
| Paddy..... | 63 18 23.51 | 242 55 35.71 | 4.7776704 |

ROGERS (ELLIOTT KNOB).

A triangulation station of the U. S. C. & G. S. in Augusta Co., Va.

[Latitude, $38^{\circ} 09' 59''$.36. Longitude, $79^{\circ} 18' 51''$.30]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Fork..... | 245 53 17.98 | 66 26 43.28 | 4.9338746 |
| Humpback..... | 303 25 22.43 | 123 40 43.46 | 4.6405399 |

PADDY.

A triangulation station of the U. S. C. & G. S. on Alleghany range, at the corner of Bath and Highland counties, Va., and Pocahontas Co., W. Va.

Permanent mark: Marble block 6 by 6 by 30 inches.

[Latitude, $38^{\circ} 15' 56''$.77. Longitude, $79^{\circ} 47' 46''$.29.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| State Springs..... | 242 55 35.71 | 63 18 23.51 | 4.7776704 |
| Panther..... | 218 20 53.40 | 38 32 05.10 | 4.6251480 |
| Bald Knob..... | 7 19 03.00 | 187 17 00.60 | 4.5803674 |

HOLMES.

A triangulation station of the U. S. C. & G. S. in Kanawha Co., W. Va. It is on the ridge dividing the waters flowing into Cooper Creek and thence into Elk River, and those by Two Mile Creek into the Kanawha River. Station on land owned by Mr. S. W. Gibson, is about $8\frac{1}{2}$ miles from Charleston and about one-half mile northeast of Holmes' house.

Permanent mark: A bottle set in cement, and over this a stone block 6 by 6 by 30 inches. The top of the block is marked U. S. C. S. Four blocks, each 6 by 6 by 30 inches, placed north, south, east, and west. North block is 6.94 feet from center, south block 6.60 feet, east block 6.95 feet, west block 6.69 feet.

[Latitude, $38^{\circ} 25' 40''$.87. Longitude, $81^{\circ} 35' 34''$.31.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Table Rock..... | 4 07 37.3 | 184 06 48.4 | 4.4258038 |
| Elk..... | 17 54 57.0 | 197 54 06.0 | 3.8120110 |
| Creed..... | 311 56 47.0 | 131 58 01.0 | 3.5886000 |

SUMMERSVILLE.

A triangulation station of the U. S. C. & G. S. in Nicholas Co., W. Va. Station is on a ridge 1 mile from Nicholas C. H. belfry and bearing 6° north of west. A large tree left standing is visible for 40 miles. A spike is driven into this tree, and station bears $354^{\circ} 40'$, distant 15.4 feet from this spike. Nearest railroad station is Kanawha Falls, on Chesapeake and Ohio Railroad, 32 miles distant.

Permanent mark: Bottle set into a hole with sandstone block placed over it, 6 by 6 by 30 inches, and cross cut on top. Reference marks, four sandstone blocks set north, south, east, and west, with arrow cut on top pointing to center. Distance, north block, 7.02 feet; south block, 7 feet; east block, 7.29 feet; west block, 6.90 feet.

[Latitude, $38^{\circ} 16' 55''$.42. Longitude, $80^{\circ} 52' 07''$.65.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Beech..... | 309 07 25.1 | 129 17 18.8 | 4.4741174 |
| Ivy..... | 45 04 22.9 | 224 41 22.4 | 4.8889444 |

BEECH.

A triangulation station of the U. S. C. & G. S. Station on Beech knob about 4 miles north of Mr. Albert G. Williams's house in Greenbrier Co., W. Va., and 11 miles northeast of Snow Hill post-office. Station on the highest part of Beech knob.

Permanent mark: A rough sandstone block 24 by 6 by 6 inches, with four other similar blocks north, south, east, and west. Distance

from center to north block, 6.90 feet; to south block, 6.98 feet; to east block, 6.81 feet; to west block, 7.09 feet.

[Latitude, $38^{\circ} 06' 44''$.63. Longitude, $80^{\circ} 36' 18''$.88.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Briery..... | 261 06 01.7 | 81 15 41.1 | 4.3641965 |
| Keeney..... | 13 11 44.6 | 193 08 03.1 | 4.5868151 |
| Summersville..... | 129 17 18.8 | 309 07 25.1 | 4.4741174 |

BRIERY.

A triangulation station of the U. S. C. & G. S. in Pocahontas Co., W. Va., on the divide between Greenbrier and Gauley rivers. The station is on a knob about 4 miles west of Hillsboro, at the headwaters of Spring Creek. It is at the eastern end of knob about 50 yards west of a bunch of live pines.

Permanent mark: Copper bolt in solid rock, with cross on top, above which is placed a marble slab 6 by 6 by 30 inches, top marked U. S. C. S. North, iron bolt in rock, 7.02 feet distance; south, iron bolt in rock, 7.06 feet; east, marble block, 6.98 feet; west, marble block, 7.02 feet.

[Latitude, $38^{\circ} 08' 39''$.65. Longitude, $80^{\circ} 20' 40''$.40.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bald Knob..... | 299 06 43.0 | 119 24 57.1 | 4.6958141 |
| Keeney..... | 37 43 22.1 | 217 30 03.3 | 4.7155703 |
| Beech..... | 81 15 41.1 | 261 06 01.7 | 4.3641965 |

TABLE ROCK.

A triangulation station of the U. S. C. & G. S. in Kanawha Co., W. Va. Station on the range of hills lying between the two forks of Lens Creek, which flows into the Kanawha River at Brownstown, and is near the headwaters of the creek, about 7 miles from Brownstown station, on a long, very narrow, and steep ridge, cleared of trees.

Permanent mark: A small bottle set in cement 30 inches below surface, and on top is a sandstone block 6 by 6 by 30 inches, top marked U. S. C. S. Four other blocks are placed north, south, east, and west, with tops cut with cross and arrows pointing to center. North block 30 inches long; distance, 7.01 feet. South block 30 inches long; distance, 6.97 feet. East block 30 inches long; distance, 7.05 feet. West block 30 inches long; distance, 6.98 feet.

[Latitude, $38^{\circ} 11' 18''$.56. Longitude, $81^{\circ} 36' 53''$.13.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ivy..... | 346 14. 43.2 | 166 19 17.1 | 4.6607764 |
| Holmes..... | 184 06 48.4 | 4 07 37.3 | 4.4258038 |
| Creed..... | 191 18 19.0 | 11 20 22.0 | 4.3886600 |

MOUNT STERLING.

Station on old Fort Hill, on edge of town of Mount Sterling, Montgomery Co., Ky. Summit cleared of timber.

Permanent mark: Tripod with tin cone.

[Latitude, $38^{\circ} 03' 28'' \cdot 4$. Longitude, $83^{\circ} 55' 50'' \cdot 9$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|----------------|----------------|----------------|
| | $^{\circ}$ ' " | $^{\circ}$ ' " | <i>Meters.</i> |
| Coburn | 308 06 18 | 128 13 46 | 4·35341 |
| Pilot | 1 16 15 | 181 16 06 | 4·20986 |

HUMPBACK.

A triangulation station of the U. S. C. & G. S. on boundary between Augusta and Nelson counties, Va.

[Latitude, $37^{\circ} 56' 55'' \cdot 91$. Longitude, $78^{\circ} 53' 57'' \cdot 24$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|----------------|----------------|----------------|
| | $^{\circ}$ ' " | $^{\circ}$ ' " | <i>Meters.</i> |
| Peters | 249 45 46·02 | 70 08 25·64 | 4·7579991 |
| Fork | 215 34 15·22 | 35 52 11·46 | 4·8603035 |
| Spears | 344 20 09·02 | 164 25 09·40 | 4·6492787 |

BALD KNOB.

A triangulation station of the U. S. C. & G. S., in Bath Co., Va., on Warm Springs Mountain, about 3 miles (air line) south of Healing Springs, 1,000 feet north of highest summit, and 20 feet lower. Millboro depot and Covington, nearest railroad stations.

Permanent mark: Copper bolt in large flat rock.

[Latitude, $37^{\circ} 55' 32'' \cdot 64$. Longitude, $79^{\circ} 51' 04'' \cdot 72$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|----------------|----------------|----------------|
| | $^{\circ}$ ' " | $^{\circ}$ ' " | <i>Meters.</i> |
| Paddy | 187 17 00·6 | 7 19 03·0 | 4·5803674 |
| Flat Top | 335 40 48·5 | 155 50 39·8 | 4·7609375 |
| Potts | 35 49 53·1 | 215 39 03·8 | 4·647675 |
| Keeney | 77 36 00·0 | 257 04 33·3 | 4·8866970 |
| Briery | 119 24 57·1 | 299 06 43·0 | 4·6958141 |

PAINT.

Sharp knob near Paint Creek, Fayette Co., W. Va.

Permanent mark: Lone tree.

[Latitude, $37^{\circ} 56' 50'' \cdot 8$. Longitude, $81^{\circ} 18' 28'' \cdot 8$.]

KEENEY.

A triangulation station of the U. S. C. & G. S. in Summers Co., W. Va., on highest part of Keeney Mountain, 8 miles by road and trail north-west of Alderson, W. Va.

Permanent mark: Marble block 6 by 6 by 30 inches.

[Latitude, $37^{\circ} 46' 24''$.92. Longitude, $80^{\circ} 42' 19''$.11.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Bald Knob..... | 257 | 04 | 33.3 | 77 | 36 | 00.0 | 4.8866970 |
| Potts..... | 201 | 03 | 48.1 | 111 | 24 | 19.4 | 4.723811 |
| Salt Pond..... | 342 | 26 | 41.9 | 162 | 32 | 50.0 | 4.692562 |
| Buckhorn..... | 24 | 34 | 15.4 | 204 | 24 | 12.9 | 4.768306 |
| Beech..... | 193 | 08 | 03.1 | 13 | 11 | 44.6 | 4.5868151 |
| Briery..... | 217 | 30 | 03.3 | 37 | 43 | 22.1 | 4.7155703 |

DRY MOUNTAIN.

On a small hill in Campbell Co., Va., about 200 feet above surrounding country, 13 miles from Brook Neal. Summit flat and timbered, with exception of small clearing. Instrument mounted on scaffold 35 feet high.

Permanent mark: Pine tree.

[Latitude, $37^{\circ} 06' 22''$.90. Longitude, $79^{\circ} 03' 47''$.09.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Johnson..... | 109 | 54 | 13 | 289 | 43 | 24 | 4.450035 |
| Long Top..... | 174 | 21 | 08 | 354 | 29 | 18 | 4.313741 |
| Brushy..... | 65 | 44 | 01 | 245 | 34 | 27 | 4.412498 |

LONG TOP.

A triangulation station of the U. S. C. & G. S., in Campbell Co., Va.

[Latitude, $37^{\circ} 17' 27''$.65. Longitude, $79^{\circ} 05' 10''$.24.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Dry Mountain..... | 354 | 20 | 18.00 | 174 | 21 | 08.00 | 4.313741 |
| Johnson..... | 65 | 59 | 05.00 | 245 | 49 | 04.00 | 4.428030 |
| Smith..... | 54 | 21 | 55.00 | 234 | 04 | 32.17 | 4.7203317 |
| Brushy..... | 34 | 40 | 48.00 | 214 | 32 | 02.00 | 4.578031 |

BAKER.

On a wooded hill but little higher than the surrounding country in southwestern part of Prince Edward Co., Va., about 6 miles south of

Pamplin City, on Norfolk and Western Railroad. Lanes were cut from signal tree toward Leigh, Willis, Spear, and Long stations.

Permanent mark: A tall pine.

[Latitude, $37^{\circ} 12' 09''$.57. Longitude, $78^{\circ} 38' 39''$.19.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Long Top | 104 | 10 | 23.00 | 283 | 54 | 20.00 | 4.606598 |
| Spear | 165 | 15 | 37.00 | 345 | 11 | 18.00 | 4.615267 |
| Willis | 207 | 52 | 51.00 | 27 | 59 | 23.00 | 4.530945 |
| Leigh | 269 | 35 | 25.27 | 89 | 45 | 45.83 | 4.403301 |

LEIGH.

On a hill about 150 feet high, about 6 miles northwest of Burkeville (the crossing of the Norfolk and Western and Richmond and Danville railroads), and 8 miles southwest of Farmville, Prince Edward Co., Va. Timber cut from summit.

Permanent mark: A tall leaning pine.

[Latitude, $37^{\circ} 12' 14''$.21. Longitude, $78^{\circ} 21' 32''$.82.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Baker | 89 | 45 | 45.83 | 269 | 35 | 25.27 | 4.403301 |
| Willis | 162 | 37 | 59.22 | 342 | 34 | 08.68 | 4.495407 |

WILLIS.

On a hill in eastern part of Buckingham Co., Va. Summit bare and rocky. Altitude above the surrounding country about 900 feet.

Permanent mark: Bolt in solid rock.

[Latitude, $37^{\circ} 28' 22''$.76. Longitude, $78^{\circ} 27' 52''$.93.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Baker | 27 | 59 | 23.00 | 207 | 52 | 51.00 | 4.530945 |
| Spear | 110 | 36 | 46.00 | 290 | 25 | 52.00 | 4.449553 |
| Leigh | 342 | 34 | 08.68 | 162 | 37 | 59.22 | 4.495407 |

SPEAR.

A triangulation station of the U. S. C. & G. S. in Buckingham Co., Va.

[Latitude, $37^{\circ} 33' 42''$.91. Longitude, $78^{\circ} 45' 46''$.66.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Humpback | 164 | 25 | 09.40 | 344 | 20 | 09.02 | 4.6492787 |
| Peters | 213 | 41 | 29.41 | 33 | 59 | 02.17 | 4.8770536 |
| Willis | 290 | 25 | 52.00 | 110 | 36 | 46.00 | 4.449553 |
| Baker | 345 | 11 | 18.00 | 165 | 15 | 37.00 | 4.615267 |

TOBACCO ROW.

A triangulation station of the U. S. C. & G. S., in Amherst Co., Va.

[Latitude, $37^{\circ} 33' 55''$.76. Longitude, $79^{\circ} 11' 26''$.17.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Spear | 270 | 28 | 12.87 | 90 | 43 | 51.43 | 4.5773224 |
| Humpback | 211 | 01 | 08.58 | 31 | 11 | 50.86 | 4.6963346 |

FLAT TOP.

A triangulation station of the U. S. C. & G. S., on line between Boteourt and Bedford counties, Va., 10 miles northwest of Liberty, Bedford Co., Va. Rough wagon road to within one-fourth of a mile of station.

Permanent mark: Marble block, 6 by 6 by 30 inches.

[Latitude, $37^{\circ} 27' 06''$.85. Longitude, $79^{\circ} 34' 58''$.40.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Potts | 108 | 32 | 37.90 | 288 | 12 | 03.40 | 4.719626 |
| Bald Knob | 155 | 50 | 39.80 | 335 | 40 | 48.50 | 4.760975 |
| Smith | 358 | 12 | 27.78 | 178 | 13 | 04.97 | 4.6865204 |
| Cahas | 46 | 04 | 20.04 | 225 | 48 | 36.09 | 4.7276606 |

POTTS.

On line between Craig and Alleghany counties, Va. On a rounded knob on Potts Mountain east of Fincastle and Sweet Springs, 12 miles by road and trail north of Newcastle, Craig Co.

Permanent mark: Rock cairn.

[Latitude, $37^{\circ} 36' 02''$.9. Longitude, $80^{\circ} 08' 45''$.0.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Keeney | 111 | 24 | 19.4 | 291 | 03 | 48.1 | 4.723811 |
| Bald Knob | 215 | 39 | 03.8 | 35 | 49 | 53.1 | 4.647675 |
| Flat Top | 288 | 12 | 03.4 | 108 | 32 | 37.9 | 4.719626 |
| Salt Pond | 51 | 22 | 13.4 | 231 | 07 | 55.8 | 4.647707 |
| Cahas | 347 | 50 | 23.3 | 167 | 55 | 07.5 | 4.739539 |
| Streets | 4 | 53 | 56.7 | 184 | 52 | 14.1 | 4.688312 |

JOHNSON.

On boundary between Bedford and Campbell counties, Va., 7 miles from Lynch Station on Virginia Midland Railroad. Summit sharp and about 600 feet above surrounding country. Timber cut down.

Permanent mark: Lone tree.

[Latitude, $37^{\circ} 11' 32''$.78. Longitude, $79^{\circ} 21' 42''$.56.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Smith | 42 35 34 | 222 28 11 | 4.428534 |
| Long Top..... | 245 49 04 | 65 59 05 | 4.428030 |
| Dry Mountain.... | 289 43 24 | 109 54 13 | 4.450035 |

BRUSHY.

Sharp peak on big ridge in Pittsylvania Co., Va., 2 miles from Sycamore Station, Virginia Midland Railroad. Timber cut down.

Permanent mark: Lone tree.

[Latitude, $37^{\circ} 00' 37''$.16. Longitude, $79^{\circ} 19' 41''$.32.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Smith..... | 91 16 15 | 271 07 40 | 4.325442 |
| Long Top..... | 214 32 02 | 34 40 48 | 4.578031 |
| Dry Mountain.... | 245 34 27 | 65 44 01 | 4.412498 |

SMITH.

A triangulation station of the U. S. C. & G. S., in Pittsylvania Co., Va.

[Latitude, $37^{\circ} 00' 51''$.53. Longitude, $79^{\circ} 33' 56''$.93.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Flat Top..... | 178 13 04.97 | 358 12 27.78 | 4.6865204 |
| Long Top..... | 234 04 32.17 | 54 21 55.00 | 4.7203317 |
| Johnson..... | 222 28 11.00 | 42 35 34.00 | 4.428534 |
| Brushy..... | 271 07 40.00 | 96 16 15.00 | 4.325442 |

WASEOTO.

In Letcher Co., Ky., near Virginia and Kentucky State line, at the junction of Black and Cumberland mountains, at the head of Poor Fork of Cumberland and Pond Fork of Big Sandy, 7 miles east of Whitesburg, Letcher Co., Ky.

Permanent mark: Chestnut tree.

[Latitude, $37^{\circ} 08' 44''$.8. Longitude, $82^{\circ} 43' 54''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Quicksand..... | 157 01 47.9 | 336 54 36.3 | 4.651632 |
| Frazier..... | 189 57 17.2 | 9 59 35.4 | 4.511800 |
| Willard..... | 242 01 51.2 | 62 14 29.2 | 4.543945 |
| Big Butt..... | 275 55 06.5 | 96 20 17.5 | 4.794159 |
| High Knob..... | 339 31 42.5 | 159 35 23.9 | 4.415766 |

CARR.

Not occupied. Situated in Perry Co., Ky., at head of Stacy Branch of Carr Fork of Kentucky River, about 7 miles from its mouth.
Permanent mark: Medium sized pine tree trimmed up.

[Latitude, 37° 14' 29''-2. Longitude, 83° 05' 33''-5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Long Spur | 352 18 06 | 172 19 56 | 4-529005 |
| Harlan | 27 47 28 | 207 39 20 | 4-633374 |

WILLARD.

On Pine Mountain on the line between Dickinson Co., Va., and Pike Co., Ky., 4 miles west of "the Breaks" of Russell Fork of Sandy River, and south-southeast of Fish Trap post-office.

Permanent mark: Two small trees.

[Latitude, 37° 15' 35''-3. Longitude, 82° 22' 59''-9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Frazier | 121 52 25-4 | 301 42 03-4 | 4-472873 |
| Wolf | 162 08 53-3 | 342 01 58-8 | 4-735622 |
| Wascoto | 62 14 29-2 | 242 01 51-2 | 4-543945 |

FRAZIER.

In Floyd Co., Ky., on end of spur, near head of Mud and Frazier creeks, ten miles (air line) southwest of Pikeville, Ky.

Permanent mark: Tall hickory tree.

[Latitude, 37° 24' 02''-9. Longitude, 82° 40' 05''-6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Quicksand | 111 54 23-0 | 291 44 51-1 | 4-396315 |
| Preston | 152 23 43-8 | 332 14 31-1 | 4-679871 |
| Wolf | 193 09 13-7 | 13 12 43-8 | 4-569316 |
| Willard | 331 42 03-4 | 121 52 25-4 | 4-472873 |
| Wascoto | 9 59 35-4 | 189 57 17-2 | 4-511800 |

QUICKSAND.

On line between Floyd and Knott counties, Ky., at the head of Licking River. Nearest town is Hindman, in Knott Co.

Bull. 122—6

Permanent mark: Large pine tree.

[Latitude, $37^{\circ} 29' 03''$. Longitude, $82^{\circ} 55' 46''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Preston..... | 181 27 41.1 | 1 28 02.2 | 4.520126 |
| Waseoto..... | 336 54 36.3 | 157 01 47.9 | 4.651632 |
| Frazier..... | 201 44 51.1 | 111 54 23.0 | 4.396315 |

HOGTOWN.

On divide between Quicksand and Licking rivers on line between Magoffin and Breathitt counties, Ky.; 12 to 15 miles south of Salyersville. Summit cleared of timber.

Permanent mark: A chestnut oak, shaped like a pine.

[Latitude, $37^{\circ} 37' 01''$.9. Longitude, $83^{\circ} 04' 28''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Nailor..... | 60 40 38 | 240 28 09 | 4.539877 |
| Cope..... | 92 09 43 | 272 00 57 | 4.325746 |

WOLF.

On sharp ridge at head of Wolf Creek, Martin Co., Ky., 12 miles (air line) southwest of Warfield on Tug Fork of Sandy River.

Permanent mark: Large chestnut tree.

[Latitude, $37^{\circ} 43' 34''$.4. Longitude, $82^{\circ} 34' 20''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Castle..... | 138 37 03.8 | 378 28 31.8 | 4.489071 |
| Preston..... | 101 39 08.3 | 281 26 22.5 | 4.494856 |
| Frazier..... | 13 12 43.8 | 193 09 13.7 | 4.569316 |
| Willard..... | 342 01 58.8 | 162 08 53.3 | 4.735622 |

PRESTON.

On northeast end of Long Knob at head of Barnett and Jennie and Little Paint creeks, in Johnson Co., Ky., 7 miles southwest of Paintsville.

[Latitude, $37^{\circ} 46' 57''$.3. Longitude, $82^{\circ} 55' 11''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wolf..... | 281 26 22.5 | 101 39 08.3 | 4.494856 |
| Quicksand..... | 1 28 02.2 | 181 27 41.1 | 4.520126 |
| Frazier..... | 332 14 31.1 | 152 23 43.8 | 4.679871 |

BEAR WALLOW.

On Sandy Ridge, near State boundary between McDowell Co., W. Va., and Buchanan and Tazewell counties, Va.

Permanent mark: Tall tree.

[Latitude, $37^{\circ} 14' 38''$.6. Longitude, $81^{\circ} 44' 50''$.2.]

DIAL ROCK.

On East River Mountain, 10 miles west of Graham, Tazewell Co., Va.; summit rounded, with timber mostly cut down.

Permanent mark: Rock cairn.

[Latitude, $37^{\circ} 09' 68''$.4. Longitude, $81^{\circ} 25' 00''$.3.]

BIG BEND.

On line between Wythe and Bland counties, Va., on Walker Mountain, east of Wythe and Tazewell road gap, 12 miles northwest of Wytheville, Va. Summit is barren and rocky. All timber cut down.

Permanent mark: Small dead tree on highest part.

[Latitude, $37^{\circ} 01' 37''$.8. Longitude, $81^{\circ} 10' 56''$.4.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Draper | 284 | 59 | 45.4 | 105 | 10 | 01.0 | 4.418229 |
| Lookout | 358 | 05 | 57.5 | 178 | 06 | 29.4 | 4.600876 |
| Peak | 270 | 35 | 37.3 | 90 | 51 | 17.9 | 4.586716 |
| Morris | 93 | 45 | 57.0 | 273 | 30 | 14.3 | 4.588357 |
| Ripshin | 37 | 36 | 57.5 | 217 | 30 | 32.1 | 4.415592 |

BUCKHORN.

At Doubles of East River Mountain, on State line between Giles Co., Va., and Mercer Co., W. Va. Oakvale, on New River branch of Norfolk and Western Railroad, is nearest railroad station; distant, 4 miles. Station on sharp rock, half way between tree trunks.

Permanent mark: Hole drilled in rock.

[Latitude, $37^{\circ} 17' 33''$.5. Longitude, $80^{\circ} 58' 49''$.3.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Keeney | 204 | 24 | 12.9 | 24 | 34 | 15.4 | 4.768306 |
| Salt Pond | 260 | 36 | 50.6 | 80 | 52 | 57.0 | 4.599484 |
| Peak | 325 | 24 | 28.0 | 145 | 32 | 52.3 | 4.560481 |

PILOT.

On line between Mercer and Wyoming counties, W. Va., on Flat Top Mountain, a few miles from Peters Gap.

Permanent mark: Stump on highest point.

[Latitude, $37^{\circ} 29' 04''$.3. Longitude, $81^{\circ} 16' 18''$.8.]

BURNING ROCK.

On Huff Mountain, 4 miles west of Oceana, Wyoming Co., W. Va.

Permanent mark: Lone tree.

[Latitude, $37^{\circ} 41' 38''$.0. Longitude, $81^{\circ} 41' 51''$.6.]

SALT POND.

On Salt Pond Mountain, one-fourth of a mile by trail above Mountain Lake Post-office and hotel, Giles Co., Va. Staytide is nearest railroad station. Station is on highest part of flat ledge of rocks.

Permanent mark: Three holes drilled in rock, with arrows cut in rock pointing to center.

[Latitude, $37^{\circ} 21' 00''$.8. Longitude, $80^{\circ} 32' 15''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Keeney | 162 32 50.0 | 342 26 41.9 | 4.692562 |
| Potts | 231 07 55.8 | 51 22 13.4 | 4.647707 |
| Streets | 304 06 24.2 | 124 18 55.7 | 4.568130 |
| Buffalo | 355 00 55.7 | 175 03 06.1 | 4.790414 |
| Buckhorn | 80 52 57.0 | 260 36 50.6 | 4.599484 |
| Peak | 27 19 26.7 | 207 11 47.9 | 4.611519 |

STREETS.

In Montgomery Co., Va., Streets Entry, a part of Poore's Mountain on Blue Ridge, 5 miles south of Big Springs Depot, Va., by good trail.

Permanent mark: Large oak tree.

[Latitude, $37^{\circ} 09' 46''$.1. Longitude, $80^{\circ} 11' 33''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Potts | 184 52 14.1 | 4 53 56.7 | 4.688312 |
| Caahas | 287 47 07.7 | 107 53 32.4 | 4.218064 |
| Buffalo | 32 00 56.7 | 211 50 40.0 | 4.680703 |
| Salt Pond | 124 18 55.7 | 304 06 24.2 | 4.563130 |
| Peak | 72 42 25.2 | 252 22 18.7 | 4.714273 |

CAHAS.

A triangulation station of the U. S. C. & G. S., in Franklin Co., Va. Rocky Mount is the nearest railroad station on south, and Salem and Roanoke nearest ones on north.

Permanent mark: Marble block 6 by 6 by 30 inches.

[Latitude, $37^{\circ} 07' 01''$.95. Longitude, $80^{\circ} 00' 56''$.64.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Potts | 167 55 07.5 | 347 50 23.3 | 4.739539 |
| Flat Top (C. & G. S.) | 225 48 36.09 | 46 04 20.04 | 4.7276606 |
| Streets | 107 53 32.4 | 287 47 07.7 | 4.218064 |
| Turkey Cock | 314 14 55.0 | 134 27 50.0 | 4.649021 |

BIG BUTT.

On Sandy Ridge, between Russell and Buchanan counties, Va.

Permanent mark: Tall tree.

[Latitude, 37° 03' 09''-2. Longitude, 82° 02' 08''-0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Morris..... | 270 25 33.5 | 90 40 41.1 | 4.570827 |
| Red Rock..... | 305 13 51.0 | 125 22 07.9 | 4.398423 |
| Waseoto..... | 96 20 17.5 | 275 55 06.5 | 4.794159 |
| High Knob..... | 71 36 52.2 | 251 15 26.3 | 4.746547 |
| Clinch..... | 8 58 16.1 | 188 56 41.1 | 4.539896 |

MORRIS.

In Tazewell Co., Va., on Morris Knob, about 10 miles from Tazewell, Va. Summit level for some distance, and cleared of large timber.

Permanent mark: Rock cairn.

[Latitude, 37° 02' 57''-5. Longitude, 81° 37' 01''-6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Big Bend..... | 273 30 14.3 | 93 45 57.0 | 4.588357 |
| Ripshin..... | 315 13 20.5 | 135 22 35.7 | 4.511802 |
| Red Rock..... | 50 05 22.9 | 229 58 33.5 | 4.341566 |

PEAK.

In Pulaski Co., Va., on Peak Creek Knob, 3 miles southeast of Pulaski City, on Norfolk and Western Railroad.

Permanent mark: Long-leaved pine on edge of cliff, with blaze on southeast side of foot.

[Latitude, 37° 01' 22''-0. Longitude, 80° 44' 54''-5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Draper..... | 64 39 03.3 | 244 33 38.9 | 4.168954 |
| Big Bend..... | 90 51 17.9 | 270 35 37.3 | 4.586716 |
| Buckhorn..... | 145 32 52.3 | 325 24 28.0 | 4.560481 |
| Salt Pond..... | 207 11 47.9 | 27 19 26.7 | 4.611519 |
| Streets..... | 252 22 18.7 | 72 42 25.2 | 4.714273 |
| Buffalo..... | 316 04 45.7 | 136 14 31.5 | 4.542365 |

STONE QUARRY.

In Estill Co., Ky., 7 miles south of Irvine; west of station Camp Creek. Summit cleared on north side. Lanes cut through timber on other sides.

Permanent mark: Oak tree, east of summit.

[Latitude, $37^{\circ} 37' 56'' \cdot 2$. Longitude, $84^{\circ} 02' 33'' \cdot 1$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pilot (2) | 196 57 38 | 17 01 35 | 4·51120 |
| High Rocks | 233 14 05 | 53 23 50 | 4·46560 |
| Richmond | 118 10 05 | 298 00 37 | 4·411876 |

BEAR.

In Madison Co., Ky., 5 miles east of Berea, on Louisville and Nashville Railroad. Wagon road within 300 yards of station; all timber cut down. Permanent mark: Chestnut oak stump, 5 feet high.

[Latitude, $37^{\circ} 32' 08'' \cdot 9$. Longitude, $84^{\circ} 15' 21'' \cdot 3$.]

| To stations. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Richmond | 170 11 41·0 | 350 10 03·0 | 4·365480 |
| Pilot (2) | 214 02 34·0 | 34 14 21·0 | 4·702669 |
| Lancaster | 108 09 36·0 | 287 57 47·0 | 4·477008 |
| Brushy | 34 47 27·0 | 214 41 04·0 | 4·34232 |

LANCASTER.

Station on top of court-house, Lancaster, Garrard Co., Ky.
Permanent mark: Center of cupola.

[Latitude, $37^{\circ} 37' 10'' \cdot 5$. Longitude, $84^{\circ} 34' 43'' \cdot 3$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Richmond | 240 58 15 | 61 08 27 | 4·447482 |
| Bear | 287 57 47 | 108 09 36 | 4·477008 |
| Sand | 66 48 27 | 246 37 49 | 4·446153 |
| Brushy | 337 29 52 | 157 35 16 | 4·534883 |

SAND.

In Casey Co., Ky., near corner of Casey, Lincoln, and Boyle counties, 6 miles southwest of Junction City. Wagon road to station. Summit cleared of timber.

Permanent mark: Charred stump of tree, 15 feet high.

[Latitude, $37^{\circ} 31' 12'' \cdot 4$. Longitude, $84^{\circ} 52' 08'' \cdot 9$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lancaster | 246 37 49 | 66 48 27 | 4·446153 |
| Brushy | 297 49 39 | 118 05 38 | 4·642653 |
| Green River | 356 59 50 | 177 00 42 | 4·609318 |

BRUSHY.

In Rockcastle Co., Ky., at head of Brushy Creek, 7 miles southwest of Mount Vernon, Rockcastle Co. Summit cleared of timber.

Permanent mark: Tripod of saplings.

[Latitude, $37^{\circ} 20' 04''$.5. Longitude, $84^{\circ} 25' 51''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lancaster..... | 157 35 16 | 337 29 52 | 4 534383 |
| Bear..... | 214 41 04 | 34 47 27 | 4 434232 |
| Sand..... | 118 05 38 | 297 49 39 | 4 642653 |
| Green River..... | 61 32 39 | 241 17 36 | 4 621760 |

GREEN RIVER.

Not occupied. In Casey Co., Ky., near Pulaski Co. line, 15 miles west of Somerset. Houses near by. Summit cleared on south side, field full of dead trees on north side.

Permanent mark: Lone dead tree.

[Latitude, $37^{\circ} 09' 14''$.9. Longitude, $84^{\circ} 50' 42''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sand..... | 177 00 42 | 356 59 50 | 4 609318 |
| Brushy..... | 241 17 36 | 61 32 39 | 4 621760 |

RICHMOND.

In Madison Co., Ky. Station on main building of Richmond University. Instrument set on chimney and angles reduced to flagstaff. Connection made with astronomical station U. S. C. & G. S.

Permanent mark: Flagstaff.

[Latitude, $37^{\circ} 44' 30''$.4. Longitude, $84^{\circ} 18' 02''$.64.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pilot(2)..... | 239 30 48 | 59 44 16 | 4 572089 |
| Stone Quarry..... | 298 00 37 | 118 10 05 | 4 411876 |
| Bear..... | 350 10 03 | 170 11 41 | 4 365480 |
| Lancaster..... | 61 08 27 | 240 58 15 | 4 447482 |

WILLOUGHBY.

In Montgomery Co., Ky., 10 miles south of Mount Sterling. Station on the north side of summit in a field full of dead trees; south side

entirely cleared. Mr. Willoughby lives about one-half mile from the summit.

Permanent mark: Small oak tree.

[Latitude, $37^{\circ} 55' 39''$.8. Longitude, $83^{\circ} 53' 07''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ballard..... | 272 19 44 | 92 26 20 | 4.19743 |
| High Rocks | 328 02 21 | 148 06 21 | 4.25704 |

RACCOON.

In Laurel Co., Ky., 6 or 7 miles east of London. Lafayette McDaniel lives near station. Summit cleared of timber.

Permanent mark: A dead chestnut tree.

[Latitude, $37^{\circ} 09' 04''$.3. Longitude, $83^{\circ} 59' 29''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| King | 15 07 57 | 195 04 18 | 4.539352 |
| Paint Gap | 302 32 21 | 122 46 11 | 4.606811 |
| High Knob | 217 32 55 | 37 36 20 | 4.137989 |
| Hunter | 216 38 35 | 36 46 33 | 4.512155 |
| Pilot (1) | 242 59 12 | 63 04 52 | 4.193329 |
| Orchard | 272 10 32 | 92 19 50 | 4.358185 |

ORCHARD.

Station in peach orchard belonging to Gen. Garrard, 4 miles from Manchester, Clay Co., Ky. Summit entirely cleared.

Permanent mark: Scaffold 40 feet high.

[Latitude, $37^{\circ} 08' 35''$.2. Longitude, $83^{\circ} 44' 05''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Paint Gap | 331 44 57 | 151 49 31 | 4.375560 |
| Raccoon | 92 19 50 | 272 10 32 | 4.358185 |
| Pilot (1) | 131 58 16 | 311 54 38 | 4.076677 |

PILOT (1).

At head of Rudder Creek, Clay Co., Ky., 8 miles northwest of Manchester. All timber cut down except three small trees, middle one of which is the signal.

Permanent mark: Small tree.

[Latitude, 37° 12' 53''-8. Longitude, 83° 50' 05''-6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Orchard | 311 54 38 | 131 58 16 | 4-076677 |
| Raccoon | 63 04 52 | 242 59 12 | 4-193329 |
| Rice | 231 06 12 | 51 15 01 | 4-440279 |
| High Knob | 124 37 12 | 304 34 57 | 3-826928 |
| Hunter | 196 14 54 | 16 17 10 | 4-296360 |

PILOT (2).

Three miles north of Clay, Powell Co., Ky., near head of Black Creek.

[Latitude, 37° 51' 42''-63. Longitude, 83° 56' 05''-64.]

| To station | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Richmond | 59 44 16 | 239 30 48 | 4-511200 |
| Stone Quarry | 17 01 35 | 196 57 38 | 4-702669 |
| Bear | 34 14 21 | 214 02 34 | 4-209860 |
| Mount Sterling | 181 16 06 | 1 16 15 | |

HIGH KNOB.

Near corner of Jackson, Owsley, Clay, and Laurel counties, Ky., near head of Sexton Creek, 14 miles northwest of Manchester Summit. Cleared of timber.

Permanent mark: Oak tree.

[Latitude, 37° 14' 57''-6. Longitude, 83° 53' 49''-7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Raccoon | 37 36 20-0 | 217 32 55-0 | 4-137989 |
| Pilot | 304 34 57-0 | 124 37 12-0 | 3-826928 |

HUNTER.

At head of Island Creek, Owsley Co., Ky., three-fourths of a mile north of Island Creek Knob, 15 miles southwest of Booneville Summit, cleared.

Permanent mark: White oak tree.

[Latitude, 37° 23' 10''-0. Longitude, 83° 46' 26''-6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Pilot (1) | 16 17 10 | 196 14 54 | 4-296360 |
| Raccoon | 36 46 33 | 216 38 35 | 4-512155 |
| Gross | 229 27 41 | 49 34 15 | 4-321085 |
| Rose | 246 37 16 | 66 45 12 | 4-322187 |
| Rice | 276 06 10 | 96 12 42 | 4-204182 |

RICE.

On divide at head of Indian and Buffalo creeks, in Owsley Co., Ky. Is best reached from Booneville by road up Indian Creek. Wagon road runs within 1 mile of station. Summit partly cleared.

Permanent mark: Scaffold built on eight white oak trees.

[Latitude, $37^{\circ} 22' 14''$.3. Longitude, $83^{\circ} 35' 33''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pilot (1) | 51 15 01 | 231 06 12 | 4.440279 |
| Hunter | 96 12 42 | 276 06 10 | 4.204182 |
| Gross | 189 07 54 | 00 07 55 | 4.185112 |

TURKEY.

Near head of Buck Creek, 5 miles southwest of Booneville, Owsley Co., Ky. Summit not cleared on the west side. Wagon road to Mr. Brandenburg's, one-half mile from summit.

Permanent mark: A slender hickory tree.

[Latitude, $37^{\circ} 27' 16''$.3. Longitude, $83^{\circ} 44' 26''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gross | 245 20 58 | 65 26 23 | 4.159544 |
| Rose | 267 25 41 | 87 32 29 | 4.217351 |

ROSE.

On line between Owsley and Breathitt counties, Ky. On divide between Meadow and Turkey creeks, 9 miles east of Booneville. Wagon road runs one-half mile north of station. John Terry lives $1\frac{1}{2}$ miles east of station. Observations were made from a 20-foot platform.

Permanent mark: A chestnut oak tree.

[Latitude, $37^{\circ} 27' 39''$.7. Longitude, $83^{\circ} 33' 16''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hunter | 66 45 12 | 246 37 16 | 4.322187 |
| Gross | 147 41 30 | 327 40 07 | 3.796433 |
| Nailor | 268 32 58 | 88 38 01 | 4.088108 |
| Turkey | 87 32 29 | 267 25 41 | 4.217351 |

NAILOR.

In Breathitt Co., Ky., at head of Cane Creek and Canoe Fork, 9 miles south of Jackson. A high bare rock. Roger Spicer lives one-half mile from station on Canoe Fork.

Permanent mark: A scrubby chestnut tree.

[Latitude, $37^{\circ} 27' 49''$.5. Longitude, $83^{\circ} 24' 58''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rose | 88 38 01 | 268 32 58 | 4.088108 |
| Gross | 107 47 46 | 287 51 20 | 4.213942 |
| Nelson | 162 29 08 | 342 25 24 | 4.475289 |
| High Rocks | 138 44 18 | 318 31 05 | 4.682865 |
| Hogtown | 240 28 09 | 60 40 38 | 4.539877 |
| Cope | 206 49 01 | 26 52 45 | 4.300015 |

GROSS.

At head of north fork of Meadow Creek, on line between Owsley and Breathitt counties, Ky., 8 miles northeast of Boonville. Col. Wm. Wilson lives near station. Not cleared on highest summit. Clearing 100 yards southwest and 40 feet lower than highest summit.

Permanent mark : Chestnut oak.

[Latitude, $37^{\circ} 30' 31''$.1. Longitude, $83^{\circ} 35' 32''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rice..... | 00 07 55 | 180 07 54 | 4.185112 |
| Hunter..... | 49 34 15 | 229 27 41 | 4.321085 |
| Cope..... | 242 22 44 | 62 32 55 | 4.442788 |
| Nailor..... | 287 41 20 | 107 47 46 | 4.213942 |
| Rose..... | 327 40 07 | 147 41 30 | 3.796433 |
| Turkey..... | 65 26 23 | 245 20 58 | 4.159544 |

COPE.

At head of Frozen Creek, branch of Cope's Fork, in Breathitt Co., Ky. Capt. Cope lives 2 miles from station. Summit cleared except on north side.

Permanent mark : Hickory tree.

[Latitude, $37^{\circ} 37' 26''$.9. Longitude, $83^{\circ} 18' 51''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Nailor..... | 26 52 45 | 206 49 01 | 4.300015 |
| Gross..... | 62 32 55 | 242 22 44 | 4.442788 |
| Nelson..... | 120 45 31 | 300 38 02 | 4.320641 |
| High Rocks..... | 114 21 47 | 294 04 46 | 4.650713 |
| Hogtown..... | 272 00 57 | 92 09 43 | 4.325746 |

NELSON.

Two miles southeast of Campton, Wolf Co., Ky., on divide between Stillwater, Swift Camp, and Upper Devil creeks. Summit cleared on south and west ends. Instrument on 45-foot scaffold.

[Latitude, $37^{\circ} 43' 13''$.4. Longitude, $83^{\circ} 31' 05''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cope..... | 300 38 02 | 120 45 31 | 4.320641 |
| Nailor..... | 342 25 24 | 162 29 08 | 4.475289 |
| Ballard..... | 143 29 24 | 323 22 28 | 4.444551 |

HIGH ROCKS.

In Powell Co., Ky., near Estill Co. line, 4 miles east of Estill furnace. Summit a bare rock.

Permanent mark: Pine tree trimmed up.

[Latitude, $37^{\circ} 47' 22''$.3. Longitude, $83^{\circ} 46' 36''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cope..... | 294 04 46 | 114 21 47 | 4.650713 |
| Nailor..... | 318 31 05 | 138 44 18 | 4.682865 |
| Ballard..... | 202 51 47 | 22 54 23 | 4.20244 |
| Coburn..... | 194 54 31 | 14 56 17 | 4.21478 |
| Willoughby..... | 148 06 21 | 328 02 21 | 4.25704 |
| Stone Quarry..... | 53 23 50 | 233 14 05 | 4.46560 |

BALLARD.

In Menifee Co., Ky., on west end of Ballard Knob. Dick Powell (guide) lives $1\frac{1}{2}$ miles southeast of Rothwell Station, on coal road. Instrument on 25-foot platform.

Permanent mark: 25-foot stump.

[Latitude, $37^{\circ} 55' 18''$.4. Longitude, $83^{\circ} 42' 23''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Nelson..... | 323 22 28 | 143 29 24 | 4.444551 |
| High Rocks..... | 22 54 23 | 202 51 47 | 4.20244 |
| Coburn..... | 120 28 25 | 300 27 35 | 3.35970 |
| Willoughby..... | 92 26 20 | 272 19 44 | 4.19743 |

COBURN.

Two miles south of Rothwell Station on coal railroad, Menifee Co., Ky. Dick Powell (guide) lives at foot. Timber all cut down.

Permanent mark: Large pine tree trimmed up.

[Latitude $37^{\circ} 55' 56''$.2. Longitude $83^{\circ} 43' 43''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ballard..... | 300 27 35 | 120 28 25 | 3.35970 |
| High Rocks..... | 14 56 17 | 194 54 31 | 4.21478 |
| Mount Sterling... | 128 13 46 | 308 06 18 | 4.35341 |

SHORT.

In Hawkins Co., Tenn. On highest part of Short Mountain, 16 miles northeast of Morristown, Tenn. Summit is flat, requiring much chopping.

Permanent mark: Large oak tree standing alone on highest part.

[Latitude, $36^{\circ} 22' 52''$.6. Longitude, $83^{\circ} 10' 45''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| House..... | 60 39 14.1 | 240 18 24.1 | 4.782893 |
| McLean..... | 98 44 41.8 | 278 17 58.2 | 4.832847 |
| White Rock..... | 142 24 47.5 | 322 15 05.7 | 4.599886 |
| War Gap..... | 224 59 04.6 | 45 04 29.9 | 4.285132 |
| Chucky..... | 329 08 24.4 | 149 18 28.7 | 4.698762 |
| English..... | 11 20 20.8 | 191 16 09.7 | 4.734850 |

WAR GAP.

In Hawkins Co., Tenn., on Clinch Mountain, one-fourth of a mile west of gap of same name. There is a wagon road to within one-fourth of a mile of station; the remaining distance has to be traversed on foot. Rogersville, Tenn., 11 miles distant, is nearest railroad station.

Permanent mark: Small cedar tree.

[Latitude, $36^{\circ} 30' 14''$.7. Longitude, $83^{\circ} 01' 38''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| White Rock | 115 22 11.1 | 295 07 01.9 | 4.622433 |
| Short | 45 04 29.9 | 224 59 04.6 | 4.285132 |
| Grays Knob | 143 16 41.0 | 323 07 15.0 | 4.594655 |

DRAPER.

In Wythe Co., Va., on knob at west end of Draper Mountain, 12 miles by road and trail east of Wytheville, Va. Summit cleared.

Permanent mark: Tall chestnut left standing on summit.

[Latitude, $36^{\circ} 57' 56''$.7. Longitude, $80^{\circ} 53' 53''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Buffalo | 296 31 07.1 | 116 46 16.1 | 4.622859 |
| Rich | 351 25 20.7 | 171 27 57.3 | 4.639612 |
| Lookout | 56 06 02.8 | 215 56 21.7 | 4.611367 |

CLINCH.

On Clinch Mountain, north of Little Moccasin Gap and 13 miles northwest of Abingdon, Va., on county line between Russell and Washington counties, Va. Summit nearly level for one-eighth of a mile.

Permanent mark: Large sugar maple tree.

[Latitude, $36^{\circ} 49' 44''$.5. Longitude, $82^{\circ} 04' 46''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Big Butt | 188 56 41.1 | 8 58 16.1 | 4.399896 |
| Red Rock | 246 55 06.6 | 67 04 57.1 | 4.422822 |
| Holston | 359 44 24.8 | 179 44 29.3 | 4.615067 |
| High Knob | 98 20 19.3 | 278 00 31.5 | 4.695063 |

RED ROCK.

In Smyth Co., Va., 5 miles northwest of Saltville. This town, on branch of Norfolk and Western Railroad, is the nearest railroad station.

Permanent mark: Dead tree on northern edge of summit.

[Latitude, $36^{\circ} 55' 20''$.0. Longitude, $81^{\circ} 48' 22''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Morris..... | 229 58 33.5 | 50 05 22.9 | 4.341566 |
| Ripshin..... | 282 37 16.0 | 102 53 18.8 | 4.609925 |
| Rogers..... | 321 13 35.1 | 141 22 58.1 | 4.571462 |
| Clinch..... | 67 04 57.1 | 246 55 06.6 | 4.422822 |

RIPSHIN.

In Smyth Co., Va., on Ripshin Mountain, east of Marion, Va. Summit a long, wooded ridge. Much timber still standing back from signal.

Permanent mark: Oak tree on east end of ridge.

[Latitude, $36^{\circ} 50' 28''$.3. Longitude, $81^{\circ} 21' 37''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Big Bend..... | 217 30 32.1 | 37 36 57.5 | 4.415592 |
| Lookout..... | 318 04 45.4 | 138 11 41.1 | 4.411971 |
| Rogers..... | 39 23 32.0 | 219 16 54.6 | 4.414834 |
| Red Rock..... | 102 53 18.8 | 282 37 16.0 | 4.609925 |

BUFFALO.

A triangulation station of the U. S. C. & G. S. in Floyd Co., Va., on a rocky ridge, about 150 yards long, with no trees on the top. This ridge has two rocky elevations, one at the west end and the other at the east end of the ridge. The station is at the west end.

Permanent mark: Copper bolt driven into the solid rock.

[Latitude, $36^{\circ} 47' 46''$.26. Longitude, $80^{\circ} 28' 39''$.05.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Moore (C. & G. S.) | 338 26 35.5 | 158 33 32.7 | 4.6763536 |
| Rich..... | 52 05 47.1 | 231 53 18.6 | 4.596347 |
| Draper..... | 116 46 16.1 | 296 31 07.1 | 4.622859 |
| Poore..... | 36 25 06.9 | 216 00 55.1 | 5.0132543 |

LOOKOUT.

In Grayson Co., Va., 3 miles by road and trail north of Independence, Va., and 28 miles south of Wytheville, Va. Station on bluff of western summit. Top is nearly level and heavily timbered,

Permanent mark: Oak tree.

[Latitude, 36° 40' 04''·5. Longitude, 81° 10' 03''·2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rich..... | 288 07 25·3 | 108 19 39·8 | 4·507986 |
| Bullhead..... | 339 46 04·1 | 159 49 40·0 | 4·416687 |
| Draper..... | 215 56 21·7 | 36 06 02·8 | 4·611367 |
| Ripshin..... | 138 11 41·1 | 318 04 45·4 | 4·411971 |
| Negro..... | 42 09 07·5 | 221 58 33·2 | 4·597278 |
| Rogers..... | 88 37 51·8 | 268 24 20·4 | 4·528367 |

ROGERS.

On Mount Rogers, Balsam Mountains, Grayson Co., Va. Marion, Va., is nearest railroad station, 25 miles distant. Summit is very flat and covered with balsam timber, through which lines of sight were cut to other stations.

Permanent mark: Balsam tree on highest part.

[Latitude, 36° 39' 36''·1. Longitude, 81° 32' 42''·0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ripshin..... | 219 16 54·6 | 39 23 32·0 | 4·414834 |
| Lookout..... | 268 24 20·4 | 88 37 51·8 | 4·528367 |
| Negro..... | 345 36 45·9 | 105 39 40·6 | 4·408604 |
| Red Rock..... | 141 22 58·1 | 321 13 35·1 | 4·571462 |
| Snake..... | 21 49 15·4 | 201 43 26·8 | 4·594754 |

WHITE TOP.

On mountain of same name, near corner of Washington, Smyth, and Grayson counties, Va. Marion, 25 miles distant, is the nearest railroad station. The summit is very flat and covered with balsam timber.

Permanent mark: Lone tree on edge of cliff on eastern end of summit.

[Latitude, 36° 38' 21''·76. Longitude, 81° 36' 12''·48.]

MOORE.

A triangulation station of the U. S. C. & G. S., on Moore Knob, 7 miles by road and trail west of Danbury, Stokes Co., N. C.

[Latitude, 36° 23' 53''·60. Longitude, 80° 16' 59''·24.]

| Station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Young..... | 24 13 35·34 | 204 00 42·94 | 4·9049408 |
| Buffalo..... | 158 33 32·74 | 338 26 35·52 | 4·6763536 |
| Rich..... | 112 22 41·40 | 292 03 20·20 | 4·7201740 |
| Bullhead..... | 94 38 57·10 | 274 11 01·80 | 4·8481660 |
| Poore..... | 63 50 32·92 | 243 19 34·44 | 4·9430262 |

TURKEY COCK.

Sixteen miles west of Chatham and near Calland, near county line of Franklin, Henry, and Pittsylvania counties, Va. Summit cleared of timber.

Permanent mark: A lone chestnut oak.

[Latitude, $36^{\circ} 50' 11''$. Longitude, $79^{\circ} 39' 28''$. 25.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cahas..... | 134 27 50 | 314 14 55 | 4.649021 |
| Smith..... | 202 31 56 | 22 35 15 | 4.329907 |
| White Oak..... | 303 10 14 | 123 18 33 | 4.392873 |

WHITE OAK.

Nine miles south of Chatham, 7 miles northwest of Danville, in Pittsylvania Co., Va. Summit cleared on north end. Mr. Johnson lives on summit.

Permanent mark: Chestnut oak tree.

[Latitude, $36^{\circ} 42' 51''$. Longitude, $79^{\circ} 25' 34''$. 9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Turkey Cock..... | 123 18 33 | 303 10 14 | 4.392873 |
| Smith..... | 159 33 18 | 339 28 17 | 4.550606 |

RICH.

On Blue Ridge 12 miles north of Fisher Peak, in Patrick Co., Va. Summit flat and timbered.

Permanent mark: Oak tree.

[Latitude, $36^{\circ} 34' 37$. Longitude, $80^{\circ} 49' 31''$. 9.]

| To station. | Azimuth. | Black azimuth. | Log. dist. |
|---------------|-------------|----------------|------------|
| | ° ' " | ° ' " | Meters. |
| Buffalo..... | 231 53 18.6 | 52 05 47.1 | 4.596347 |
| Moore..... | 292 03 20.2 | 112 22 41.4 | 4.720174 |
| Draper..... | 171 27 57.3 | 351 25 20.7 | 4.639612 |
| Lookout..... | 108 19 39.8 | 288 07 25.3 | 4.507986 |
| Bullhead..... | 56 21 41.2 | 236 13 04.3 | 4.414766 |

BULLHEAD.

On Blue Ridge on the boundary between Alleghany and Wilkes counties, N. C., a few miles southeast of Sparta.

Permanent mark: A few small trees standing together.

[Latitude, $36^{\circ} 26' 49''$. Longitude, $81^{\circ} 04' 00''$. 7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rich..... | 236 13 04.3 | 56 21 41.2 | 4.414766 |
| Moore..... | 274 11 01.8 | 94 38 57.1 | 4.848166 |
| Lookout..... | 159 49 40.0 | 339 46 04.1 | 4.416687 |
| Negro..... | 82 18 58.2 | 262 04 50.3 | 4.555147 |
| Poore..... | 10 19 40.6 | 190 16 29.3 | 4.654910 |

NEGRO.

Two miles south of Jefferson, Ashe Co., N. C. There is a trail part way up the mountain, but last half mile is very steep and rocky and must be walked.

Permanent mark: Small tree on highest point.

[Latitude, $36^{\circ} 24' 11''$.6. Longitude, $81^{\circ} 27' 48''$.7.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Rogers | 165 | 39 | 40.6 | 345 | 36 | 45.9 | 4.468604 |
| Lookout | 221 | 58 | 33.2 | 42 | 09 | 07.5 | 4.597278 |
| Bullhead | 262 | 04 | 50.3 | 82 | 18 | 58.2 | 4.555147 |
| Snake | 69 | 57 | 38.3 | 249 | 48 | 56.8 | 4.368287 |
| Pooro. | 325 | 02 | 01.2 | 145 | 12 | 53.9 | 4.683388 |

SNAKE.

Station is in Watauga Co., N. C., very near Tennessee line. Abingdon, Va., is perhaps the most convenient railroad station, but is about 45 miles distant. Summit is a long, barren, rocky ridge. A guide and accommodations can be had at Lionsville, at the head of Cove Creek, 5 miles from station.

Permanent mark: Hole drilled in rock.

[Latitude, $36^{\circ} 19' 51''$.1. Longitude, $81^{\circ} 42' 28''$.2.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Rogers | 201 | 43 | 26.8 | 21 | 49 | 15.4 | 4.594754 |
| Negro | 249 | 48 | 56.8 | 69 | 57 | 38.3 | 4.368287 |
| Pooro. | 302 | 18 | 29.7 | 122 | 38 | 01.1 | 4.769059 |
| Grandfather | 20 | 45 | 23.1 | 200 | 41 | 45.2 | 4.415328 |
| Roan | 56 | 09 | 16.3 | 235 | 54 | 34.5 | 4.652679 |
| Holston | 113 | 05 | 39.5 | 292 | 52 | 30.3 | 4.556433 |

HOLSTON.

In Carter and Sullivan counties, Tenn., on range of same name, 16 miles by road southeast of Bristol, Tenn.

Permanent mark: Large oak tree.

[Latitude, $36^{\circ} 27' 27''$.3. Longitude, $82^{\circ} 04' 38''$.5.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| High Knob | 134 | 31 | 23.4 | 314 | 11 | 36.2 | 4.839025 |
| Clinch | 179 | 44 | 29.3 | 359 | 44 | 24.8 | 4.615067 |
| Snake | 292 | 52 | 30.3 | 113 | 05 | 39.5 | 4.556433 |
| Roan | 5 | 54 | 31.1 | 185 | 52 | 55.2 | 4.505290 |
| Chimney Top. | 84 | 57 | 09.8 | 264 | 14 | 44.2 | 4.753608 |

HIGH KNOB.

On Powell Mountain, at the head of Stony Creek, and on the line between Scott and Wise counties, Va., 22 miles north of Gate City.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 53' 33'' \cdot 0$. Longitude, $82^{\circ} 37' 46'' \cdot 1$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Big Butt..... | 251 | 15 | 26.3 | 71 | 36 | 52.2 | 4.746547 |
| Clinch..... | 278 | 00 | 31.5 | 98 | 20 | 19.3 | 4.695063 |
| Chimney Top..... | 7 | 20 | 44.0 | 187 | 17 | 57.9 | 4.734033 |
| Holston..... | 314 | 11 | 36.2 | 134 | 31 | 23.4 | 4.839025 |

LONG SPUR.

In Harlan Co., Ky., on Black Mountain, near the mouth of Clover Lick Creek, branch of Poor Fork of the Cumberland River.

Permanent mark: Large bushy oak $2\frac{1}{2}$ feet in diameter.

[Latitude, $36^{\circ} 56' 22'' \cdot 4$. Longitude, $83^{\circ} 02' 30'' \cdot 5$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Gray..... | 52 | 53 | 11 | 232 | 44 | 14 | 4.444875 |
| Paint Gap..... | 92 | 03 | 39 | 271 | 43 | 12 | 4.703587 |
| Harlan..... | 79 | 35 | 10 | 259 | 25 | 14 | 4.397712 |

GRAY.

In Harlan Co., Ky., on Little Black Mountain, 6 miles by road south of Harlan. Knob is sharp and top is well cleared.

Permanent mark: Double oak tree.

[Latitude, $36^{\circ} 47' 16'' \cdot 2$. Longitude, $83^{\circ} 17' 26'' \cdot 4$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| War Gap..... | 323 | 07 | 15 | 143 | 16 | 41 | 4.594655 |
| White Rocks..... | 46 | 29 | 55 | 226 | 24 | 10 | 4.295623 |
| Long Spur..... | 232 | 44 | 14 | 52 | 53 | 11 | 4.444875 |
| Harlan..... | 168 | 57 | 46 | 348 | 56 | 48 | 4.097454 |
| Paint Gap..... | 123 | 12 | 27 | 303 | 01 | 00 | 4.529809 |

HARLAN.

In Harlan Co., Ky., on Pine Mountain, 3 miles north of the town of Harlan. Trail from Harlan to Hazard passes near station.

Permanent mark: White oak 2 feet in diameter.

[Latitude $36^{\circ} 53' 54'' \cdot 7$. Longitude $83^{\circ} 19' 03'' \cdot 1$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Long Spur..... | 259 | 25 | 14 | 79 | 35 | 10 | 4.397712 |
| Gray..... | 348 | 56 | 48 | 168 | 57 | 46 | 4.097454 |

PAINT GAP.

At the head of Goose Creek, branch of South Fork of Kentucky River and Stinking Creek, of Cumberland River. On boundary between Clay and Knox counties, Ky., 20 miles by road north-north-east of Pineville. Knob is well cleared.

Permanent mark: Large oak tree to northwest of summit.

[Latitude, $36^{\circ} 57' 16''$.5. Longitude, $83^{\circ} 36' 31''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gray | 303 01 00 | 123 12 27 | 4'529809 |
| White Rocks | 336 15 36 | 156 21 17 | 4'544900 |
| Long Spur | 271 43 12 | 92 03 39 | 4'703587 |

McLEAN.

In Claiborne Co., Tenn., on Cumberland Mountain, 20 miles southwest of Cumberland Gap. Caryville, Tenn., on Kanawha and Ohio Railroad, is the nearest railroad station, distant 20 miles.

Permanent mark: Dead chestnut tree, 80 feet north of cliff.

[Latitude, $36^{\circ} 28' 19''$.8. Longitude, $83^{\circ} 55' 47''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| House | 339 48 23.4 | 159 54 11.3 | 4'629186 |
| White Rocks | 243 18 36.3 | 63 35 43.5 | 4'680563 |
| Short | 278 17 58.2 | 98 44 41.8 | 4'832847 |
| King | 160 52 57.0 | 340 47 07.0 | 4'647229 |
| Cross | 41 48 22.1 | 221 37 39.3 | 4'609123 |

WHITE ROCKS.

In Lee Co., Va., and Harlan Co., Ky., on Cumberland Mountain, 12 miles northeast of Cumberland Gap, and on the Kentucky and Virginia State line.

Permanent mark: Lone, dead, chestnut tree.

[Latitude, $36^{\circ} 39' 54''$.7. Longitude, $83^{\circ} 27' 03''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| McLean | 63 35 43.5 | 243 18 36.3 | 4'680563 |
| War Gap | 295 07 01.9 | 115 22 11.1 | 4'622433 |
| Short | 322 15 05.7 | 142 24 47.5 | 4'599886 |
| Gray | 226 24 10.0 | 46 29 55.0 | 4'295623 |
| Paint Gap | 156 21 17.0 | 336 15 36.0 | 4'544900 |
| King | 109 52 31.0 | 289 29 28.0 | 4'784457 |

KING.

In Whitley Co., Ky., 2 miles from Brummett Station, on Louisville and Nashville Railroad. Summit cleared of timber.

Permanent mark: Hickory tree.

[Latitude, $36^{\circ} 50' 59''$.9. Longitude, $84^{\circ} 05' 34''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| White Rocks | 289 29 28 | 109 52 31 | 4.784457 |
| McLean | 340 47 07 | 160. 52 57 | 4.647229 |
| Paint Gap | 254 47 58 | 75 05 24 | 4.650120 |

ROAN.

On the summit of Roan Mountain in Mitchell Co., N. C., and Carter Co., Tenn., on State line. Reached from Roan Mountain station, on East Tennessee and Western North Carolina Railroad, by regular stage line in summer, distant 12 miles. Station locally known as "High Knob."

Permanent mark: "B" cut in rock on highest point.

[Latitude, $36^{\circ} 06' 16''$.4. Longitude, $82^{\circ} 07' 20''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mitchell | 18 54 52.4 | 198 49 50.8 | 4.600175 |
| Big Bald | 69 06 27.5 | 248 53 28.2 | 4.550354 |
| Chimney Top | 122 50 21.7 | 302 29 37.7 | 4.795078 |
| Holston | 185 52 55.2 | 5 54 31.1 | 4.595299 |
| Snake | 235 54 34.5 | 56 09 16.3 | 4.652679 |
| Table Rock | 317 36 15.2 | 137 44 41.6 | 4.505777 |
| Grandfather | 268 19 43.8 | 88 30 46.0 | 4.448944 |

CHIMNEY TOP.

In Sullivan, Greene, and Hawkins counties, Tenn., on a spur of Bays Mountain, 16 miles northwest of Jonesboro, Tenn. A road and trail lead to eastern end of summit; the rest of the distance is very steep and rocky, and can not be ridden over.

Permanent mark: Pine tree just below summit.

[Latitude, $36^{\circ} 24' 28''$.9. Longitude, $82^{\circ} 42' 24''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| High Knob | 187 17 57.9 | 7 20 44.0 | 4.734033 |
| Holston | 264 14 44.2 | 84 37 09.8 | 4.753608 |
| Big Bald | 337 10 27.8 | 157 18 08.1 | 4.701716 |
| Roan | 302 29 37.7 | 122 50 21.7 | 4.795078 |

CROSS.

In Campbell and Anderson counties, Tenn., on Cross Mountain, 6 miles from Coal Creek station, on the Knoxville and Ohio Railroad. Summit is flat, bald in center, but heavily timbered around the edge.

Permanent mark: Large oak tree, from which lines of sight were cut out.

[Latitude, $36^{\circ} 11' 55''$.2. Longitude, $84^{\circ} 13' 52''$.3.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| McLean | 221 | 37 | 39.3 | 41 | 48 | 22.1 | 4.609123 |
| House | 282 | 49 | 46.2 | 103 | 06 | 12.9 | 4.632455 |
| Melton | 11 | 45 | 21.6 | 191 | 42 | 45.0 | 4.515224 |

HOUSE.

In Knox Co., Tenn., on House Mountain, 12 miles by road northeast of Knoxville, Tenn. Summit is sparsely timbered with pine; timber near the station has been cut down.

Permanent mark: Bolt in rock, set by the U. S. C. & G. S.

[Latitude, $36^{\circ} 06' 42''$.9. Longitude, $83^{\circ} 45' 59''$.9.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| English..... | 298 | 47 | 11.1 | 119 | 03 | 43.7 | 4.684020 |
| Chilhowee (1)..... | 358 | 53 | 11.2 | 178 | 53 | 28.7 | 4.585295 |
| Melton | 65 | 20 | 59.9 | 245 | 02 | 00.1 | 4.728210 |
| McLean | 159 | 54 | 11.3 | 339 | 48 | 23.4 | 4.629186 |
| Short | 240 | 18 | 24.1 | 60 | 39 | 14.1 | 4.782893 |
| Cross | 103 | 06 | 12.9 | 282 | 49 | 46.2 | 4.632455 |

POORE.

A triangulation station of the U. S. C. & G. S. in Alexander and Wilkes counties, N. C., on Poore Knob, of Brushy Mountain, 9 miles south-southeast of Wilkesboro, N. C., and 35 miles northwest of Statesville, on railroad. Moravian Falls is a good place to stop, from which there is a road and trail to station, a distance of 5 miles.

Permanent mark: Marble block 6 by 6 by 30 inches.

[Latitude, $36^{\circ} 02' 47''$.66. Longitude, $81^{\circ} 09' 24''$.25.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Negro | 145 | 12 | 53.9 | 325 | 02 | 01.2 | 4.683388 |
| Bull Head | 190 | 16 | 29.3 | 10 | 19 | 40.6 | 4.654910 |
| Buffalo | 216 | 00 | 55.17 | 36 | 25 | 06.97 | 5.0132543 |
| Moore | 243 | 19 | 34.44 | 63 | 50 | 32.92 | 4.9430292 |
| Young | 306 | 34 | 59.21 | 126 | 52 | 53.88 | 4.7586426 |
| Bear | 40 | 35 | 53.13 | 220 | 18 | 12.26 | 4.8461656 |
| Snake | 122 | 38 | 01.1 | 302 | 18 | 29.70 | 4.769059 |
| Grandfather | 97 | 10 | 24.1 | 276 | 47 | 18.6 | 4.773093 |

GRANDFATHER.

This station is the highest point anywhere on the Blue Ridge, being nearly 6,000 feet high. It is at the corner of Caldwell, Watauga, and

Mitchell counties, N. C. The nearest railroad stations are Lenoir to southeast and Cranberry to the northwest. The last 1,500 feet of ascent is very difficult and can not be made on horseback.

Permanent mark: A balsam tree.

[Latitude, $36^{\circ} 06' 41'' \cdot 5$. Longitude, $81^{\circ} 48' 36'' \cdot 9$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Roan | 88 30 46·0 | 268 19 43·8 | 4·448944 |
| Snake | 200 41 45·2 | 20 45 23·1 | 4·415328 |
| Poore | 276 47 18·6 | 97 10 24·1 | 4·773093 |
| Benn | 347 21 59·0 | 167 27 14·8 | 4·793092 |
| Table Rock | 15 02 31·7 | 194 59 57·6 | 4·403691 |
| Hibriten | 308 02 44·3 | 128 14 02·7 | 4·565110 |

TABLE ROCK.

In Burke Co., N. C. This station is on a lofty spur of the Blue Ridge. It can be reached from Morganton, N. C., by good road, 16 miles. The last 600 feet is very steep and rocky and must be walked.

Permanent mark: Cross cut in rock on highest part.

[Latitude, $35^{\circ} 53' 27'' \cdot 7$. Longitude, $81^{\circ} 52' 59'' \cdot 0$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Mitchell | 68 02 55·9 | 247 49 30·8 | 4·571149 |
| Roan | 137 44 41·6 | 317 36 15·2 | 4·505777 |
| Grandfather | 194 59 57·6 | 15 02 31·7 | 4·403691 |
| Benn | 330 48 04·5 | 150 55 52·5 | 4·616723 |

HIBRITEN.

In Caldwell Co., N. C. This station is on Brushy Mountain, a few miles east of Lenoir.

Permanent mark: A large hickory tree near southwest end of summit.

[Latitude, $35^{\circ} 54' 25'' \cdot 4$. Longitude, $81^{\circ} 29' 22'' \cdot 7$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Benn | 22 13 11·4 | 202 07 12·3 | 4·612200 |
| Grandfather | 128 14 02·7 | 308 02 44·3 | 4·565110 |

YOUNG.

A triangulation station of the U. S. C. & G. S. in Rowan Co., N. C.

[Latitude, $35^{\circ} 44' 14'' \cdot 49$. Longitude, $80^{\circ} 38' 51'' \cdot 17$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Poore | 126 52 53·88 | 306 34 59·21 | ·7586426 |
| Moore | 204 00 42·94 | 24 13 35·34 | 4·9049408 |

BENN.

A station of the U. S. C. & G. S. in Cleveland, Burke Co., N. C., on South Mountain, 18 miles south of Morganton.

Permanent mark: A marble block 6 by 6 by 30 inches with U. S. C. S. cut on top.

[Latitude, $35^{\circ} 33' 55''$.06. Longitude, $81^{\circ} 39' 37''$.56.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Hogback | 52 | 44 | 45.02 | 232 | 22 | 51.79 | 4.8581240 |
| Mitchell | 112 | 11 | 53.80 | 291 | 50 | 44.60 | 4.7713100 |
| Table Rock | 150 | 55 | 52.50 | 330 | 48 | 04.50 | 4.6167230 |
| Grandfather | 167 | 27 | 14.80 | 347 | 21 | 59.00 | 4.7930920 |
| Poore | 220 | 18 | 12.26 | 40 | 35 | 53.13 | 4.8461656 |
| Wofford | 20 | 28 | 12.08 | 200 | 18 | 41.01 | 4.8559012 |
| Hibriten | 202 | 07 | 12.30 | 22 | 13 | 11.40 | 4.6122000 |
| King | 321 | 21 | 36.22 | 141 | 33 | 41.23 | 4.7051366 |

KING.

A triangulation station of the U. S. C. & G. S. in Gaston Co., N. C.

[Latitude, $35^{\circ} 12' 27''$.87. Longitude, $81^{\circ} 18' 45''$.59.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Benn | 141 | 33 | 41.23 | 321 | 21 | 36.22 | 4.7051366 |
| Young | 225 | 34 | 52.15 | 45 | 58 | 01.68 | 4.9255300 |

ENGLISH.

In Jefferson and Cocke counties, Tenn. On highest part of English Mountain, 10 miles southwest of Newport, Tenn. Mountain is flat and nearly level for a long distance. It is heavily wooded and is not a good station.

Permanent mark: A tall oak tree, from which lines of sights were cut in the directions of the other stations.

[Latitude, $35^{\circ} 54' 04''$.9. Longitude, $83^{\circ} 17' 51''$.5.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Chilhowee (1) | 70 | 10 | 49.9 | 249 | 54 | 38.9 | 4.646266 |
| House | 119 | 03 | 43.7 | 298 | 47 | 11.1 | 4.684020 |
| Short | 191 | 16 | 09.7 | 11 | 20 | 20.8 | 4.734850 |
| Chucky | 254 | 01 | 41.9 | 74 | 15 | 52.6 | 4.576996 |

CHUCKY.

In Greene Co., Tenn., on an outlying range of bald mountains, 15 miles south-southeast of Greenville, Tenn.

Permanent mark: Small tree just below summit.

[Latitude, $35^{\circ} 59' 39'' \cdot 5$. Longitude, $82^{\circ} 53' 42'' \cdot 3$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| English | 74 15 52·6 | 254 01 41·9 | 4·576996 |
| Short | 149 18 28·7 | 329 08 24·4 | 4·698762 |

BIG BALD.

On State line, at the corner of Unicoi Co., Tenn., and Madison and Yancey counties, N. C. Jonesboro, Tenn., is nearest railroad station. No trees on summit and no permanent mark.

[Latitude, $35^{\circ} 59' 23'' \cdot 5$. Longitude, $82^{\circ} 29' 25'' \cdot 0$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Chimney Top..... | 157 18 08·1 | 337 10 27·8 | 4·701716 |
| Sandymush..... | 45 54 47·0 | 225 40 57·8 | 4·695401 |
| Mitchell | 320 46 10·4 | 140 54 05·4 | 4·507746 |
| Roan | 248 53 28·2 | 69 06 27·5 | 4·550354 |

MITCHELL.

In Yancey Co., N. C. The highest summit of Black Mountain and the highest peak east of the Rocky Mountains. The nearest railroad station is Black Mountain station on Western North Carolina Railroad. From there a road and trail lead to the summit, 18 miles distant. Very little timber obstructs the view from this station.

No permanent mark.

[Latitude, $35^{\circ} 45' 53'' \cdot 6$. Longitude, $82^{\circ} 15' 54'' \cdot 5$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hogback | 2 01 02·1 | 182 00 08·8 | 4·819174 |
| Pisgah | 49 57 35·4 | 229 40 25·1 | 4·765870 |
| Sandymush..... | 80 26 03·2 | 260 04 20·0 | 4·754281 |
| Big Bald | 140 54 05·4 | 320 46 10·4 | 4·507746 |
| Benn | 201 50 44·6 | 112 11 53·8 | 4·771310 |
| Table Rock | 247 49 30·8 | 68 02 55·9 | 4·571149 |
| Roan | 198 49 50·8 | 18 54 52·4 | 4·600175 |

BALSAM.

In Jackson and Haywood counties, N. C., on Balsam Mountain, 12 miles by road and trail south of Waynesville, N. C. Horses can be ridden to within 2 miles of the summit, but the remaining distance must be walked on account of fallen timber.

Permanent mark: Lone balsam tree.

[Latitude, 35° 22' 02".1. Longitude, 82° 59' 24".7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | c ' " | o ' " | Meters. |
| Sandymush..... | 195 36 18.2 | 15 40 00.9 | 4.554261 |
| Pisgah..... | 252 55 22.4 | 73 03 29.0 | 4.345752 |
| Rabun..... | 32 24 58.9 | 212 14 17.1 | 4.722187 |
| Pinnacle..... | 328 29 12.1 | 148 37 47.9 | 4.637371 |
| Cowee..... | 82 10 14.9 | 261 58 14.6 | 4.501722 |

PISGAH.

In the southwest corner of Buncombe and Haywood counties, N. C. It is best reached from Asheville. Summit is very sharp and rocky. The instrument was set on the highest point and no signal was used or permanent mark left.

[Latitude, 35° 25' 32".5. Longitude, 82° 45' 24".6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | o ' " | o ' " | Meters. |
| Sandymush..... | 157 42 50.3 | 337 38 24.7 | 4.481298 |
| Mitchell..... | 229 40 25.1 | 49 57 35.4 | 4.765870 |
| Balsam..... | 73 03 29.0 | 252 55 22.4 | 4.345752 |
| Pinnacle..... | 358 10 37.2 | 178 11 08.7 | 4.638736 |
| Hogback..... | 303 38 20.9 | 123 54 30.7 | 4.707685 |

SANDYMUSH.

In Buncombe, Haywood, and Madison counties, N. C., on Newfound range, distant 26½ miles from Asheville, N. C. There is a good road and trail from Thomas Ferguson's house, 3½ miles from station.

Permanent mark: Chestnut tree, trimmed.

[Latitude, 35° 40' 41".7. Longitude, 82° 53' 01".4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | o ' " | o ' " | Meters. |
| Big Bald..... | 225 40 57.8 | 45 54 47.0 | 4.605401 |
| Mitchell..... | 260 04 20.0 | 80 26 00.2 | 4.754281 |
| Pisgah..... | 337 38 24.7 | 157 42 50.3 | 4.481298 |
| Balsam..... | 15 40 00.9 | 195 36 18.2 | 4.554261 |

THUNDERHEAD.

On the Great Smoky Mountains on the boundary between Swain Co., N. C., and Blount Co., Tenn. Bryson, N. C., is the nearest railroad station on the North Carolina side, and Marysville on the Tennessee side. The nearest settlement on the south side is Mr. Hall's, from which there is a good trail to station, 6 miles distant.

Permanent mark: Clump of laurel bushes on highest summit.

[Latitude, $35^{\circ} 34' 06''$.8. Longitude, $83^{\circ} 42' 22''$.5.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Chilhowee (2)..... | 96 | 31 | 53.6 | 276 | 21 | 22.0 | 4.439392 |
| Chilhowee (1)..... | 167 | 48 | 44.2 | 347 | 46 | 54.8 | 4.348599 |
| Cowee..... | 308 | 22 | 32.4 | 128 | 35 | 25.2 | 4.632765 |
| Cheowah..... | 355 | 04 | 54.3 | 175 | 05 | 47.5 | 4.432219 |
| Christie Peak..... | 49 | 46 | 32.3 | 229 | 37 | 22.3 | 4.495836 |

CHILHOWEE (2).

In Blount Co., Tenn., on Chilhowee range, 6 miles by road and trail southwest of Montvale Springs Hotel. Marysville, Tenn., is the nearest railroad station, 15 miles distant.

Permanent mark: Pine tree.

[Latitude, $35^{\circ} 35' 46''$.9. Longitude, $84^{\circ} 00' 28''$.0.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Guide..... | 49 | 59 | 05.4 | 229 | 51 | 11.6 | 4.429081 |
| Roy Knob..... | 78 | 45 | 33.6 | 258 | 30 | 15.7 | 4.607927 |
| Melton..... | 142 | 21 | 58.5 | 322 | 11 | 13.1 | 4.642955 |
| Thunderhead..... | 276 | 21 | 22.0 | 96 | 31 | 53.6 | 4.439392 |
| Chilhowee (1)..... | 230 | 15 | 40.5 | 50 | 24 | 24.2 | 4.467369 |

CHILHOWEE (1).

In Blount Co., Tenn., on Chilhowee range, 1 mile southwest of Millstone Gap. Marysville, Tenn., is nearest railroad station, 16 miles distant.

Permanent mark: One chestnut and one hickory tree standing together.

[Latitude, $35^{\circ} 45' 54''$.5. Longitude, $83^{\circ} 45' 30''$.1.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Chilhowee (2)..... | 50 | 24 | 24.2 | 230 | 15 | 40.5 | 4.467369 |
| Melton..... | 108 | 08 | 44.8 | 287 | 49 | 32.3 | 4.715486 |
| House..... | 178 | 53 | 28.7 | 358 | 53 | 11.2 | 4.585295 |
| English..... | 249 | 54 | 38.9 | 70 | 10 | 49.9 | 4.646266 |
| Thunderhead..... | 347 | 46 | 54.8 | 167 | 48 | 44.2 | 4.348599 |

MELTON.

A triangulation station of the U. S. C. & G. S., Roane Co., Tenn. Nearest railroad station is Lenoir, about 12 miles distant. Summit is long, flat, and heavily timbered.

Permanent mark: Marble block 6 by 6 by 30 inches.

[Latitude, $35^{\circ} 54' 34''\cdot 8$. Longitude, $84^{\circ} 18' 18''\cdot 4$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cross | 191 42 45·0 | 11 45 21·6 | 4·515224 |
| House | 245 02 00·1 | 65 20 59·9 | 4·728210 |
| Chilhowee (1)..... | 287 49 32·3 | 108 08 44·8 | 4·715486 |
| Chilhowee (2)..... | 322 11 13·1 | 142 21 38·5 | 4·642955 |
| Boy Knob | 16 40 03·5 | 196 35 07·0 | 4·649520 |
| Hinch | 77 01 58·5 | 256 38 18·7 | 4·795756 |

COWEE.

In Macon, Jackson, and Swain counties, N. C. This station is on Cowee Ridge, 9 miles west of Webster, N. C. House of James Buchanan, on Green Creek, 6 miles from Webster and 3 miles from the triangulation station, is a convenient stopping place.

Permanent mark: Small oak tree.

[Latitude, $35^{\circ} 19' 39''\cdot 9$. Longitude, $83^{\circ} 20' 10''\cdot 0$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Thomas Bald | 29 36 26·3 | 209 29 27·5 | 4·571563 |
| Cheowah | 89 39 45·8 | 269 27 48·4 | 4·496065 |
| Thunderhead | 128 35 25·2 | 308 22 32·4 | 4·632765 |
| Balsam | 261 58 14·6 | 82 10 14·9 | 4·501722 |
| Rabun | 355 16 54·5 | 175 18 09·8 | 4·605596 |

HOGBACK.

A triangulation station of the U. S. C. & G. S. in Greenville Co., S. C. A summit of the Blue Ridge, 10 miles southeast of Saluda, N. C. This is a very flat mountain, but nearly all the timber has been cut.

Permanent mark: Marble block 6 by 6 by 30 inches.

[Latitude, $35^{\circ} 10' 12''\cdot 25$. Longitude, $82^{\circ} 17' 26''\cdot 34$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pinnacle | 69 54 49·28 | 249 39 15·61 | 4·6416975 |
| Pisgah | 123 54 30·70 | 303 38 20·30 | 4·7076850 |
| Paris | 23 27 52·72 | 203 23 43·61 | 4·4415437 |
| Benn | 232 22 51·79 | 52 44 45·02 | 4·8581240 |
| Mitchell | 182 00 08·80 | 2 01 02·10 | 4·8197740 |

PINNACLE.

In Pickens Co., S. C., on a spur of the Blue Ridge. Greenville is the nearest railroad station.

Permanent mark: A marble block 6 by 6 by 30 inches, placed there by the U. S. C. & G. S.

[Latitude, 35° 02' 00"·85. Longitude, 82° 44' 30"·02.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rabun | 81 43 40·71 | 261 24 28·30 | 4·7118767 |
| Balsam | 148 37 47·90 | 328 29 12·10 | 4·6373710 |
| Pisgah | 178 11 08·70 | 358 10 37·20 | 4·6387360 |
| Mauldin | 337 23 21·00 | 157 27 01·39 | 4·4055863 |
| Hogback | 249 39 15·61 | 69 54 49·28 | 4·6416975 |

THOMAS BALD.

Also called Standing Indian Mountain, in Macon Co., N. C., and near the Georgia State line, at head of Nantahalal River, North Carolina, and Tallulah River, Georgia. Tallulah Falls, Ga., is nearest railroad station. Summit is a long, barren, rocky ridge.

Permanent mark: Rock cairn.

[Latitude, 35° 02' 07"·3. Longitude, 83° 32' 16"·8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blood | 48 09 33·5 | 227 55 51·9 | 4·690619 |
| Tusquittah | 125 22 42·6 | 305 16 12·6 | 4·323497 |
| Cheowah | 158 02 57·7 | 337 58 01·6 | 4·540647 |
| Rabun | 289 33 19·3 | 109 41 31·1 | 4·363354 |
| Cowee | 209 29 27·5 | 29 36 26·3 | 4·571563 |

PACK.

On highest part of Pack Mountain, Cherokee Co., N. C., 21 miles west of Murphy by road and trail; easy of ascent.

Permanent mark: Two trees standing together.

[Latitude, 35° 03' 00"·9. Longitude, 84° 17' 10"·0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Haw Knob | 219 21 31·9 | 39 30 30·4 | 4·570986 |
| Tusquittah | 258 10 54·9 | 78 30 13·4 | 4·716895 |
| Blood | 317 05 02·1 | 137 17 01·1 | 4·671646 |
| Cowpen | 55 59 46·7 | 235 49 52·6 | 4·501706 |
| Chilhowee (4) | 104 59 45·6 | 284 48 12·3 | 4·499915 |

GRINDSTONE.

In James and Bradley counties, Tenn. On the Grindstone Mountains, 3 miles east of Ooltewah and 11 miles west of Cleveland, Tenn. Summit very flat, but mostly cleared.

Permanent mark: Tall oak tree.

[Latitude, 35° 04' 18''-0. Longitude, 85° 01' 18''-6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Chilhowee (4)..... | 260 56 17-0 | 81 10 06-4 | 4-568020 |
| Rocky Face..... | 7 19 24-1 | 177 19 53-1 | 4-439467 |
| High Point..... | 55 50 16-2 | 235 37 31-6 | 4-612271 |

TUSQUITTAH.

On highest part of Tusquittah Mountains, Clay Co., N. C. The Summit is nearly bald. It is reached from Valleytown by a good road and trail.

[Latitude, 35° 08' 42''-5. Longitude, 83° 43' 35''-2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Haw Knob..... | 123 48 43-8 | 303 38 20-8 | 4-516385 |
| Cheowah..... | 191 43 13-3 | 11 44 53-2 | 4-310650 |
| Blood..... | 23 13 14-0 | 203 05 59-8 | 4-689405 |
| Thomas Bald..... | 305 16 12-6 | 125 22 42-6 | 4-323497 |
| Pack..... | 78 30 13-4 | 258 10 54-9 | 4-716895 |

CHILHOWEE (4).

Knob at south end of Beans Mountain, Polk Co., Tenn., 6 miles by road and trail south-southeast of Benton, Tenn. Cleveland is nearest railroad station, 21 miles distant.

Permanent mark: Tall oak tree.

[Latitude, 35° 07' 24''-7. Longitude, 84° 37' 16''-2.

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Haw Knob..... | 248 58 13-8 | 69 18 48-4 | 4-763014 |
| Pack..... | 284 48 12-3 | 104 59 45-6 | 4-499915 |
| Cowpen..... | 350 33 47-4 | 170 35 24-7 | 4-419569 |
| Roy Knob..... | 199 38 00-3 | 19 44 04-4 | 4-674199 |
| Texas..... | 130 26 56-9 | 310 16 55-7 | 4-538978 |
| Grindstone..... | 81 10 06-4 | 260 56 17-0 | 4-568029 |

TEXAS.

In Meigs Co., Tenn., highest of Texas Knobs, 14 miles by road north of Cleveland, Tenn. Summit wooded, but all obstructing timber has been cut down, except on east end.

Permanent mark: Chestnut tree.

[Latitude, 35° 19' 31''-7. Longitude, 84° 54' 38''-4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Harvey..... | 102 06 36-1 | 281 53 13-7 | 4-553740 |
| Hinch..... | 173 04 49-4 | 353 02 27-3 | 4-707236 |
| Roy Knob..... | 242 15 06-1 | 62 31 15-3 | 4-677625 |
| Chilhowee (4)..... | 310 16 55-7 | 130 26 56-9 | 4-538978 |

HARVEY.

In Sequatchie Co., Tenn, on west side of Walden Ridge, between Henson and Alexander Gaps, near Raven Cliff. It can be reached from Dunlap, in the Sequatchie Valley, or from Rathburn (Soddy Iron Works) on the Cincinnati, New Orleans and Texas Pacific Railroad. It is the highest summit on ridge, and is flat and heavily timbered.

Permanent mark: Oak tree.

[Latitude, $35^{\circ} 23' 33'' \cdot 1$. Longitude, $85^{\circ} 17' 44'' \cdot 9$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hinch | 213 35 13·2 | 33 46 17·8 | 4·714751 |
| Texas | 281 53 13·7 | 102 06 36·1 | 4·553740 |

HAW KNOB.

On the boundary line between Monroe Co., Tenn., and Graham Co., N. C. It can be reached from Murphy, N. C., by road and trail; distance 24 miles. Summit is flat and covered with huckleberry bushes 20 feet high.

Permanent mark: Clump of saplings on highest part.

[Latitude, $35^{\circ} 18' 34'' \cdot 2$. Longitude, $84^{\circ} 01' 35'' \cdot 2$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Christie Peak | 211 23 38·1 | 31 25 36·8 | 3·997389 |
| Tusquittah | 303 38 20·8 | 123 48 43·8 | 4·516385 |
| Cheowah | 266 38 41·4 | 86 50 40·9 | 4·498134 |
| Pack | 39 30 30·4 | 219 21 31·9 | 4·570986 |
| Chilhowee (4) s. | 69 18 48·4 | 248 58 13·8 | 4·763014 |

CHRISTIE PEAK.

In Graham Co., N. C., about three miles from the Tennessee boundary. Can be reached by going up Little Santeetla Creek, thence by rough trail to station.

Permanent mark: Small clump of birch trees on highest part of summit.

[Latitude, $35^{\circ} 23' 09'' \cdot 4$. Longitude, $83^{\circ} 58' 10'' \cdot 1$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Thunderhead | 229 37 22·3 | 49 46 32·3 | 4·495836 |
| Cheowah | 284 13 47·3 | 104 23 48·7 | 4·432687 |
| Haw Knob | 31 25 36·8 | 211 23 38·1 | 3·997389 |

GUIDE.

Also known as Peaked Top, in Monroe Co., Tenn. Sweetwater, Tenn., is the nearest railroad station, 22 miles distant. Madiscnville is 10 miles northwest.

Permanent mark: Dead chestnut tree.

[Latitude, 35° 26' 25"-8. Longitude, 84° 14' 03"-6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Roy Knob | 115 52 38.8 | 295 45 16.1 | 4.329587 |
| Chilhowee (2)..... | 229 51 11.6 | 49 59 05.4 | 4.429081 |

ROY KNOB.

In Monroe Co., Tenn., on Roy Knob, 8 miles by road south of Sweetwater, Tenn.

Permanent mark: Large oak tree.

[Latitude, 35° 31' 27"-6. Longitude, 84° 26' 46"-3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Molton | 196 35 07.0 | 16 40 03.5 | 4.649520 |
| Chilhowee (4)..... | 19 44 04.4 | 199 38 00.3 | 4.674199 |
| Chilhowee (2)..... | 258 30 15.7 | 78 45 33.6 | 4.607927 |
| Guide | 295 45 16.1 | 115 52 38.8 | 4.329587 |
| Texas | 62 31 15.3 | 242 15 06.1 | 4.677625 |

HINCH.

In Cumberland Co., Tenn. This station of the U. S. C. & G. S. is 12 miles northwest of Spring City, Tenn., and 3 miles west of Jewett, on Narrow Gauge Railroad. The summit is flat and wooded.

Permanent mark: U. S. C. & G. S. mark + in rock.

[Latitude, 35° 46' 53"-1. Longitude, 84° 58' 42"-8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Melton | 256 38 18.7 | 77 01 58.5 | 4.795756 |
| Texas | 353 02 27.3 | 173 04 49.4 | 4.707236 |
| Harvey..... | 33 46 17.8 | 213 35 13.2 | 4.714751 |

CHEOWAH.

The highest summit of Cheowah Mountains, Graham Co., N. C. It is entirely bald. The railroad passes within a few miles of station.

Permanent mark: Rock cairn.

[Latitude, 35° 19' 32"-2. Longitude, 83° 40' 50"-7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Haw Knob..... | 86 50 40.9 | 266 38 41.4 | 4.498134 |
| Christie Peak | 164 23 48.7 | 284 13 47.3 | 4.432687 |
| Thunderhead..... | 175 05 47.5 | 355 04 54.3 | 4.432219 |
| Cowee..... | 269 27 48.4 | 89 39 45.8 | 4.490665 |
| Thomas Bald..... | 337 58 01.5 | 158 02 57.7 | 4.540647 |
| Tusquittah..... | 11 44 53.2 | 191 43 18.3 | 4.310650 |

WOFFORD.

Primary triangulation station of the U. S. C. & G. S. in Spartanburg Co., S. C.

[Latitude, $34^{\circ} 57' 32''$.31. Longitude, $81^{\circ} 56' 06''$.73.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| King | 243 53 48.85 | 64 15 17.00 | 4.8002103 |
| Benn | 200 18 41.01 | 20 28 12.08 | 4.8559012 |

PARIS.

A triangulation station of the U. S. C. & G. S. in Greenville Co., S. C.

[Latitude, $34^{\circ} 56' 29''$.27. Longitude, $82^{\circ} 24' 40''$.05.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hogback | 203 23 43.61 | 23 27 52.72 | 4.4415437 |
| Wofford | 267 18 17.75 | 87 34 39.25 | 4.6386551 |

MAULDIN.

A triangulation station of the U. S. C. & G. S. in Pickens Co., S. C.

[Latitude, $34^{\circ} 49' 18''$.46. Longitude, $82^{\circ} 38' 05''$.09.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pinnacle..... | 157 27 01.39 | 337 23 21.00 | 4.4055863 |
| Paris | 236 56 15.41 | 57 03 55.80 | 4.3869655 |

RABUN.

A triangulation station of the U. S. C. & G. S. on Blue Ridge, Rabun Co., Ga., at head of Little Tennessee River. The summit is sharp, rocky, and barren. Walhalla, S. C., is the nearest railroad station.

Permanent mark of the U. S. C. & G. S. could not be identified.

[Latitude, $34^{\circ} 57' 55''$.75. Longitude $83^{\circ} 17' 59''$.27.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blood..... | 66 55 55.20 | 246 34 04.20 | 4.8022677 |
| Thomas Bald..... | 109 41 31.10 | 289 33 19.30 | 4.363354 |
| Cowee | 175 13 09.80 | 355 16 54.50 | 4.605596 |
| Balsam | 212 14 17.10 | 32 24 58.90 | 4.722187 |
| Currahee | 8 13 04.00 | 188 19 27.80 | 4.6892851 |
| Pinnacle..... | 261 24 28.30 | 81 43 40.70 | 4.7118767 |

INDIAN.

A triangulation station of the U. S. C. & G. S. in Cherokee Co., Ala.

[Latitude, $34^{\circ} 01' 49''$.94. Longitude, $85^{\circ} 25' 31''$.10.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lavender | 201 16 30.8 | 21 21 07.6 | 4.5405243 |
| Carnes | 276 05 35.7 | 96 19 24.2 | 4.5823753 |

LAVENDER.

A triangulation station of the U. S. C. & G. S. Station on highest peak of Lavender range, in Floyd Co., Ga., about 12 miles west of Rome.
Permanent mark: Granite post.

[Latitude, $34^{\circ} 19' 19''$.58. Longitude, $85^{\circ} 17' 18''$.39.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pine Log | 269 51 12.99 | 90 13 15.05 | 4.7777508 |
| Carnes | 325 09 30.87 | 145 18 45.80 | 4.6473879 |
| Johns | 207 33 58.84 | 27 40 26.35 | 4.5761765 |

PINE LOG.

A triangulation station of the U. S. C. & G. S. in Bartow Co., Ga.

[Latitude, $34^{\circ} 19' 18''$.31. Longitude, $84^{\circ} 38' 13''$.66.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sawnee | 282 00 16.00 | 102 16 21.90 | 4.6519200 |
| Grassy | 236 55 18.70 | 57 05 40.60 | 4.5252408 |
| Johns | 128 24 22.93 | 308 08 43.29 | 4.7321290 |

SWEAT.

A triangulation station of the U. S. C. & G. S. in Cobb Co., Ga.

[Latitude, $34^{\circ} 04' 01''$.44. Longitude, $84^{\circ} 27' 21''$.54.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pine Log | 149 27 57.15 | 329 21 50.66 | 4.5160840 |
| Sawnee | 235 15 58.91 | 55 25 55.50 | 4.5197394 |

SAWNEE.

A triangulation station of the U. S. C. & G. S. in Forsyth Co., Ga.

[Latitude, $34^{\circ} 14' 12''$. Longitude, $84^{\circ} 09' 38''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Grassy | 150 29 49.72 | 330 24 03.05 | 4.5027518 |
| Skitt | 233 23 19.17 | 53 38 10.60 | 4.7005389 |

GULF POINT.

A triangulation station of the U. S. C. & G. S. in Walker Co., Ga., on Lookout Mountain, near "The Gulf," 33 miles by road and trail south of Chattanooga, Tenn. Summit is flat except east of station. All large timber cut down.

Permanent mark: Marble block 6 by 6 by 30 inches of the U. S. C. & G. S.

[Latitude, $34^{\circ} 37' 32''$. Longitude, $85^{\circ} 28' 02''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| High Point | 194 32 12.07 | 14 34 45.8 | 4.436212 |
| Johns | 270 21 38.30 | 90 34 13.30 | 4.5295379 |
| Brandon | 44 41 02.50 | 224 31 18.9 | 4.5731889 |
| Gunter | 84 36 45.60 | 264 12 44.6 | 4.812768 |

JOHNS.

A triangulation station of the U. S. C. & G. S. in Walker Co., Ga., 1 mile south of north end of Johns Mountain, 21 miles south of Ringgold, 3 miles south of Villanow.

Permanent mark: Marble block of U. S. C. & G. S., 6 by 6 by 30 inches.

[Latitude, $34^{\circ} 37' 23''$. Longitude, $85^{\circ} 05' 53''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gulf Point | 90 34 13.30 | 270 21 38.30 | 4.5295379 |
| High Point | 134 50 00.20 | 314 39 56.70 | 4.578956 |
| Rocky Face | 200 22 30.60 | 20 25 36.10 | 4.376078 |
| Pine Log | 308 08 43.29 | 128 24 22.93 | 4.7321290 |
| Lavender | 27 40 26.35 | 207 33 58.84 | 4.5761765 |

BRANDON.

A triangulation station of the U. S. C. & G. S. in DeKalb Co., Ala.

[Latitude, $34^{\circ} 23' 07''$. Longitude, $85^{\circ} 45' 12''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Indian | 322 21 48.3 | 142 32 52.6 | 4.6958379 |
| Gulf Point | 224 31 18.9 | 44 41 02.5 | 4.5731889 |

GUNTER.

A triangulation station of the U. S. C. & G. S. in Madison Co., Ala.

[Latitude, $34^{\circ} 34' 06''$.83. Longitude, $86^{\circ} 10' 20''$.30.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gulf Point..... | 264 12 44.6 | 84 36 45.6 | 4.612768 |
| Aurora..... | 1 16 13.0 | 181 15 50.1 | 4.070381 |

HIGH POINT.

A triangulation station of U. S. C. & G. S. in Walker Co., Ga., on Lookout Mountain, south of Nickajack Gap, 13 miles south-southwest of Chattanooga, Tenn. Summit is barren and rocky; all timber cut down..

Permanent mark: Hole drilled in rock, with arrow.

[Latitude, $34^{\circ} 51' 49''$.8. Longitude, $85^{\circ} 23' 32''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Grindstone..... | 235 37 31.60 | 55 50 16.20 | 4.612271 |
| Rocky Face..... | 277 03 05.20 | 97 16 16.20 | 4.549672 |
| Gulf..... | 14 34 45.80 | 194 32 12.07 | 4.436212 |
| Johns..... | 314 39 56.70 | 134 50 00.20 | 4.578956 |

ROCKY FACE.

A triangulation station of the U. S. C. & G. S. in Whitfield Co., Ga. It is a rounded knob on Rocky Face Mountain, 3 miles east of Tunnel Hill, Ga., and about 6 miles northwest of Dalton, Ga.

Permanent mark: Small lone tree.

[Latitude, $34^{\circ} 49' 26''$.3. Longitude, $85^{\circ} 00' 28''$.10.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Grindstone..... | 177 19 53.1 | 7 19 24.1 | 4.439467 |
| Cowpen..... | 259 26 13.3 | 79 41 05.8 | 4.605691 |
| Johns..... | 20 25 36.1 | 200 22 30.6 | 4.376078 |
| High Point..... | 97 16 16.2 | 277 03 05.2 | 4.549672 |

GRASSY.

A triangulation station of the U. S. C. & G. S. in Lumpkin Co., Ga.

[Latitude, $34^{\circ} 29' 10''$.58. Longitude, $84^{\circ} 19' 53''$.05.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blood..... | 232 01 29.60 | 52 14 56.10 | 4.6610442 |
| Sawnee..... | 330 24 03.05 | 150 29 49.72 | 4.5027518 |
| Pine Log..... | 57 05 40.60 | 236 55 18.70 | 4.5252408 |

SKITT.

A triangulation station of the U. S. C. & G. S. in Hall Co., Ga.

[Latitude, $34^{\circ} 30' 20''$.56. Longitude, $83^{\circ} 43' 19''$.84.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blood | 142 52 20.69 | 322 45 01.27 | 4.5131465 |
| Currahee | 295 12 57.37 | 85 24 43.72 | 4.5038010 |

CURRAHEE.

A triangulation station of the U. S. C. & G. S. in Habersham Co., Ga.

[Latitude, $34^{\circ} 31' 45''$.13. Longitude, $83^{\circ} 22' 33''$.32.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rabun | 188 10 27.80 | 8 13 04.00 | 4.6892851 |
| Mauldin | 244 15 00.38 | 64 40 18.43 | 4.8767020 |

BLOOD.

A triangulation station of the U. S. C. & G. S. on Blue Ridge, in Lumpkin and Union counties, Ga. Clarksville is nearest railroad station. Summit barren and rocky.

Permanent mark: Copper bolt in solid rock.

[Latitude, $34^{\circ} 44' 23''$.24. Longitude, $83^{\circ} 56' 13''$.23.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Grassy | 52 14 56.10 | 232 01 29.60 | 4.6610442 |
| Cowpen | 106 07 23.00 | 285 45 33.70 | 4.7825770 |
| Pack | 137 17 01.10 | 317 05 02.10 | 4.6716460 |
| Tusquittah | 203 05 59.80 | 23 13 14.00 | 4.6894050 |
| Skitt | 322 45 01.27 | 142 52 20.69 | 4.5131465 |
| Rabun | 246 34 04.20 | 66 55 55.20 | 4.8022677 |
| Thomas Bald | 227 55 51.90 | 48 09 33.50 | 4.6906190 |

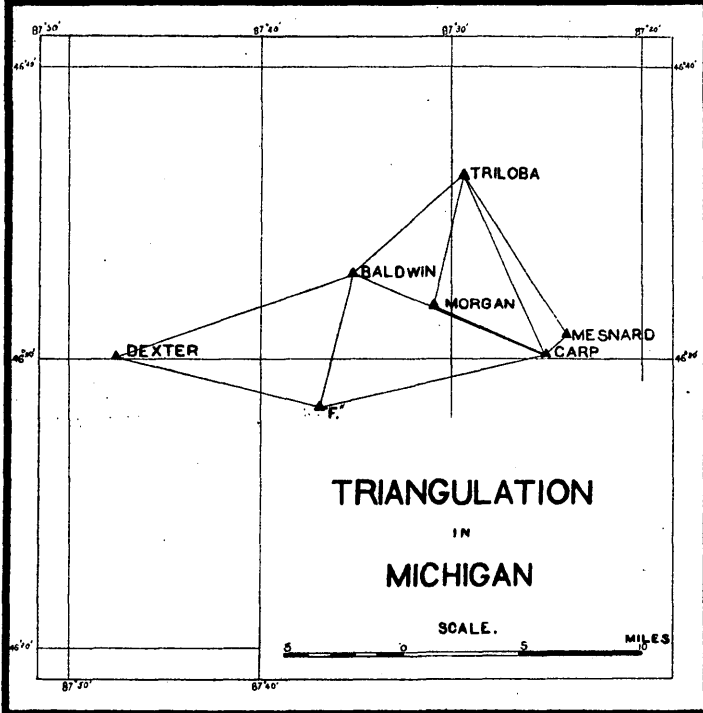
COWPEN.

Highest summit of Cohutta Mountain, Fannin Co., Ga., 7 miles by trail from nearest road on south side. Summit flat and timbered on north end.

Permanent mark: Rock cairn.

[Latitude, $34^{\circ} 53' 23''$.5. Longitude, $84^{\circ} 34' 26''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Chillhowee (4) | 170 35 24.7 | 350 33 47.4 | 4.419569 |
| Pack | 235 49 52.6 | 55 59 46.7 | 4.501706 |
| Blood | 285 45 33.7 | 106 07 23.0 | 4.782577 |
| Rocky Face | 79 41 05.8 | 259 26 13.3 | 4.605691 |



MICHIGAN.

METHODS OF WORK.

A narrow belt of triangulation was extended westward from Marquette in 1889. It rested upon two stations of the U. S. Lake Survey, Mesnard-Triloba. Angles were measured with a Schilling 6½-inch theodolite by F. J. Knight. Stations were selected on rocky knobs on either side of the railroad.

DESCRIPTIONS AND POSITIONS OF STATIONS.

MESNARD.

A U. S. Lake Survey station in Marquette Co., Mich., 2 miles south of Marquette. Height of ground at station is 522 feet above Lake Superior.

Permanent mark: A cross cut in solid rock, which is about 3 feet below surface soil.

[Latitude, 46° 30' 48"·34. Longitude, 87° 23' 59"·23.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|------|---------------|----|------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Triloba | 146 | 00 | 24·0 | 325 | 56 | 29·8 | 4·089203 |
| Carp | 47 | 50 | 48·0 | 227 | 50 | 00·0 | 3·28232 |

F.

Station on high, rocky knob, 3 miles southeast of Ishpeming, in Marquette Co., Mich., and 1½ miles northeast of the highest hill of the range.

Permanent mark: A cross cut in solid rock.

[Latitude, 46° 28' 18"·28. Longitude, 87° 36' 55"·47.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|----|---------------|----|----|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Baldwin | 195 | 12 | 54 | 15 | 14 | 14 | 3·95166 |
| Carp | 257 | 27 | 22 | 77 | 35 | 57 | 4·19038 |
| Dexter | 103 | 22 | 16 | 283 | 14 | 33 | 4·14590 |

BALDWIN.

On a granite ridge, about 4 miles north of Negaunee, in Marquette Co., Mich., one-half mile west of gap through which passed the old charcoal tramway to Morgan Furnace.

Permanent mark: Cross cut on small, firm boulder projecting a few inches above ground.

[Latitude, $46^{\circ} 32' 57''$.85. Longitude, $87^{\circ} 35' 05''$.25.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Triloba..... | 229 46 13 | 49 50 22 | 3.98107 |
| Carp..... | 292 24 44 | 112 31 59 | 4.14069 |
| Dexter..... | 71 20 23 | 251 11 20 | 4.22661 |
| F..... | 15 14 14 | 195 12 54 | 3.95166 |

DEXTER.

On quartzite knob, south of the Dexter mine, one-half mile south of Golden Station, on Chicago and Northwestern Railroad, in Marquette Co., Mich., on highest point on north end of rock outcrop.

Permanent mark: Cross cut in solid rock.

[Latitude, $46^{\circ} 30' 02''$.57. Longitude, $87^{\circ} 47' 33''$.91.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Baldwin..... | 251 11 20 | 71 20 23 | 4.22661 |
| F..... | 283 14 33 | 103 22 16 | 4.14590 |

CARP.

A wooded hill 3 miles southwest of Marquette; in Marquette Co., Mich. Part of timber has been cut down.

Permanent mark: A small evergreen tree on highest part.

[Latitude, $46^{\circ} 30' 06''$.70. Longitude, $87^{\circ} 25' 05''$.84.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Morgan..... | 112 51 46 | 292 47 32 | 3.90759 |
| F..... | 77 35 57 | 257 27 22 | 4.19038 |
| Baldwin..... | 112 31 59 | 292 24 44 | 4.14069 |
| Mesnard..... | 227 50 00 | 47 50 48 | 3.28232 |

MORGAN.

A steep hill about 1 mile north of old Morgan furnace, in Marquette Co., Mich. Station on high rock on south side of summit. Highest point not occupied because of a tree in line with Baldwin signal about half way between them.

Permanent mark: Cross cut in rock.

[Latitude, $46^{\circ} 31' 48''$. 26. Longitude, $87^{\circ} 30' 55''$. 32.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Triloba..... | 193 26 16 | 13 27 34 | 3.93258 |
| Carp..... | 292 47 32 | 112 51 46 | 3.90759 |

TRILOBA.

U. S. Lake Survey Station, 7 miles northwest of Marquette, on Mount Crissy, or Crispy, in Marquette Co., Mich. It is a bald granite knob about 3 miles southwest of Granite Point. Height of station above Lake Superior, 635 feet.

Permanent mark: A brass frustum leaded into the solid rock.

[Latitude, $46^{\circ} 36' 17''$. 94. Longitude, $87^{\circ} 29' 21''$. 83.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Carp..... | 334 31 57.0 | 154 35 03.0 | 4.103610 |
| Baldwin..... | 49 50 22.0 | 229 46 13.0 | 3.981070 |
| Morgan..... | 13 27 34.0 | 193 26 16.0 | 3.992580 |
| Mesnard..... | 325 56 29.8 | 146 00 24.0 | 4.089203 |

ARKANSAS.

METHODS OF WORK.

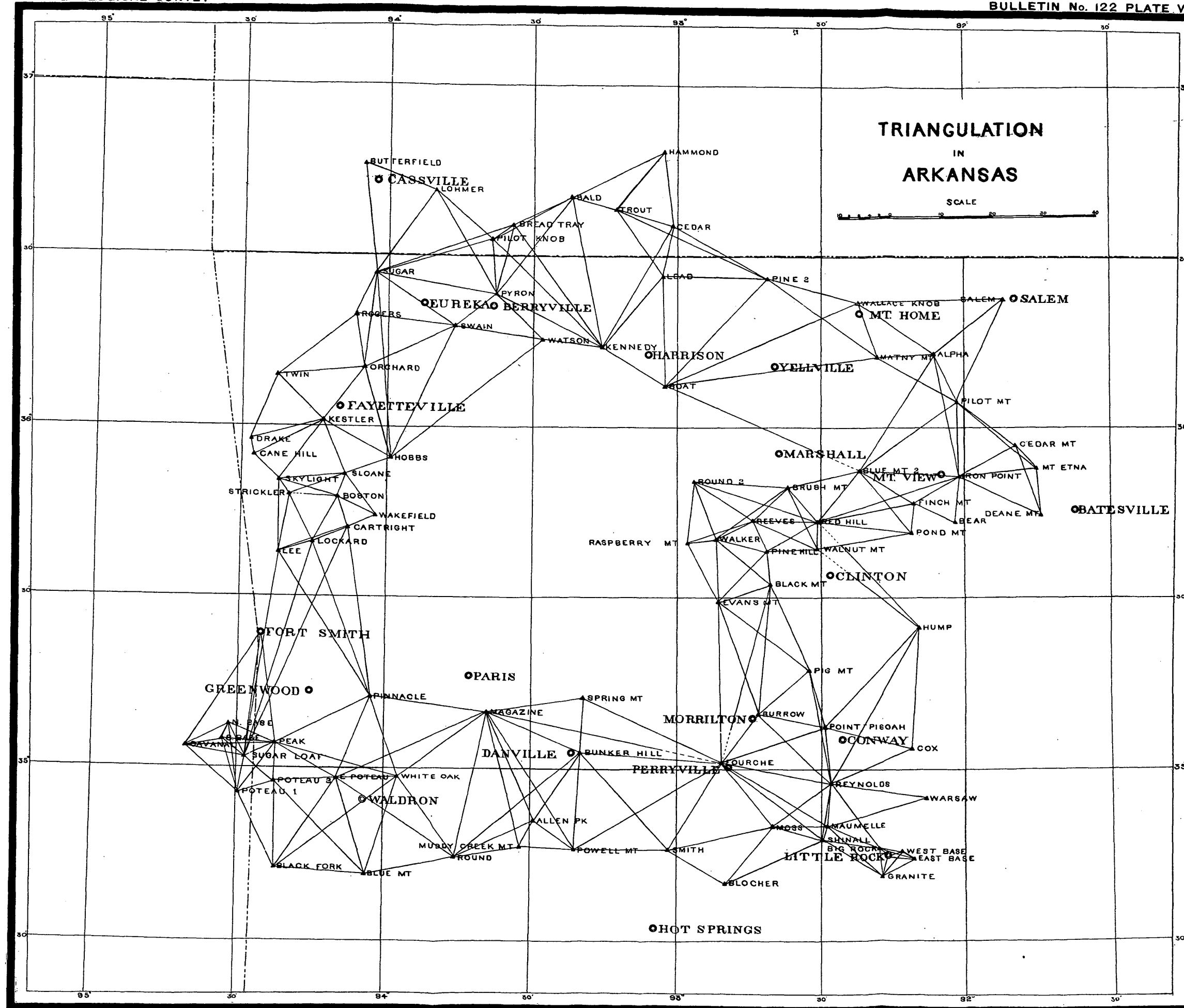
The triangulation in Arkansas starts from a base located just west of the State line in the Indian Territory and connected with the astronomical station of the U. S. Coast and Geodetic Survey at Fort Smith. It extends eastward along the thirty-fifth parallel of latitude to Little Rock, near which city a check base was measured. Difficulty was experienced in finding a favorable location for the initial base, but the site finally selected was in an open prairie bordered by several mountain ranges over 2,000 feet high, which furnished good points for expansion.

The initial base was measured at night with a 300-foot steel tape, on the roadbed of the St. Louis and San Francisco Railroad, beginning at Cameron, and was 2.84 miles in length. It was divided into sections of 1,200 feet, or 4 tape lengths, each section being measured three times. The tape was stretched under a tension of 20 pounds and the temperature noted at each tape length. A wye level was used to determine the relative elevations of stations. The base near Little Rock was measured twice on a cloudy day, its length being 3.72 miles. The azimuth of each base was determined by observations on Polaris near elongation.

The axial length of the belt of triangulation connecting the two bases is 135 miles; number of stations occupied, twenty-seven. This work was commenced in 1887 by S. S. Gannett, assisted by G. T. Hawkins, and finished in 1888. The angles at most of the stations were measured with a Fauth 7-inch (vernier) theodolite, but at the stations in the expansion of the Little Rock base a new Fauth 8-inch (micrometer) theodolite was used. The computation included a complete least square station and figure adjustment.

A belt of triangulation was extended during 1889, 1890, and 1891 from Fourche-Reynolds, stations of the initial belt near Morrillton, northward to Missouri; thence westward along the southern border of that State for about 60 miles; thence southward, joining the initial belt at the line Pinnacle-Sugarloaf, 20 miles southeast of Fort Smith. Angles at stations in this belt were measured with a Fauth 8-inch (micrometer) theodolite by George T. Hawkins. Azimuths were observed at intervals of about 50 miles.

Triangulation in this State was conducted generally in a manner similar to that pursued in the Appalachian Mountain region; that is,



rounded, wooded summits were selected as stations, cleared of timber, and one tree trimmed up and left as a signal and mark. In a few instances, where it was impracticable to cut off the timber, scaffolds were erected.

DESCRIPTIONS AND POSITIONS OF STATIONS.

CAVANAL.

High, flat mountain, 12 miles west of Cameron, in the Choctaw Nation, Ind. T. Station in tree top.

Permanent mark: Tree blazed near foot.

[Latitude, 35° 04' 11" 43. Longitude, 94° 40' 46" 16.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Sugarloaf..... | 284 18 30.16 | 104 25 46.09 | 4.297986 |
| Peak | 269 10 57.02 | 89 21 30.97 | 4.446473 |

NORTH BASE.

About 800 feet north of Cameron station, Choctaw Nation, Ind. T.

Permanent mark: Stone 6 by 6 by 30 inches set flush with surface of the ground.

[Latitude, 35° 07' 59" 47. Longitude, 94° 32' 01" 38.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Peak | 294 26 05.63 | 114 31 38.31 | 4.206813 |
| Sugarloaf..... | 333 34 24.91 | 153 36 39.60 | 4.125449 |

SOUTH BASE.

Two and one-half miles south of Cameron Station, Choctaw Nation, Ind. T., on St. Louis and San Francisco Railroad, 50 feet east of railroad.

Permanent mark: Stone 6 by 6 by 30 inches set flush with surface of ground.

[Latitude, 35° 05' 47" 52. Longitude, 94° 33' 23" 98.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Sugarloaf..... | 314 27 54.85 | 134 30 56.92 | 4.051474 |
| Peak | 278 47 20.48 | 98 53 40.54 | 4.229148 |

SUGARLOAF.

On Sugarloaf Mountain, 7 miles southeast of Cameron station, in the Choctaw Nation, Ind. T.; has all the timber cleared from summit.

Permanent mark: Lone tree with spikes.

[Latitude, $35^{\circ} 01' 31''$.49. Longitude, $94^{\circ} 28' 07''$.04.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Poteau (2) | 309 38 29.34 | 129 41 41.88 | 4.043759 |
| Peak | 238 45 47.12 | 58 49 04.79 | 4.008536 |
| Fort Smith | 184 50 17.23 | 4 51 34.89 | 4.605344 |
| Poteau (1) | 10 18 45.54 | 190 17 59.02 | 4.060919 |
| North Base | 153 36 39.60 | 333 34 24.91 | 4.125449 |
| South Base | 134 30 56.92 | 314 27 54.85 | 4.051474 |
| Cavanal | 104 25 46.09 | 284 18 30.16 | 4.297986 |

FORT SMITH.

Sebastian Co., Ark. Station on top of Col. Leflore's house at southwest corner of old fort about 50 feet from U. S. C. & G. S. astronomical station which was used as initial point by U. S. G. S.

Permanent mark: Stone monument.

[Latitude, $35^{\circ} 23' 14''$.65. Longitude, $94^{\circ} 25' 52''$.35.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Peak | 351 20 45.80 | 171 22 46.66 | 4.547466 |
| Sugarloaf | 4 51 34.89 | 184 50 17.23 | 4.605344 |

POTEAU (1).

High mountain in Choctaw Nation, Ind T., 15 miles south of Cameron station on the St. Louis and San Francisco Railroad; has about 3 acres of timber chopped down; a good deal still standing on east and west ends.

Permanent mark: Lone oak tree.

[Latitude, $34^{\circ} 55' 24''$.14. Longitude, $94^{\circ} 29' 28''$.19.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sugarloaf | 190 17 59.02 | 10 18 45.54 | 4.060919 |
| Poteau (2) | 248 01 48.53 | 68 05 47.28 | 4.057047 |

POTEAU (2).

High round point on Poteau range, 2 miles south of Hartford, Sebastian Co., Ark.; has about 6 acres of timber cut down on top.

Permanent mark: Lone oak tree.

[Latitude, 34° 57' 42"-39. Longitude, 94° 22' 31"-33.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Peak | 180 59 47-13 | 0 59 51-99 | 4-091545 |
| East Poteau | 265 28 50-94 | 85 36 18-68 | 4-298333 |
| Sugarloaf | 129 41 41-88 | 309 38 29-34 | 4-043759 |
| Poteau (1) | 68 05 47-28 | 248 01 48-53 | 4-057047 |
| Black Fork | 358 38 27-23 | 178 38 42-24 | 4-444388 |

BLACK FORK.

Hump on Black Fork range, on line between Scott and Polk counties, Ark., about 4 miles west of Eagle gap on the road between Waldron and Dallas.

Permanent mark: Lone tree.

[Latitude, 34° 42' 39"-78. Longitude, 94° 22' 05"-39.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| East Poteau | 213 06 24-02 | 33 13 35-50 | 4-544975 |
| Poteau (2) | 178 38 42-24 | 358 38 27-23 | 4-444388 |

PEAK.

Sharp peak on Sugarloaf Mountain, about 25 miles south of Fort Smith, Sebastian Co., Ark.

Permanent mark: A pile of rocks.

[Latitude, 35° 04' 22"-98. Longitude, 94° 22' 22"-85.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| East Poteau | 298 48 33-09 | 118 55 56-58 | 4-349626 |
| Pinnacle | 241 54 15-25 | 62 05 17-48 | 4-518284 |
| Poteau (2) | 0 59 51-99 | 180 59 47-13 | 4-091545 |
| Sugarloaf | 58 49 04-79 | 238 45 47-12 | 4-008536 |
| Fort Smith | 171 22 46-66 | 351 20 45-80 | 4-547466 |
| South Base | 98 53 40-54 | 278 47 20-48 | 4-229148 |
| Cavanal | 89 21 30-97 | 269 10 57-02 | 4-446473 |
| North Base | 114 31 38-31 | 294 26 05-63 | 4-206813 |

EAST POTEAU.

At east end of Poteau range, about 10 miles northwest of Waldron, Scott Co., Ark. Has most of the timber cleared from the summit.

Permanent mark: Lone oak tree.

[Latitude, 34° 58' 32"-51. Longitude, 94° 09' 30"-16.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| White Oak | 269 09 28-38 | 89 16 49-26 | 4-296232 |
| Pinnacle | 199 58 08-28 | 20 01 45-45 | 4-446743 |
| Peak | 118 55 56-58 | 298 48 33-09 | 4-349626 |
| Poteau (2) | 85 36 18-68 | 265 28 50-94 | 4-298333 |
| Blue Mountain | 342 34 49-11 | 162 38 35-83 | 4-528324 |
| Black Fork | 33 13 35-50 | 213 06 24-02 | 4-544975 |

PINNACLE.

Knob on ridge about 5 miles south of Charleston, Franklin Co., Ark. Has all timber cleared from summit. It was also used as an azimuth station.

Permanent mark: Lone tree, blazed near foot.

[Latitude, 35° 12' 45''-51. Longitude, 94° 03' 12''-44.]

| To station. | Azimuth. | Back azimuth | Log. dist. |
|------------------|--------------|--------------|------------|
| | ° ' " | ° ' " | Meters. |
| White Oak..... | 339 06 55.10 | 159 10 40.11 | 4.444739 |
| Magazine..... | 277 47 44.40 | 98 01 51.99 | 4.574789 |
| East Poteau..... | 20 01 45.45 | 199 58 08.28 | 4.446743 |
| Peak..... | 62 05 17.48 | 241 54 15.25 | 4.518284 |

BLUE MOUNTAIN.

Station on a high peak about 5 miles southwest of Buck Knob post-office, Scott Co., Ark. Summit entirely cleared of brush.

Permanent mark: Stump of tree on highest part.

[Latitude, 34° 41' 07''-21. Longitude, 94° 02' 53''-18.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| East Poteau..... | 162 38 35.83 | 342 34 49.11 | 4.528324 |
| White Oak..... | 196 12 02.72 | 16 15 35.23 | 4.529249 |

WHITE OAK.

High mountain about 12 miles northeast of Waldron, Scott Co., Ark. Has all timber cleared off the summit, though there is still some large timber standing on the north side.

Permanent mark: Post-oak tree.

[Latitude, 34° 58' 41''-14. Longitude, 93° 56' 41''-10.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Round..... | 326 29 52.59 | 146 36 35.80 | 4.5120745 |
| Magazine..... | 232 35 32.38 | 52 45 52.63 | 4.5363977 |
| Pinnacle..... | 159 10 40.11 | 339 06 55.10 | 4.4447392 |
| East Poteau..... | 89 16 49.26 | 269 09 28.38 | 4.290232 |
| Blue Mountain... | 16 15 35.23 | 196 12 02.72 | 4.5292490 |

MAGAZINE.

Station on middle hump of Magazine Mountain, in Logan Co., Ark. Has about 5 acres of timber cut down and has still a great deal of large timber standing.

Permanent mark: Large oak tree trimmed up. The platform for observing was built around this tree, 44 feet from the ground.

[Latitude, 35° 09' 57"-68. Longitude, 93° 38' 41"-72.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Powell..... | 328 14 19.05 | 148 24 35.83 | 4.7159107 |
| Bunker Hill | 293 32 16.10 | 113 43 07.95 | 4.4959055 |
| Muddy Creek Mountain .. | 346 53 14.98 | 166 57 06.48 | 4.6558448 |
| Round | 11 12 53.87 | 191 09 19.66 | 4.6893775 |
| White Oak..... | 52 45 52.03 | 232 35 32.38 | 4.5363977 |
| Pinnacle..... | 98 01 51.99 | 277 47 44.40 | 4.5747892 |

ROUND.

Peak just west of "Old Missouri road" near head waters of Cedar Creek in Montgomery Co., Ark. Has all timber cleared off the summit.
Permanent mark: Post-oak tree.

[Latitude, 34° 44' 00"-72. Longitude, 93° 44' 55"-63.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Muddy Creek Mountain.. | 258 50 32.68 | 78 57 56.07 | 4.3044880 |
| Magazine..... | 191 09 19.66 | 11 12 53.87 | 4.6893775 |
| White Oak..... | 146 36 35.80 | 326 29 52.59 | 4.5120745 |

MUDDY CREEK MOUNTAIN.

Knob on ridge 6 or 7 miles south of Onyx, Yell Co., Ark. Has most of timber cleared off the summit.

Permanent mark: Pine tree.

[Latitude, 34° 46' 06"-63. Longitude, 93° 31' 57"-82.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Magazine..... | 166 57 06.48 | 346 53 14.98 | 4.6558448 |
| Powell..... | 270 26 03.47 | 90 32 26.84 | 4.2328765 |
| Round..... | 78 57 56.07 | 258 50 32.68 | 4.3044880 |

ALLEN PEAK.

High peak 3 miles northwest of Onyx, Yell Co., Ark. Has all timber chopped down on top.

Permanent mark: Post-oak tree.

[Latitude, 34° 51' 06"-10. Longitude, 93° 28' 14"-79]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Powell..... | 309 20 57.86 | 129 25 14.29 | 4.1694563 |
| Bunker Hill..... | 209 53 28.04 | 29 58 18.13 | 4.4107648 |

POWELL.

High peak of Fourche range, in Garland Co., Ark., 30 miles northwest of Hot Springs.

Permanent mark: Black oak tree.

[Latitude, $34^{\circ} 46' 01''$.91. Longitude, $95^{\circ} 20' 45''$.57.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Smith..... | 269 | 20 | 00.07 | 89 | 30 | 48.24 | 4.4609414 |
| Bunker Hill..... | 182 | 37 | 01.07 | 2 | 37 | 33.78 | 4.5013612 |
| Magazine..... | 148 | 24 | 35.83 | 328 | 14 | 19.05 | 4.7159107 |
| Muddy Creek Mountain.. | 90 | 32 | 26.84 | 270 | 26 | 03.47 | 4.2328765 |
| Allen Peak..... | 129 | 25 | 14.29 | 309 | 20 | 57.86 | 4.1694563 |

BUNKER HILL.

Highest knob near Danville, Yell Co., Ark. All timber has been chopped off the summit.

Permanent mark: Post oak tree.

[Latitude, $35^{\circ} 03' 10''$.25. Longitude, $93^{\circ} 19' 48''$.41.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Fourche..... | 275 | 00 | 52.92 | 95 | 17 | 28.01 | 4.6445536 |
| Smith..... | 318 | 48 | 11.64 | 138 | 58 | 29.43 | 4.6198532 |
| Powell..... | 2 | 37 | 33.78 | 182 | 37 | 01.07 | 4.5013612 |
| Magazine..... | 113 | 42 | 07.95 | 293 | 32 | 16.10 | 4.4959055 |
| Spring Mountain..... | 180 | 58 | 37.00 | 0 | 58 | 44.00 | 4.2465800 |
| Allen Peak..... | 29 | 58 | 18.13 | 209 | 53 | 28.04 | 4.4107648 |

SPRING MOUNTAIN.

High, flat mountain on line between Yell and Logan counties, about 15 miles southwest of Dardanelle, Ark. Lines of sight have been cut out to different stations.

Permanent mark: Stump of pine tree 20 feet high, about 10 feet north of signal, with observing platform built around it. The instrument was mounted on this stump.

[Latitude, $35^{\circ} 12' 42''$.00. Longitude, $93^{\circ} 19' 36''$.80.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Fourche..... | 296 | 13 | 11 | 116 | 29 | 41 | 4.68706 |
| Bunker Hill..... | 0 | 58 | 44 | 180 | 58 | 37 | 4.24658 |

SMITH.

High mountain in Saline Co., Ark., 18 miles north of Hot Springs. All timber has been cleared from top except one black oak tree.

Permanent mark: Black oak tree.

[Latitude, 34° 46' 11"-34. Longitude, 93° 01' 49"-01.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blocher..... | 302 38 07.21 | 122 44 32.65 | 4.3108946 |
| Moss..... | 258 09 06.03 | 78 21 25.50 | 4.5268175 |
| Fourche..... | 211 07 39.04 | 31 13 53.11 | 4.5060766 |
| Bunker Hill..... | 138 53 29.43 | 318 48 11.64 | 4.6198532 |
| Powell..... | 89 30 48.24 | 269 20 00.07 | 4.4609414 |

BLOCHER.

Low wooded ridge, 3 miles east of Blocher, Saline Co., Ark.
Permanent mark: Lone pine tree.

[Latitude, 34° 40' 12"-75. Longitude, 92° 50' 32"-26.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Smith..... | 122 44 32.65 | 302 38 07.21 | 4.3108946 |
| Moss..... | 221 16 53.51 | 41 22 46.25 | 4.3772020 |

MOSS.

A sharp rocky peak, 20 miles west of Little Rock, in Saline Co., Ark.
Permanent mark: Lone pine tree just below summit.

[Latitude, 34° 49' 53"-56. Longitude, 92° 40' 13"-42.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shinall..... | 283 16 36.51 | 103 22 32.66 | 4.2119800 |
| Reynolds..... | 228 47 19.08 | 48 54 08.65 | 4.3826270 |
| Fourche..... | 141 42 15.37 | 321 36 07.97 | 4.4191024 |
| Smith..... | 78 21 25.50 | 258 09 06.03 | 4.5268175 |
| Blocher..... | 41 22 46.25 | 221 16 53.51 | 4.3772020 |

SHINALL.

A high, flat mountain, 15 miles northwest of Little Rock, Pulaski Co., Ark. About 8 acres of timber have been cut down. Some timber is still standing on east and west ends. Station can be reached on horse-back from Mat Brown's on south side, and also from north side.

Permanent mark: Tall oak trimmed up.

[Latitude, 34° 47' 51"-69. Longitude, 92° 29' 49"-62.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Granite..... | 303 13 42.79 | 123 20 44.03 | 4.352013 |
| Big Rock..... | 278 50 21.57 | 99 06 09.00 | 4.264459 |
| Reynolds..... | 186 46 27.27 | 366 47 19.87 | 4.296138 |
| Moss..... | 103 22 32.66 | 283 16 36.51 | 4.211980 |

BIG ROCK.

Station on top of cupola, situated on bluff of Big Rock, $2\frac{1}{2}$ miles northwest of Little Rock, Pulaski Co., Ark.

Permanent mark: Flag pole on cupola of hotel.

[Latitude, $34^{\circ} 46' 17''$.88. Longitude, $92^{\circ} 17' 55''$.49.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| West Base..... | 285 10 50.05 | 105 13 19.54 | 3.8393960 |
| Granite..... | 356 09 03.15 | 176 09 17.39 | 3.9765670 |
| Shinall..... | 99 06 09.00 | 278 59 21.57 | 4.2644590 |
| Reynolds..... | 145 00 13.52 | 324 54 17.76 | 4.4396040 |
| Maumelle..... | 114 01 36.67 | 293 55 11.78 | 4.2731768 |

WEST BASE.

Near Little Rock, Ark., $2\frac{1}{2}$ miles east of Argenta, Pulaski Co., Ark., on land owned by J. J. Martin, on prolongation of tangent of the Althimer branch of St. Louis, Arkansas and Texas Railway.

Permanent mark: Rock 5 by 7 by 48 inches, top just flush with surface, cross cut on iron bolt sunk in stone. Reference, rock 9.7 feet north, another 10.1 feet west, and another 9.5 feet south. All have arrows pointing to center.

[Latitude, $34^{\circ} 45' 19''$.09. Longitude, $92^{\circ} 13' 33''$.32.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Post-office..... | 77 35 52.76 | 257 34 14.69 | 3.6513178 |
| East Base..... | 294 10 39.62 | 114 12 27.11 | 3.7208870 |
| Granite..... | 38 18 58.59 | 218 16 43.49 | 3.9884370 |
| Big Rock..... | 105 13 19.54 | 285 10 50.05 | 3.8393960 |

EAST BASE.

Near Little Rock, Ark., 6 miles east of Argenta, Pulaski Co., Ark., close to track of Althimer branch of St. Louis, Arkansas and Texas Railway.

Permanent mark: Rock sunk in swampy soil 15.5 feet north of center of track. Iron bolt sunk in stone and cross cut on bolt. Rock sunk in center of track, top flush with roadbed, arrowhead pointing to center.

[Latitude, $34^{\circ} 44' 09''$.15. Longitude, $92^{\circ} 10' 24''$.73.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Post-office..... | 97 25 51.31 | 277 22 25.79 | 3.966162 |
| West Base..... | 114 12 27.11 | 294 10 39.62 | 3.720887 |

GRANITE.

Also called Fourche Mountain, $4\frac{1}{2}$ miles south of Little Rock, Pulaski Co., Ark. A long, nearly level ridge, heavily timbered. A wagon road runs nearly to station. Instrument mounted on stump of tree nearly 12 feet high. Lines of sight were cut through the timber.

Permanent mark: Stump 12 feet high.

[Latitude, $34^{\circ} 41' 11''$. Longitude, $92^{\circ} 17' 30''$.50.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| West Base..... | 218 16 43.49 | 38 18 58.59 | 3.988437 |
| Post-office..... | 193 55 58.39 | 13 56 35.49 | 3.837660 |
| Big Rock..... | 176 09 17.39 | 356 09 03.15 | 3.976567 |
| Shinall..... | 123 20 44.03 | 303 13 42.79 | 4.352013 |

POST-OFFICE.

Station on public building, Little Rock, Pulaski Co., Ark. Instrument set on roof, near flag pole, to which all the angles are reduced.

Permanent mark: U. S. C. & G. S. astronomical station in post-office grounds. Stone post underground.

[Latitude, $34^{\circ} 44' 47''$.83. Longitude, $92^{\circ} 16' 25''$.36.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| West Base..... | 257 34 14.69 | 77 35 52.76 | 3.651318 |
| East Base..... | 277 23 25.79 | 97 25 51.31 | 3.966162 |
| Granite..... | 13 56 35.49 | 193 55 58.39 | 3.837660 |

MAUMELLE.

A high, steep, rocky pinnacle, 12 miles west of north from Little Rock, Pulaski Co., Ark. The top is barren and covered with loose rock; sides very precipitous.

Permanent mark: Hole drilled in rock.

[Latitude, $34^{\circ} 50' 25''$.22. Longitude, $92^{\circ} 29' 09''$.79.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Big Rock..... | 293 55 11.78 | 114 01 36.67 | 4.2731768 |
| Reynolds..... | 185 04 12.92 | 5 04 42.76 | 4.1750859 |
| Warsaw..... | 249 44 55.92 | 69 56 32.46 | 4.5176680 |

REYNOLDS.

A hump on a ridge, $2\frac{1}{2}$ miles west of Mayflower, Faulkner Co., Ark. Has all the timber cut on south and west sides; timber is yet standing on north and east sides.

Permanent mark: Stump sawed off 4 feet from ground about 18 feet north of signal.

[Latitude, $34^{\circ} 58' 28''$. 95. Longitude, $92^{\circ} 28' 17''$. 66.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Maumelle..... | 5 04 42.76 | 185 04 12.92 | 4.1750859 |
| Big Rock..... | 324 54 17.76 | 145 00 13.52 | 4.4396040 |
| Shinall..... | 6 47 19.87 | 186 46 27.27 | 4.2961380 |
| Moss..... | 48 54 08.65 | 228 47 19.08 | 4.3826270 |
| Fourche..... | 97 53 35.54 | 277 40 36.96 | 4.5408876 |
| Burrow..... | 131 33 04.59 | 311 24 21.22 | 4.4886580 |
| Point Pisgah..... | 174 52 56.54 | 254 52 22.81 | 4.2232200 |
| Hump..... | 209 17 29.04 | 29 26 07.43 | 4.6671490 |
| Cox..... | 243 57 30.20 | 64 05 09.91 | 4.3539590 |
| Warsaw..... | 276 46 09.11 | 96 57 16.94 | 4.4739880 |

FOURCHE.

Highest point on range, 3 miles northwest of Perryville, Perry Co., Ark. Summit cleared of timber.

Permanent mark: Oak tree standing alone.

[Latitude, $35^{\circ} 01' 01''$. 68. Longitude, $92^{\circ} 50' 55''$. 13.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Bunker Hill..... | 95 17 28.01 | 275 00 52.92 | 4.6445536 |
| Burrow..... | 215 44 06.77 | 35 48 23.43 | 4.2866586 |
| Point Pisgah..... | 249 56 20.88 | 70 08 47.00 | 4.5440928 |
| Reynolds..... | 277 40 36.96 | 97 53 35.54 | 4.5408816 |
| Moss..... | 321 36 07.97 | 141 42 16.37 | 4.4191624 |
| Smith..... | 31 13 53.12 | 211 07 39.04 | 4.5060766 |
| Spring Mountain. | 116 29 41.00 | 296 13 11.06 | 4.6870600 |

WARSAW.

Warsaw is a small, round, sharp peak one-half mile south of Warsaw, Pulaski Co., Ark., and 7 miles northwest of Jacksonville, on land owned by John See.

Permanent mark: Lone tree.

[Latitude, $34^{\circ} 56' 33''$. 48. Longitude, $92^{\circ} 08' 52''$. 12.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Maumelle..... | 69 56 32.46 | 249 44 55.92 | 4.517668 |
| Reynolds..... | 96 57 16.94 | 276 46 09.11 | 4.473988 |

BURROW.

On heavily timbered knob one-half mile northeast of Morrilton, Conway Co., Ark. Instrument elevated 60 feet.

Permanent mark: Stone marked with cross.

[Latitude, 35° 09' 31"-11. Longitude, 92° 43' 28"-65.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Fourche | 35 48 23.43 | 215 44 06.77 | 4.2866586 |
| Reynolds | 311 24 21.22 | 131 33 04.59 | 4.4886580 |
| Point Pisgah | 279 48 06.21 | 99 56 15.76 | 4.3403042 |
| Pig Mountain | 228 06 11.43 | 48 12 35.94 | 4.3546568 |
| Black Mountain .. | 185 25 18.98 | 5 26 52.53 | 4.6344878 |
| Evans Mountain .. | ..... | ..... | 4.5873924 |

COX.

Cox is on the highest part of a ridge 10 miles east of Conway and 3 miles southwest of Vilonia, Faulkner Co., Ark., on land owned by Mr. Cox, and is 3 miles south of Senator Donnaway's residence.

Permanent mark: Black-oak tree.

[Latitude, 35° 03' 50"-10. Longitude, 92° 14' 56"-57.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Point Pisgah | 107 18 03.84 | 287 09 49.40 | 4.358075 |
| Reynolds | 64 05 09.91 | 243 57 30.20 | 4.353959 |

POINT PISGAH.

Hump on ridge 4 miles northwest of Conway, Faulkner Co., Ark.

Permanent mark: Oak tree.

[Latitude, 35° 07' 29"-37. Longitude, 92° 29' 16"-62.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Reynolds | 354 52 22.00 | 174 52 56.60 | 4.2232259 |
| Fourche | 70 08 47.00 | 249 56 20.88 | 4.5440928 |
| Burrow | 99 56 15.76 | 279 48 06.21 | 4.3403042 |
| Pig Mountain | 166 02 30.45 | 346 00 43.54 | 4.2883132 |
| Hump | 225 24 36.33 | 45 33 49.68 | 4.531645 |
| Cox | 287 09 49.40 | 107 18 03.84 | 4.358075 |

HUMP.

Hump is an isolated hill about 300 feet above the surrounding country 1½ miles northeast of Enders, Faulkner Co., Ark., and 3 miles south of Quitman. Is about one-fourth mile long east and west and was very heavily timbered. The eastern half of the hill was cleared of timber except one tree.

Permanent mark: Loue tree.

[Latitude, 35° 20' 23"-13. Longitude, 92° 13' 17"-40.]

| To station. | Azimuth. | Back azimuth. | Log dist. |
|--------------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Point Pisgah | 45 33 49.68 | 225 24 36.33 | 4.531645 |
| Reynolds | 29 26 07.43 | 209 17 29.04 | 4.667149 |

PIG MOUNTAIN.

High ridge 3 miles northeast of Springfield, Conway Co., Ark.
Permanent mark: Wooden post under tripod.

[Latitude, $35^{\circ} 17' 40''$. Longitude, $92^{\circ} 32' 22''$. 09.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Point Pisgah | 346 | 00 | 43.54 | 166 | 02 | 30.45 | 4.2883132 |
| Burrow | 48 | 12 | 35.94 | 228 | 06 | 11.43 | 4.3546478 |
| Black Mountain .. | 155 | 25 | 58.75 | 335 | 21 | 06.11 | 4.4855891 |
| Evans Mountain.. | 127 | 12 | 04.80 | 307 | 01 | 06.37 | 4.5560437 |

BLACK MOUNTAIN.

High knob 5 miles northwest of Scotland, Van Buren Co., Ark.
Timber chopped off the top excepting one black-oak tree.
Permanent mark: Black-oak tree standing alone.

[Latitude, $35^{\circ} 32' 43''$. Longitude, $92^{\circ} 40' 47''$. 05.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Burrow | 5 | 26 | 52.53 | 185 | 25 | 18.98 | 4.6344878 |
| Pig Mountain | 335 | 21 | 06.11 | 155 | 25 | 58.75 | 4.4855891 |
| Evans Mountain .. | 69 | 04 | 46.56 | 248 | 58 | 39.39 | 4.2318370 |
| Pine Hill | 175 | 10 | 38.18 | 355 | 10 | 18.73 | 4.0000234 |
| Walker | | | | | | | 4.3347268 |

EVANS MOUNTAIN.

Highest part of flat top mountain in Pope Co., Ark., 10 miles northwest of Cleveland. Lines of sight cut out to different primary points.
Permanent mark: Oak tree.

[Latitude, $35^{\circ} 29' 25''$. Longitude, $92^{\circ} 51' 19''$. 02.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pig Mountain | 307 | 01 | 06.37 | 127 | 12 | 04.80 | 4.5560437 |
| Burrow | 342 | 04 | 23.05 | 162 | 08 | 54.98 | 4.5873924 |
| Black Mountain .. | 248 | 58 | 39.39 | 69 | 04 | 46.56 | 4.2318370 |
| Pine Hill | 223 | 07 | 20.99 | 43 | 13 | 09.12 | 4.3403697 |
| Walker | 178 | 03 | 11.43 | 358 | 02 | 55.73 | 4.3004644 |
| Raspberry Mountain. | 152 | 43 | 16.64 | 332 | 39 | 29.57 | 4.3308122 |

PINE HILL.

Highest knoll near Alread, Van Buren Co., Ark. It has all the timber cleared off but one tree.

Permanent mark: Spike in stump 21 feet north of lone black-oak tree.

[Latitude, 35° 38' 06"-80. Longitude, 92° 41' 20"-52.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Black Mountain..... | 355 | 10 | 18.73 | 175 | 10 | 38.18 | 4.0000234 |
| Evans Mountain..... | 43 | 13 | 09.12 | 223 | 07 | 20.99 | 4.3430697 |
| Walker..... | 103 | 56 | 55.14 | 283 | 50 | 50.52 | 4.2098001 |
| Reeves..... | 156 | 01 | 52.89 | 336 | 00 | 09.54 | 4.0399253 |
| Walnut Mountain..... | 263 | 19 | 35.95 | 83 | 25 | 55.01 | 4.2168164 |
| Red Hill..... | | | | | | | 4.2678041 |

WALKER.

High knoll near head of Illinois Bayou, Pope Co., Ark. Timber all cleared off except one black-oak tree.

Permanent mark: Black-oak tree.

[Latitude, 35° 40' 13"-08. Longitude, 92° 51' 46"-06.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Evans Mountain..... | 358 | 02 | 55.73 | 178 | 03 | 11.43 | 4.3004644 |
| Pine Hill..... | 283 | 50 | 50.52 | 103 | 56 | 55.14 | 4.2098001 |
| Raspberry Mountain. | 84 | 12 | 58.86 | 264 | 09 | 27.02 | 3.9630864 |
| Round (2)..... | 159 | 47 | 28.65 | 339 | 44 | 40.59 | 4.3042510 |
| Reeves..... | 241 | 27 | 14.69 | 61 | 31 | 36.31 | 4.1081476 |
| Black Mountain..... | | | | | | | 4.3347268 |

RASPBERRY MOUNTAIN.

High point on the old mountain road in Pope Co., Ark., about 10 miles southwest of Witts Springs. All the timber was cut off except one white-oak tree.

Permanent mark: White-oak tree.

[Latitude, 35° 39' 42"-89. Longitude, 92° 57' 49"-34.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Evans Mountain..... | 332 | 39 | 29.57 | 152 | 43 | 16.64 | 4.3308122 |
| Walker..... | 264 | 09 | 27.02 | 84 | 12 | 58.86 | 3.9630864 |
| Round (2)..... | 186 | 12 | 26.54 | 6 | 13 | 16.77 | 4.3000109 |

ROUND (2).

High knob about 8 miles northwest of Witts Springs, Searcy Co., Ark. All timber chopped off the top, and an observing platform, 25 feet high, built around the trunk of a tree.

Permanent mark: White-oak tree.

[Latitude, 35° 50' 26"-51. Longitude, 92° 56' 23"-41.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Raspberry Mountain. | 6 | 13 | 16.77 | 186 | 12 | 26.54 | 4.3000109 |
| Walker..... | 339 | 44 | 46.59 | 159 | 47 | 28.65 | 4.3042510 |

WALNUT MOUNTAIN.

High knob 10 miles northwest of Clinton, Van Buren Co., Ark., on the north bank of Archies Fork of Red River. Has all timber chopped off the top except one white-oak tree. Instrument elevated 20 feet.

Permanent mark: White-oak tree.

[Latitude, 35° 39' 08''·44. Longitude, 92° 30' 30''·08.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pine Hill | 83 | 25 | 55·01 | 263 | 19 | 35·95 | 4·2168164 |
| Reeves | 111 | 22 | 27·75 | 291 | 14 | 24·90 | 4·3490447 |
| Red Hill | 174 | 45 | 15·45 | 354 | 44 | 58·25 | 3·9086639 |
| Pond Mountain | 261 | 09 | 06·78 | 81 | 20 | 13·95 | 4·4634886 |

REEVES.

High knob in Searcy Co., Ark., 7 miles northwest of Copeland and one-half mile from Dr. Reeves's residence. Has all the timber cleared off the top.

Permanent mark: Black-oak tree.

[Latitude, 35° 43' 31''·74. Longitude, 92° 44' 17''·74.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Walker | 61 | 31 | 36·31 | 241 | 27 | 14·69 | 4·1081476 |
| Pine Hill | 336 | 00 | 09·54 | 156 | 01 | 52·89 | 4·0399253 |
| Walnut Mountain | 291 | 14 | 24·90 | 111 | 22 | 27·75 | 4·3490447 |
| Red Hill | 270 | 04 | 16·74 | 90 | 12 | 02·81 | 4·3023494 |
| Brush Mountain | 227 | 35 | 32·89 | 47 | 39 | 53·41 | 4·1805321 |

BRUSH MOUNTAIN.

High knob 6½ miles southeast of Marshall, Searcy Co., Ark. Has all timber cleared off the top except one white-oak tree.

Permanent mark: Wooden post set 3 feet in ground.

[Latitude, 35° 49' 03''·11. Longitude, 92° 36' 52''·05.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Reeves | 47 | 39 | 53·41 | 227 | 35 | 32·89 | 4·1805321 |
| Red Hill | 319 | 10 | 53·78 | 139 | 14 | 19·82 | 4·1320095 |
| Blue Mountain (2) | 255 | 16 | 36·82 | 75 | 25 | 24·38 | 4·3686265 |

RED HILL.

Midway between Clinton, Van Buren Co., Ark., and Marshall, and right on the road; the highest point in that neighborhood. Has all timber chopped off the top except one black-oak tree.

Permanent mark: Wooden post with spike in top.

[Latitude, $35^{\circ} 43' 30''$. 27. Longitude, $92^{\circ} 30' 59''$. 57.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Reeves | 90 12 02.81 | 270 04 16.74 | 4.3023404 |
| Walnut Mountain..... | 354 44 58.25 | 174 45 15.45 | 3.9006639 |
| Brush Mountain | 139 14 19.82 | 319 10 53.78 | 4.1320095 |
| Pond Mountain | 276 57 19.91 | 97 08 44.00 | 4.4725741 |
| Blue Mountain(2)..... | 220 22 33.70 | 40 27 54.52 | 4.3271528 |
| Pine Hill ..... | ..... | ..... | 4.2678041 |

BLUE MOUNTAIN (2).

Highest point in the neighborhood of Alco, Stone Co., Ark., and $1\frac{1}{2}$ miles south of post-office. Has all the timber cleared off the top except one white-oak tree.

Permanent mark: Cross cut on stone and pile of rocks over marked stone.

[Latitude, $35^{\circ} 52' 14''$. 86. Longitude, $92^{\circ} 21' 51''$. 18.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Brush Mountain..... | 75 25 24.38 | 255 16 36.82 | 4.3686265 |
| Red Hill | 40 27 46.26 | 220 22 25.46 | 4.3271528 |
| Pond Mountain..... | 321 37 18.33 | 141 43 22.98 | 4.4023817 |
| Irons Point..... | 272 23 46.92 | 92 35 57.36 | 4.4956724 |
| Finch Mountain..... | 302 08 34.35 | 122 15 05.48 | 4.2971750 |
| Pilot Mountain..... | 231 20 11.12 | 51 32 15.03 | 4.5963290 |
| Alpha | 210 22 32.57 | 30 31 23.60 | 4.6491082 |

FINCH MOUNTAIN.

Mound on flat top mountain 6 miles southwest of Mountain View, Stone Co., Ark. Has lines cut out to different primary stations.

Permanent mark: Post 15.3 feet northeast of lone hickory tree.

[Latitude, $35^{\circ} 46' 32''$. 23. Longitude, $92^{\circ} 10' 42''$. 94.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blue Mountain (2)..... | 122 15 05.48 | 302 08 34.35 | 4.2971750 |
| Pond Mountain..... | 6 54 45.04 | 186 54 18.99 | 3.9693555 |
| Irons Point..... | 237 36 07.68 | 57 41 46.20 | 4.2352699 |

POND MOUNTAIN.

Flat top mountain in Cleburne Co., Ark., 6 miles east of Rushing. All timber cleared to west and north and line cut out eastward.

Permanent mark: White oak tree.

[Latitude, $35^{\circ} 41' 32''$. 08. Longitude, $92^{\circ} 11' 27''$. 52.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Red Hill | 97 08 35.76 | 276 57 11.67 | 4.4725741 |
| Blue Mountain (2)..... | 141 43 22.98 | 321 37 18.33 | 4.4023817 |
| Walnut Mountain..... | 81 20 13.05 | 261 09 06.78 | 4.4634886 |
| Finch Mountain..... | 186 54 18.99 | 6 54 45.04 | 3.9693555 |

IRONS POINT.

Flat top spur of the Blue range 6 miles east of Mountain View, Stone Co., Ark. Has a large amount of timber cut and an observing platform, 15 feet high, built around the trunk of a tree.

Permanent mark: Trunk of tree 38 feet east of oak tree used as signal.

[Latitude, 35° 51' 30''-69. Longitude, 92° 01' 04''-50.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Finch Mountain..... | 57 | 41 | 46.20 | 237 | 36 | 07.68 | 4.2352699 |
| Blue Mountain (2).... | 92 | 35 | 57.36 | 272 | 23 | 46.92 | 4.4956724 |
| Pilot Mountain..... | 179 | 11 | 33.16 | 359 | 11 | 24.57 | 4.4145606 |
| Cedar Mountain..... | 242 | 08 | 54.76 | 62 | 15 | 45.00 | 4.2973891 |
| Deane Mountain..... | 296 | 59 | 00.58 | 117 | 08 | 45.53 | 4.4501907 |
| Mount Etna..... | 265 | 21 | 27.66 | 85 | 30 | 48.47 | 4.3818364 |

DEANE MOUNTAIN.

High spur of the Blue range just south of White River and 6 miles southwest from Batesville, Independence Co., Ark. Has timber cleared off except one tree just below the summit.

Permanent mark: Cross cut on large rock about 10 feet east of the signal tree.

[Latitude, 35° 44' 34''-43. Longitude, 91° 44' 24''-55.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Irons Point..... | 117 | 08 | 46.53 | 296 | 59 | 00.58 | 4.4501907 |
| Mount Etna..... | 165 | 50 | 08.20 | 355 | 49 | 43.16 | 4.1698300 |

MOUNT ETNA.

High, cleared, open field one-fourth of a mile north of Cushman, Independence Co., Ark.

Permanent mark: Wooden post set under a painted tripod signal.

[Latitude, 35° 52' 32''-89. Longitude, 91° 45' 07''-36.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Pilot Mountain..... | 134 | 44 | 13.03 | 314 | 34 | 42.04 | 4.5343414 |
| Irons Point..... | 85 | 30 | 48.47 | 265 | 21 | 27.66 | 4.3818364 |
| Deane Mountain..... | 355 | 49 | 43.16 | 165 | 50 | 08.20 | 4.1698300 |

CEDAR MOUNTAIN.

Highest knob within 5 miles of Barren Fork, Izaard Co., Ark., 4 miles southwest of post-office. Has all timber chopped off the top except one pine tree.

Permanent mark: × cut in solid sandstone rock 11·5 feet northeast of signal tree.

[Latitude, 35° 56' 30"-75. Longitude, 91° 49' 24"-90.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Irons Point..... | 62 15 45·00 | 242 08 54·76 | 4·2973891 |
| Pilot Mountain..... | 133 08 12·61 | 313 01 12·61 | 4·3889303 |

PILOT MOUNTAIN.

High knob 6 miles west of Melbourne, Izard Co., Ark. All timber has been chopped off except one tree.

Permanent mark: Lone tree.

[Latitude, 36° 05' 33"-37. Longitude, 92° 01' 19"-18.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Irons Point..... | 359 11 24·57 | 179 11 33·16 | 4·4145606 |
| Blue Mountain (2) ... | 51 32 15·03 | 231 20 11·12 | 4·5963290 |
| Mount Etna..... | 314 34 42·04 | 134 44 13·03 | 4·5343414 |
| Cedar Mountain..... | 313 01 12·61 | 133 08 12·51 | 4·3889303 |
| Alpha..... | 149 13 15·94 | 329 10 01·45 | 4·2065745 |
| Matny Mountain..... | 115 22 14·83 | 295 11 50·55 | 4·4662655 |
| Salem..... | 204 13 15·47 | 24 18 50·89 | 4·5375408 |

ALPHA.

High knoll 3 miles north of Pineville, Izard Co. Ark. All timber has been cleared off but one tree.

Permanent mark: Cross cut in solid rock.

[Latitude, 36° 13' 01"-65. Longitude, 92° 06' 48"-75.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pilot Mountain..... | 329 10 01·45 | 149 13 15·94 | 4·2065745 |
| Blue Mountain (2) ... | 30 31 23·60 | 210 22 32·57 | 4·6491082 |
| Matny Mountain..... | 85 54 02·87 | 265 46 52·42 | 4·2612358 |
| Salem..... | 231 43 58·44 | 51 52 49·51 | 4·4545699 |
| Wallace Knob..... | 123 14 01·47 | 303 04 39·95 | 4·451507 |

SALEM.

High knoll 3 miles west of Salem, Fulton Co., Ark. All the timber was cleared off the knoll.

Permanent mark: Cross cut in stone about 10 feet southeast of signal and large pile of stones.

[Latitude, 36° 22' 33"-15. Longitude, 91° 51' 51"-75.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Alpha..... | 51 52 49·51 | 231 43 58·44 | 4·4545699 |
| Pilot Mountain.... | 24 18 50·89 | 204 13 15·47 | 4·5375408 |

WALLACE KNOB.

Wallace Knob is 2 miles northeast of Mountain Home, Baxter Co., Ark., in plain view of the town. It is about 500 feet above the surrounding country; is nearly round, with about 1 acre on top, which is cleared of timber, except one tree.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 21' 23''$.63. Longitude, $92^{\circ} 22' 37''$.71.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Alpha | 303 | 04 | 39.95 | 123 | 14 | 01.47 | 4.451507 |
| Matny Mountain.. | 341 | 51 | 44.65 | 161 | 53 | 54.93 | 4.247176 |
| Pine (2)..... | 103 | 10 | 06.42 | 282 | 59 | 22.92 | 4.443375 |

MATNY MOUNTAIN.

High knob just south of White River and 15 miles south of Mountain Home, Baxter Co., Ark.; has most of the timber chopped off the top.

Permanent mark: Lone tree with spike in trunk.

[Latitude, $36^{\circ} 12' 18''$.70. Longitude, $92^{\circ} 18' 57''$.43.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pilot Mountain..... | 295 | 11 | 50.55 | 115 | 22 | 14.83 | 4.4662655 |
| Alpha..... | 265 | 46 | 52.42 | 85 | 54 | 02.87 | 4.2612358 |
| Boat..... | 82 | 28 | 38.80 | 262 | 03 | 09.28 | 4.815415 |
| Pine (2)..... | 125 | 25 | 58.26 | 305 | 13 | 05.54 | 4.601004 |
| Wallace Knob..... | 161 | 53 | 54.93 | 341 | 51 | 44.65 | 4.247176 |

PINE (2).

Just south of White River, 20 miles northwest of Mountain Home, and 1 mile northwest of Stone, Marion Co., Ark., on a hogback ridge running northeast and southwest, about 1,000 feet long, which is entirely cleared of timber.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 24' 47''$.43. Longitude, $92^{\circ} 40' 42''$.55.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Matny Mountain | 305 | 13 | 05.54 | 125 | 25 | 58.26 | 4.601004 |
| Wallace Knob | 282 | 59 | 22.92 | 103 | 10 | 06.42 | 4.443376 |
| Lead..... | 93 | 49 | 03.92 | 273 | 37 | 05.62 | 4.480227 |
| Boat..... | 45 | 19 | 37.48 | 225 | 06 | 56.22 | 4.655610 |

LEAD.

A bald knob about 400 feet above the surrounding country, 6 miles due west from Lead Hill, Boone Co., Ark. There was a small honey-

locust tree on top, which was used for signal. The top is flat, covered with rocks, and is about 2 acres in extent.

Permanent mark: Cross cut on solid rock, 10 inches below surface, 10.3 feet northeast of signal tree.

[Latitude, $36^{\circ} 25' 50''$. Longitude, $93^{\circ} 00' 52''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pine (2)..... | 273 37 05.62 | 93 49 03.92 | 4.480227 |
| Boat..... | 3 15 34.18 | 183 14 48.59 | 4.530009 |
| Trout..... | 149 14 09.46 | 329 09 26.59 | 4.363505 |
| Kennedy..... | 41 51 48.43 | 221 44 18.81 | 4.453208 |
| Cedar..... | 192 11 53.38 | 12 13 06.98 | 4.163281 |

BOAT.

A very sharp peak at north end of Boat Mountain, in the northeast corner of Newton Co., Ark., 9 miles southeast of Harrison and 3 miles southwest of Valley Springs, Ark. Has timber cleared from top.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 07' 33''$. Longitude, $93^{\circ} 02' 09''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Matny Mountain.. | 262 03 09.28 | 82 28 38.80 | 4.815415 |
| Pine (2)..... | 225 06 56.22 | 45 19 37.48 | 4.655610 |
| Kennedy..... | 126 40 51.62 | 306 34 09.11 | 4.326916 |
| Lead..... | 183 14 48.59 | 3 15 34.18 | 4.530009 |

KENNEDY.

On land owned by Mr. Kennedy and sometimes known by the name of Pilot. It is 6 miles west of Harrison and 1 mile south of Batavia, Boone Co., Ark. It is a bald rock about 700 feet above the surrounding country.

Permanent mark: U. S. G. S. cross cut in rock.

[Latitude, $36^{\circ} 14' 24''$. Longitude, $93^{\circ} 13' 31''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Boat..... | 306 34 09.11 | 126 40 51.62 | 4.326916 |
| Lead..... | 221 44 18.81 | 41 51 48.43 | 4.453203 |
| Cedar..... | 211 46 42.22 | 31 55 25.90 | 4.619880 |
| Pyron..... | 121 27 09.76 | 301 16 08.01 | 4.513776 |
| Bald..... | 172 10 42.33 | 352 08 11.46 | 4.666043 |
| Watson..... | 92 55 55.06 | 272 47 08.63 | 4.3475122 |

CEDAR.

A sharp peak entirely bald on side and cleared of timber on top. It is 2 miles southeast from Cedar Creek and 15 miles southeast from Forsyth, Taney Co., Mo.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 33' 32''$.76. Longitude, $92^{\circ} 58' 48''$.69.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kennedy..... | 31 55 25.96 | 211 46 43.22 | 4.619886 |
| Lead..... | 12 13 06.98 | 192 11 53.38 | 4.463281 |
| Hammond..... | 175 30 16.17 | 355 29 33.87 | 4.350669 |
| Bald..... | 110 30 46.48 | 290 19 28.75 | 4.479139 |
| Trout..... | 110 39 45.71 | 290 33 48.66 | 4.201744 |

HAMMOND.

Located about 5 miles north of Taney City, Taney Co., Mo., and about 1 mile east of Taney City and Springfield road, on a small, sharp knob known as Hammond Knob.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 45' 37''$.92. Longitude, $92^{\circ} 59' 59''$.53.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bald..... | 65 58 32.92 | 245 47 55.99 | 4.462055 |
| Cedar..... | 355 29 33.87 | 175 30 16.17 | 4.350669 |

TROUT.

A low, flat hill 1 mile southeast from Kirbyville, Taney Co., Mo. Has most of the timber cleared from the top.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 36' 34''$.49. Longitude, $93^{\circ} 08' 47''$.74.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|---------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cedar..... | 290. 33 48.66 | 110 39 45.71 | 4.201744 |
| Lead..... | 329 09 26.59 | 149 14 09.46 | 4.363505 |

BALD.

On north side of White River, in Stone Co., Mo. It is about 11 miles west of Kirbyville, Taney Co., Mo., from which place it is plainly visible. It is reached by crossing White River at the north of Turkey Creek. Is almost entirely bald on the side and has all timber cleared from top.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 39' 13''$.89. Longitude, $93^{\circ} 17' 45''$.27.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kennedy..... | 352 08 11.46 | 172 10 42.33 | 4.666043 |
| Cedar..... | 290 19 28.75 | 110 30 46.48 | 4.479139 |
| Pilot Knob..... | 62 00 05.78 | 241 51 08.48 | 4.404577 |
| Pyron..... | 36 40 05.00 | 216 31 31.14 | 4.556682 |
| Bread Tray..... | 63 22 02.76 | 243 15 27.92 | 4.265078 |
| Hammond..... | 245 47 55.99 | 65 28 32.92 | 4.462055 |

BREAD TRAY.

Bread Tray Mountain, Barry Co., Mo., is 5 miles northwest of Pilot Knob. It is about one-eighth mile long and quite narrow. Has all timber cleared from summit except one tree.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 34' 45''$.63. Longitude, $93^{\circ} 28' 47''$.28.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Bald | 243 15 27.92 | 63 22 02.76 | 4.265078 |
| Pyron | 13 39 30.16 | 193 37 30.38 | 4.327532 |

PILOT KNOB.

Pilot Knob is about 15 miles north of Berryville, Ark., and 2 miles south of Viola, Stone Co., Mo. It is a sharp knob about 400 feet above surrounding country. It has all timber cleared from summit except one tree, left for signal.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 32' 46''$.34. Longitude, $93^{\circ} 32' 46''$.49.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Pyron | 356 49 39.26 | 176 50 01.71 | 4.230640 |
| Bald | 241 51 08.48 | 62 00 05.78 | 4.404577 |
| Lohmer | 132 19 52.09 | 312 14 02.66 | 4.294134 |
| Sugar | 73 10 31.27 | 252 58 00.89 | 4.516058 |

LOHMER.

Station on a ridge north of the Cassville and Shell Knob road, about 11 miles southeast of Cassville, Barry Co., Mo., and 1 mile east of Judge Lohmer's house. A 48-foot scaffold was built around a large black-oak tree, which is trimmed up.

Permanent mark: Black-oak tree.

[Latitude, $36^{\circ} 39' 56''$.00. Longitude, $93^{\circ} 42' 32''$.43.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Pilot Knob | 312 14 02.66 | 132 19 52.09 | 4.294134 |
| Sugar | 36 26 08.01 | 216 19 25.65 | 4.452058 |
| Butterfield | 111 05 11.98 | 290 57 51.92 | 4.291899 |

BUTTERFIELD.

On edge of the right of way of the St. Louis and San Francisco Railroad, about halfway between stations Butterfield and Exeter, Barry Co., Mo. Signal scaffold 68 feet high built around a large black-oak tree and projecting above the top of the tree.

Permanent mark: Black-oak tree.

[Latitude, $36^{\circ} 43' 43''$.96. Longitude, $93^{\circ} 54' 48''$.91.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Lohmer..... | 290 | 57 | 51.92 | 111 | 05 | 11.98 | 4.291899 |
| Sugar..... | 357 | 05 | 13.28 | 177 | 05 | 49.62 | 4.475142 |

SUGAR.

Station on Sugar Mountain, Benton Co., Ark., which is 5 miles south-east of Seligman, Mo., on the Seligman and Eureka Springs road and just west of the road.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 27' 36''$.37. Longitude, $93^{\circ} 53' 48''$.00.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pilot Knob..... | 252 | 58 | 00.89 | 73 | 10 | 31.27 | 4.5160580 |
| Pyron..... | 282 | 49 | 05.60 | 103 | 01 | 57.05 | 4.5212040 |
| Butterfield..... | 177 | 05 | 49.62 | 357 | 05 | 13.28 | 4.4751420 |
| Lohmer..... | 216 | 19 | 25.65 | 36 | 26 | 08.01 | 4.4520580 |
| Orchard..... | 26 | 20 | 06.78 | 206 | 13 | 45.00 | 4.5601507 |

PYRON.

Pyron Mountain is about 2 miles northeast of Berryville, Carroll Co., Ark., and is about 800 feet above the town. Has about 2 acres on top and is cleared of timber, except one tree left for signal.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 23' 35''$.29. Longitude, $93^{\circ} 32' 08''$.61.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Kennedy..... | 301 | 16 | 08.01 | 121 | 27 | 09.76 | 4.5137760 |
| Bald..... | 216 | 31 | 31.14 | 36 | 40 | 05.00 | 4.5566820 |
| Pilot Knob..... | 176 | 50 | 01.71 | 356 | 49 | 39.26 | 4.2306400 |
| Swain..... | 60 | 52 | 49.66 | 240 | 44 | 41.98 | 4.3711983 |
| Sugar..... | 103 | 01 | 57.05 | 282 | 49 | 05.60 | 4.5212040 |
| Bread Tray..... | 193 | 37 | 30.38 | 13 | 39 | 30.16 | 4.3275320 |
| Watson..... | 340 | 21 | 31.29 | 160 | 23 | 45.71 | 4.2267538 |

WATSON.

About 15 miles southeast of Berryville, Ark., on divide between Piney and Osage Creeks, and 2 miles north of Piney, Carroll Co., Ark., on public land. It is rather a sharp peak and has all the timber cleared from summit except one tree left for a signal.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 15' 00''$.09. Longitude, $93^{\circ} 28' 21''$.56.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Swain | 99 | 38 | 46.03 | 279 | 23 | 24.91 | 4.4244809 |
| Pyron | 160 | 23 | 45.71 | 340 | 21 | 31.29 | 4.2267538 |
| Hobbs | 50 | 30 | 37.87 | 230 | 12 | 18.30 | 4.7830238 |
| Kennedy | 272 | 47 | 08.63 | 92 | 55 | 53.06 | 4.3475122 |

SWAIN.

About 10 miles south of Eureka Springs, Madison Co., Ark., about one-eighth mile west of the road between Eureka Springs and Hinds-ville, Ark. On a flat-top mountain, from which all the timber was cleared except one tree.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 17' 23''$.38. Longitude, $93^{\circ} 45' 52''$.65.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pyron | 240 | 44 | 41.98 | 60 | 52 | 49.66 | 4.3711983 |
| Watson | 279 | 28 | 24.91 | 99 | 38 | 46.03 | 4.4244656 |
| Hobbs | 25 | 26 | 05.55 | 205 | 18 | 03.99 | 4.6787670 |
| Rogers | 98 | 30 | 53.60 | 278 | 18 | 32.60 | 4.4991011 |
| Orchard | 64 | 03 | 14.03 | 243 | 52 | 11.63 | 4.4934958 |

ROGERS.

In the town of Rogers, Benton Co., Ark., 2 blocks east and 1 block north of railway depot, over center of water tower; elevated 20 feet above the top of the tower, which is 73 feet high and stands in the middle of the street.

Permanent mark: Center of water tower.

[Latitude, $36^{\circ} 19' 53''$.30. Longitude, $94^{\circ} 06' 43''$.29.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Orchard | 349 | 53 | 02.26 | 169 | 54 | 19.47 | 4.2690330 |
| Swain | 278 | 18 | 32.60 | 98 | 30 | 53.60 | 4.4991011 |
| Twin | 49 | 15 | 48.63 | 229 | 06 | 21.91 | 4.500107 |

ORCHARD.

About 3 miles east of Springdale and 8 miles northeast of Fayetteville, Washington Co., Ark., on a flat-top hill which has an orchard growing on it.

Permanent mark: Stone marked $\begin{smallmatrix} U \\ G \end{smallmatrix} \begin{smallmatrix} S \\ S \end{smallmatrix}$ set in ground.

[Latitude, $36^{\circ} 09' 59'' \cdot 74$. Longitude, $94^{\circ} 04' 32'' \cdot 59$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Swain | 243 | 52 | 11.63 | 64 | 03 | 14.03 | 4.4934958 |
| Sugar | 206 | 13 | 45.00 | 26 | 20 | 06.78 | 4.5601507 |
| Rogers | 169 | 54 | 19.47 | 349 | 53 | 02.26 | 4.2690330 |
| Kestler | 38 | 04 | 26.53 | 217 | 59 | 20.66 | 4.323958 |
| Twin | 85 | 05 | 14.10 | 264 | 54 | 31.46 | 4.436666 |
| Hobbs | 345 | 30 | 52.55 | 165 | 33 | 51.01 | 4.4830712 |

TWIN.

About 15 miles west of Fayetteville, Washington Co., Ark., on the southern of two round peaks. Has all the timber cleared from the summit except one black-oak tree.

Permanent mark: Tree.

[Latitude, $36^{\circ} 08' 42'' \cdot 54$. Longitude, $94^{\circ} 22' 42'' \cdot 02$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Rogers | 229 | 06 | 21.91 | 49 | 15 | 48.63 | 4.500107 |
| Orchard | 264 | 54 | 31.46 | 85 | 05 | 14.10 | 4.436666 |
| Drake | 32 | 19 | 55.01 | 212 | 14 | 52.26 | 4.382045 |

KESTLER.

About 5 miles southwest of Fayetteville, Washington Co., Ark., on a flat-topped hill, which was once under cultivation but is now waste land. The small timber was all cleared away, leaving one small white-oak tree, rather toward the south end of the mountain.

Permanent mark: Lone tree.

[Latitude, $36^{\circ} 01' 00'' \cdot 91$. Longitude, $94^{\circ} 13' 11'' \cdot 84$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Orchard | 217 | 59 | 20.66 | 38 | 04 | 26.53 | 4.323958 |
| Hobbs | 301 | 51 | 19.42 | 121 | 59 | 22.47 | 4.385381 |
| Drake | 77 | 20 | 08.03 | 256 | 09 | 30.68 | 4.444916 |
| Cane Hill | 61 | 36 | 15.84 | 241 | 27 | 38.46 | 4.399889 |
| Skylight | 34 | 36 | 53.43 | 214 | 31 | 25.92 | 4.392049 |
| Sloane | 341 | 27 | 27.20 | 161 | 29 | 46.10 | 4.271236 |

HOBBS.

About 12 miles southeast of Fayetteville and 3 miles south of Durham, Washington Co., Ark., on a northern spur of the Boston range of mountains. There is a cornfield on top of the peak in which a grove was standing. This grove of trees was chopped down, with the excep-

tion of one large black oak, which was reserved for a signal. Instrument elevated 20 feet.

Permanent mark: Black-oak tree.

[Latitude, 35° 54' 04''-07. Longitude, 93° 59' 28''-90.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Watson..... | 230 12 18.30 | 50 30 37.87 | 4.7830238 |
| Swain..... | 205 18 03.99 | 25 26 05.55 | 4.6787670 |
| Kestler..... | 121 59 22.47 | 301 51 19.42 | 4.385381 |
| Sloane..... | 71 44 23.92 | 251 28 40.50 | 4.189822 |
| Orchard..... | 165 33 51.01 | 345 30 52.55 | 4.4830712 |

SLOANE.

Sloane is about 15 miles south of Fayetteville, Washington Co., Ark., on a spur of the Boston range. About 5 acres of timber was chopped down to clear the top. Instrument was elevated 15 feet.

Permanent mark: Large white-oak tree.

[Latitude, 35° 51' 26''-29. Longitude, 94° 09' 14''-99]

| To station. | Azimuth. | Back azimuth. | Log dist. |
|----------------|--------------|---------------|-----------|
| | ° ' " | ° ' " | Meters. |
| Kestler..... | 161 29 46.10 | 341 27 27.20 | 4.271236 |
| Hobbs..... | 251 38 40.50 | 71 44 23.92 | 4.189822 |
| Strickler..... | 67 37 14.62 | 247 30 47.66 | 4.254126 |
| Skylight..... | 82 37 59.64 | 262 30 14.16 | 4.303541 |
| Boston..... | 9 53 35.75 | 189 53 07.12 | 3.854295 |
| Wakefield..... | 322 31 04.00 | 142 35 01.69 | 4.224813 |

SKYLIGHT.

About 3 miles west of Strickler, Washington Co., Ark., on a high, round hill, having a house on the highest part. The timber has all been cleared from the top, but has a fringe of trees around the edge, through which lines of sight were cut. The station is just in front of Mr. Donham's house.

Permanent mark: Large black-oak tree.

[Latitude, 35° 50' 02''-13. Longitude, 94° 22' 30''-28.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kestler..... | 214 31 25.92 | 34 36 53.43 | 4.392049 |
| Sloane..... | 262 30 14.16 | 82 37 59.64 | 4.305543 |
| Boston..... | 283 16 57.01 | 103 24 13.51 | 4.284353 |
| Cane Hill..... | 135 51 52.07 | 315 48 42.92 | 4.065343 |
| Strickler..... | 321 29 55.43 | 141 41 13.71 | 3.733676 |
| Lee..... | 357 58 54.14 | 177 59 12.80 | 4.358365 |

CANE HILL.

About 5 miles south of Summers, Washington Co., Ark. Station is on the northeast point of a big flat hill, and has lines of sight cut out to other primary points.

Permanent mark: Large white-oak tree.

[Latitude, $35^{\circ} 54' 32''$.-67. Longitude, $94^{\circ} 27' 53''$.-07.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Skylight..... | 315 48 42.92 | 135 51 52.07 | 4.065343 |
| Kestler..... | 241 27 38.46 | 61 36 15.84 | 4.399889 |

DRAKE.

About 20 miles west of Fayetteville and 1 mile west of Summers, Washington Co., Ark., on a long flat hill, the station being on the west end, and lines of sight chopped out to primary stations.

Permanent mark: Lone white-oak tree.

[Latitude, $35^{\circ} 57' 41''$.-53. Longitude, $94^{\circ} 31' 16''$.-56.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kestler..... | 256 09 30.68 | 77 20 08.03 | 4.444916 |
| Twin..... | 212 14 52.26 | 32 19 55.01 | 4.382045 |

STRICKLER.

About $1\frac{1}{2}$ miles southwest of Strickler, Washington Co., Ark., just east of the old wire road, running from Fayetteville southwest. Has all the timber cleared from the summit except one tree.

Permanent mark: Large white-oak tree.

[Latitude, $35^{\circ} 47' 44''$.-26. Longitude, $94^{\circ} 20' 16''$.-53.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Skylight..... | 141 41 13.71 | 321 39 55.43 | 3.733676 |
| Sloane..... | 247 30 47.66 | 67 37 14.62 | 4.254126 |
| Lockard..... | 332 46 12.72 | 152 49 11.70 | 4.226613 |
| Lee..... | 7 52 01.94 | 187 51 02.47 | 4.272616 |

BOSTON.

Boston is on the main ridge of the Boston range of mountains and about $1\frac{1}{2}$ miles west of Winslow, Washington Co., Ark., which is at the north end of the tunnel of the St. Louis and San Francisco Railway. Is about 100 feet above the general ridge. Is rather flat on top.

The station is near the north end of the hill and has lines of sight cut through to other primary points. Instrument was elevated 15 feet.

Permanent mark: Large black-oak tree.

[Latitude, 35° 47' 37"-74. Longitude, 94° 10' 03"-95.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Skylight | 103 24 13·51 | 283 16 57·01 | 4·284353 |
| Sloane | 189 53 07·12 | 9 53 35·75 | 3·854295 |
| Wakefield | 298 43 48·14 | 118 48 14·24 | 4·115503 |
| Cartright | 349 26 39·11 | 169 27 24·15 | 4·024527 |

WAKEFIELD.

Wakefield, in Franklin Co., Ark., is about 10 miles southeast of Winslow and 10 miles northeast of Chester. Has all timber cleared from summit except one tree.

Permanent mark: Lone tree.

[Latitude, 35° 44' 14"-02. Longitude, 94° 02' 28"-69.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Boston | 118 48 14·24 | 298 43 48·14 | 4·115503 |
| Sloane | 142 35 01·69 | 322 31 04·00 | 4·224813 |
| Cartright | 66 34 46·45 | 246 31 05·67 | 4·015411 |

CARTRIGHT.

Cartright is on a high ridge 3 miles east of Chester, Crawford Co., Ark. The station is the west end of Mr. Cartright's house, which is on the highest ground.

Permanent mark: West end of the comb of the roof.

[Latitude, 35° 42' 00"-22. Longitude, 94° 08' 46"-89.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Boston | 169 27 24·15 | 349 26 39·11 | 4·024527 |
| Wakefield | 246 31 05·67 | 66 34 46·45 | 4·015411 |

LOCKARD.

Lockard is about 5 miles west of Chester, Crawford Co., Ark., on a round hill, which has all the timber cleared from the summit except one tree.

Permanent mark: Tall black-oak tree.

[Latitude, $35^{\circ} 39' 37''$.70. Longitude, $94^{\circ} 15' 09''$.63.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Lee..... | 70 | 52 | 08.76 | 250 | 48 | 10.76 | 4.096555 |
| Strickler..... | 152 | 49 | 11.70 | 332 | 46 | 12.72 | 4.226613 |

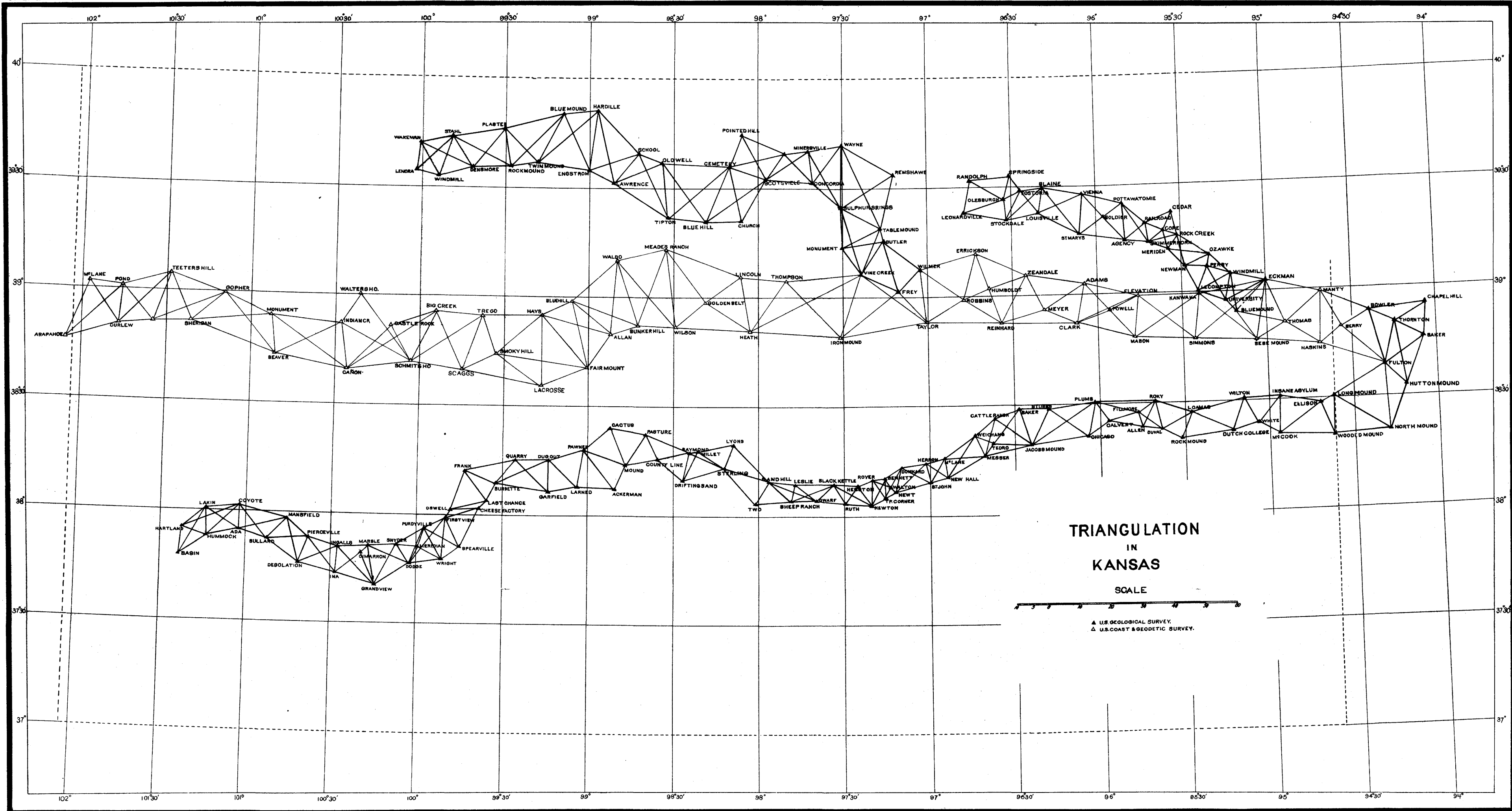
LEE.

Lee is about 13 miles west of Chester and 3 miles south of Lee Creek, Crawford Co., Ark. Is a sharp peak with a small field on top. The station is near the center of the summit. Instrument was elevated 15 feet.

Permanent mark: Large black-oak tree.

[Latitude, $35^{\circ} 37' 42''$.12. Longitude, $94^{\circ} 21' 58''$.45.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Skylight..... | 177 | 59 | 12.80 | 357 | 58 | 54.14 | 4.358365 |
| Strickler..... | 187 | 51 | 02.47 | 7 | 52 | 01.94 | 4.272616 |
| Lockard..... | 250 | 48 | 10.76 | 70 | 52 | 08.76 | 4.096555 |



KANSAS.

METHODS OF WORK.

The triangulation in Kansas conducted by the Geological Survey is in three detached belts, each of which starts from a line or lines of the transcontinental triangulation of the U. S. Coast and Geodetic Survey.

The southern belt begins with the line Fulton-Hutton Mound some 20 miles east of the Missouri-Kansas line, and proceeds nearly due west until the Arkansas River is reached at Hutchinson. From here the general course of the river is followed as far as Larned, at which point topographic conditions favored a detour to the west and southwest to Dodge, after which the river was again followed to the present terminus near Hartland.

Field work of triangulation was begun in 1885 by R. U. Goode, who continued it as far as Florence. The instrument used was a Gambey 11-inch repeating theodolite with two verniers reading to ten seconds. No azimuth observations were taken at the time, but a subsequent observation at Florence showed only a very small error. In 1889 this belt was continued westward by H. L. Baldwin, jr., as far as Spearville. The instrument used was a Fauth 8-inch theodolite, No. 362, reading with two microscopes to 2 seconds. Azimuths were taken at intervals of about 50 miles in this and all subsequent work.

At Spearville a base line 7.1 miles in length was measured with a 300-foot steel tape under very favorable conditions. The base line was divided into thirteen sections of 3,000 feet each, two complete measures of each section being made. About half of the sections were measured a third time, when work was stopped by an accident. The resulting probable error of the base is 0.39 inch. An astronomical determination of the latitude and longitude of the Spearville end of the base was made in 1889 by Prof. R. S. Woodward, signals being exchanged with St. Louis on three nights.

In 1889 work was resumed at Spearville, and continued by a series of small but well-proportioned quadrilaterals to its present terminus near Hartland. All of the southern belt west of Florence rests upon the Spearville base. The average errors of closure of the triangles for each year's field work, before station adjustment was made, were respectively 7''·85, 3''·25, and 1''·73.

The northeastern belt of triangulation was executed under the direction of Mr. John H. Renshawe in 1886. The angles were measured by Mr. E. T. Perkins, jr., excepting those from a few of the later

stations, which were observed by Mr. George T. Hawkins. The instrument used was the Gambey 11-inch theodolite used during the previous year in the southern belt. The work is based upon the U. S. Coast and Geodetic Survey line Blue Mound-Eckman, near Lawrence; and proceeds in a westerly direction, the axis of triangulation being about parallel to and 20 miles north of the Kansas River.

The northern belt of triangulation, executed by Mr. H. L. Baldwin, jr., in 1890, uses for initial positions three stations of the transcontinental triangulation of the U. S. Coast and Geodetic Survey, Vine Creek-Frey-Wilmer. It first proceeds northward 40 miles, and then takes a general westerly course to its present terminus near Lenora, Kans. The triangulation consists of a series of well-proportioned quadrilaterals of much larger size than in the other two belts, which was rendered possible by more favorable topographic conditions. The instrument used was a Fauth 8-inch theodolite, No. 362, reading by two micrometers to $2''$. Owing to the small errors of closure no figure or station adjustment was necessary. The average error of closure in 60 triangles is $2''\cdot07$.

In all of the Kansas triangulation well-proportioned figures with occasional single triangles were used, since the topography rendered it possible to place stations wherever desirable. Angles were read by the method of directions, both singly and combined, in such manner as to give check observations on each angle which entered into the computations. Adjustments by the method of least squares were made in the earlier work, in which less accurate instruments were used. In the later work the closures were so good as to render least-square adjustments unnecessary.

Nearly all of the stations in this work consisted of tripod signals built of rough lumber. Most of the earlier ones were tripods about 16 feet in height supporting an upright 4 by 4 pole and boarded to near the ground, so as to be readily distinguishable at a distance. In the later work the tripod was left more open and a target similar to that used by the Missouri River Commission, consisting of boards covered with white and black cloth and nailed on the pole at right angles to each other, was employed. In some cases, where it was necessary to elevate the instrument, a higher and larger scaffold was built for the support of the observer and within this a smaller tripod was erected for the support of the instrument.

In connection with the triangulation in Kansas a large number of townships and section corners were located usually by the method of directions and distances from the triangulation stations. These locations were made for the purpose of establishing control for the topographic work, which, in the plains country, is largely based on the land surveys.

A list of these corners with their positions is appended.

DESCRIPTORS AND POSITIONS OF STATIONS.

CHAPEL HILL.

Triangulation station of the U. S. C. & G. S. in Cass Co., Mo., on land belonging to Dr. Joseph Ragsdale, about 400 feet from his house and about one-fourth mile south-southwest from the village of Chapel Hill. Station is in the NE. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 1, T. 47, R. 29.

Permanent mark: An ale bottle filled with ashes 3 feet below surface. Surface mark, a marble stone with letters U. S. C. S. cut on top. Two witness posts were set 5 feet, respectively, north and south from center of surface mark.

[Latitude, $38^{\circ} 54' 52''$. 14. Longitude, $94^{\circ} 03' 27''$. 27.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Thornton | 62 04 23 | 241 57 17 | 4.2677195 |
| Normal | 301 29 31 | 121 41 34 | 4.5135400 |

OWLER.

Triangulation station of the U. S. C. & G. S. in Jackson Co., Mo., on a small hill situated about one-third of a mile west of the house of Mr. J. O. Bowler, the owner of the land, and about $2\frac{1}{2}$ miles southwest of the town of Lee Summit, Jackson Co., Mo. It is in the NW. $\frac{1}{4}$ of the SW. $\frac{1}{4}$ of sec. 18, T. 47, R. 31.

Permanent mark: A bottle of ashes 3 feet below surface and three posts for surface marks. The center one has the letters U. S. C. S. cut on top. The witness posts are set 5 feet, respectively, north and south.

[Latitude, $38^{\circ} 53' 20''$. 98. Longitude, $94^{\circ} 23' 38''$. 30.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Thornton | 294 33 59 | 114 39 33 | 4.1498642 |
| Fulton | 344 39 22 | 164 42 33 | 4.4455354 |
| Independence | 175 16 46.3 | 355 15 57.2 | 4.357836 |
| Berry | 62 31 45 | 242 25 32 | 4.2082964 |

THORNTON.

Triangulation station of the U. S. C. & G. S. in Cass Co., Mo., on land belonging to Mr. Charles T. Thornton, about 4 miles northeast of Pleasant Hill. It is in the NE. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of sec. 4, T. 46, R. 30, about 10 feet south of the line bounding the section on the north. The north line of the section separates Cass Co. from Jackson Co.

Permanent mark: An ale bottle filled with ashes, $2\frac{3}{4}$ feet below surface. A marble post set flush with the ground, with the letters U. S.

U. S. cut on top, is the surface mark. Two other posts are set, respectively, north and south a distance of 5 feet from center of surface mark.

[Latitude, $38^{\circ} 50' 10''$. 25. Longitude, $94^{\circ} 14' 45''$. 83.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Baker | 298 20 55 | 118 27 33 | 4.2404185 |
| Fulton | 14 39 00 | 194. 36 37 | 4.3370185 |
| Bowler | 114 39 33 | 294 33 59 | 4.1498642 |
| Chapel Hill..... | 241 57 17 | 62 04 23 | 4.2677195 |

BAKER.

Triangulation station of the U. S. C. & G. S. in Johnson Co., Mo. The station is on the highest part of a prominent hill, about 1 mile north of the town of Kingsville. It is in Johnson Co., Mo., in the S. $\frac{1}{2}$ of the E. $\frac{1}{2}$ of the SE. $\frac{1}{4}$ of sec. 25, T. 46, R. 29, on land belonging to Mr. Edward Baker, and close to his house.

Permanent mark: An ale bottle filled with ashes, $2\frac{1}{4}$ feet below surface. The surface mark, a marble post set flush with surface, with the letters U. S. C. S. cut on top. Two witness posts are set 5 feet, respectively, north and south of the center of surface mark.

[Latitude, $38^{\circ} 45' 41''$. 91. Longitude, $94^{\circ} 04' 11''$. 78.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Normal..... | 270 08 33 | 90 21 02 | 4.4608037 |
| Caldwell..... | 307 51 53 | 128 03 40 | 4.5399884 |
| Hutton Mound... | 22 09 45 | 202 05 37 | 4.4063201 |
| Fulton..... | 58 35 02 | 238 26 03 | 4.3875027 |
| Thornton..... | 118 27 33 | 298 20 55 | 4.2404185 |

FULTON.

Triangulation station of the U. S. C. & G. S. in Cass Co., Mo., about $2\frac{1}{2}$ miles east-southeast of Harrisonville, Mo., on land belonging to Mr. L. G. Fulton. It is in sec. 2, T. 44, R. 31, 168.5 feet from the northwest corner of the northeast quarter of the section and 71.1 feet south of the fence forming the boundary of Mr. Fulton's farm, separating it from the main road, and 71.5 feet east from a small house.

Permanent mark: An ale bottle filled with ashes, $2\frac{1}{2}$ feet below surface, and over it a marble post 2.1 feet, the letters U. S. C. S. cut on top. Two sandstone posts, each 2.1 feet long, were set 5 feet north and south, respectively.

[Latitude, $38^{\circ} 38' 48''$. 46. Longitude, $94^{\circ} 18' 33''$. 07.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hutton Mound.... | 313 59 26 | 134 04 16 | 4.1938480 |
| Baker | 238 26 03 | 58 35 02 | 4.3875027 |
| Berry | 131 54 11 | 311 44 48 | 4.4646561 |
| Bowler | 164 42 33 | 344 39 22 | 4.4455354 |
| Thornton..... | 194 36 37 | 14 39 00 | 4.3370185 |

HUTTON MOUND.

Triangulation station on the U. S. C. & G. S. in Cass Co., Mo. This station is on a hill, locally known as "Big Mound," belonging to Mr. Thomas Hutton, about five-eighths of a mile east of his house, and about 14 miles southeast of Harrisonville, in the NE. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 1, T. 43, R. 30.

Permanent mark: An ale bottle filled with ashes, 2 $\frac{1}{2}$ feet below surface, over this a stone post, set flush with surface, with the letters U. S. C. S. cut on top. Two other posts were set 5 feet, respectively, north and south of station.

[Latitude, 38° 32' 56''-24. Longitude, 94° 10' 48''-82.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Baker..... | 202 05 37 | 22 09 45 | 4.4063201 |
| Caldwell..... | 260 20 22 | 86 36 14 | 4.5689069 |
| Fulton..... | 134 04 16 | 313 59 26 | 4.1938480 |

NORTH MOUND.

Triangulation station in Bates Co., Kans., on what is locally known as North Mound, in the SE. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of sec. 19, T. 40, R. 30, about 7 miles northeast of Butler and 6 miles southeast of Adrian.

Permanent mark: Stone set in the ground, marked with cross and U. S. G. S.

Latitude, 38° 20' 51''-45. Longitude, 94° 17' 13''-20.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Long Mound..... | 122 03 05.6 | 301 50 51.47 | 4.528461 |
| Wooded Mound... | 87 01 37.1 | 266 49 11.02 | 4.466131 |

LONG MOUND.

In Miami Co., Kans., on what is locally known as Long Mound, about 12 miles south of Louisburg and one-eighth mile west of the State line, in the SE. $\frac{1}{4}$ of the SW. $\frac{1}{4}$ of sec. 2, T. 18, R. 25.

Permanent mark: Stone sunk 18 inches below surface; top flush with surface and marked with cross and U. S. G. S.

[Latitude, 38° 30' 30''-94. Longitude, 94° 36' 54''-35.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wooded Mound .. | 1 32 38.97 | 181 32 25.59 | 4.288793 |
| Ellison | 65 02 13.67 | 244 59 25.75 | 3.858096 |
| North Mound..... | 301 50 51.47 | 122 03 05.6 | 4.528461 |

WOODED MOUND.

In Linn Co., Kans., about 8 miles east of La Cygne and 3 miles southwest of West Point, in the SW. $\frac{1}{4}$ of sec. 2, T. 20, R. 25, one-fourth mile west of State line.

Permanent mark: Stone sunk 18 inches in the ground, marked with cross and U. S. G. S.

[Latitude, $38^{\circ} 20' 00''$.55. Longitude, $94^{\circ} 37' 15''$.90.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Ellison | 159 | 50 | 51.79 | 339 | 48 | 17.59 | 4.242093 |
| McCook | 93 | 11 | 51.39 | 272 | 59 | 57.93 | 4.446725 |
| North Mound..... | 266 | 49 | 11.02 | 87 | 01 | 37.1 | 4.466631 |
| Long Mound..... | 181 | 32 | 25.59 | 1 | 32 | 38.97 | 4.288793 |

ELLISON.

In Miami Co., Kans., about 3 miles northeast of Lancaster, in the SE. $\frac{1}{4}$ of the SW. $\frac{1}{4}$ of sec. 18, T. 18, R. 25.

Permanent mark: Stone, top flush with surface and marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 28' 52''$.14. Longitude, $94^{\circ} 41' 24''$.12.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Insane Asylum... | 99 | 39 | 06.00 | 279 | 29 | 48.15 | 4.342576 |
| McCook | 55 | 51 | 47.99 | 235 | 42 | 27.19 | 4.422602 |
| Long Mound..... | 244 | 59 | 25.75 | 65 | 02 | 13.67 | 3.858096 |
| Wooded Mound... | 339 | 48 | 17.59 | 159 | 50 | 51.79 | 4.242093 |

M^CCOOK.

In Linn Co., Kans., about 9 miles west of La Cygne and 10 miles south of Osawatomie, on land owned by Mr. McCook, in the SW. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 35, T. 19, R. 22, 1,375 feet west and 35 feet north of the southeast corner of the section.

Permanent mark: Stone sunk 18 inches in the ground, top flush with the surface, marked with cross and U. S. G. S.

[Latitude, $38^{\circ} 20' 49''$.60. Longitude, $94^{\circ} 56' 26''$.04.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| White | 118 | 08 | 59.0 | 298 | 04 | 22.28 | 4.088773 |
| Insane Asylum... | 180 | 28 | 43.2 | 0 | 28 | 47.17 | 4.268103 |
| Wooded Mound... | 272 | 59 | 57.93 | 93 | 11 | 51.39 | 4.446725 |
| Ellison..... | 235 | 42 | 27.19 | 55 | 51 | 47.99 | 4.422602 |

INSANE ASYLUM.

In Miami Co., Kans., at Osawatomie. Station in main cupola of building. In sec. 2, T. 18, R. 22.

Permanent mark: Center of cupola.

[Latitude, 38° 30' 50''-86. Longitude, 94° 56' 19''-64.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| White | 40 42 40-37 | 220 37 59-16 | 4-225875 |
| Wilton | 88 45 02-57 | 268 37 15-33 | 4-259700 |
| Ellison | 279 29 48-15 | 99 39 06-00 | 4-342576 |
| McCook | 0 28 47-17 | 180 28 43-20 | 4-268103 |

WHITE.

In Franklin Co., Kans., near corner of Franklin, Miami, Linn, and Anderson counties, on land owned by J. H. White, and is in the SW. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of sec. 14, T. 19, R. 21, about $5\frac{1}{2}$ miles northeast of Greeley and 5 miles southeast of Lane.

Permanent mark: Stone sunk 18 inches in the ground, top flush with the surface, and marked with a cross and U. S. G. S.

[Latitude, 38° 23' 57''-08. Longitude, 95° 03' 51''-80.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Wilton | 149 39 39-96 | 329 36 34-5 | 4-155446 |
| Dutch College.... | 74 54 35-7 | 254 48 55-2 | 4-139510 |
| Insane Asylum... | 220 37 59-16 | 40 42 40-37 | 4-225875 |
| McCook | 298 04 22-28 | 118 08 59-0 | 4-088773 |

WILTON.

In Franklin Co., Kans., 8 miles east of Princeton, and about 8 miles northwest of Lane. Station is center of the chimney of Mrs. Wilton's house in the SE. $\frac{1}{4}$ of the SW. $\frac{1}{4}$ of sec. 1, T. 18, R. 20.

Permanent mark: Chimney.

[Latitude, 38° 30' 37''-34. Longitude, 95° 08' 50''-00.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Dutch College.... | 29 51 30-30 | 200 48 54-80 | 4-231921 |
| Loamas | 77 09 25-30 | 256 57 48-28 | 4-444930 |
| White | 329 36 34-51 | 149 39 39-96 | 4-155446 |
| Insane Asylum... | 268 37 15-33 | 88 45 02-57 | 4-259700 |

DUTCH COLLEGE.

In Anderson Co., Kans., about 1 mile southeast of Scipio, on the Kansas Southern Railway, about 6 miles north-northeast of Garnett, in

the cupola of the Dutch Catholic College. In the NE. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 29, T. 19, R. 20.

Permanent mark: Center of cupola.

[Latitude, $38^{\circ} 22' 00'' .30$. Longitude, $95^{\circ} 13' 00'' .18$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Loamas | 114 | 46 | 01.80 | 294 | 37 | 01.31 | 4.366056 |
| Rock Mound..... | 82 | 44 | 26.50 | 262 | 33 | 10.07 | 4.426359 |
| White | 254 | 48 | 55.2 | 74 | 54 | 35.7 | 4.139510 |
| Wilton | 200 | 48 | 54.80 | 20 | 51 | 30.30 | 4.231921 |

LOAMAS.

In Franklin Co., Kans., about $1\frac{1}{2}$ miles south of Williamsburg, on land owned by Mr. Loamas, in the center of the SE. $\frac{1}{4}$ of sec. 30, T. 18, R. 18.

Permanent mark: Stone sunk in the ground 18 inches and marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 27' 15'' .04$. Longitude, $95^{\circ} 27' 30'' .12$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Rock Mound..... | 22 | 10 | 56.01 | 202 | 08 | 39.33 | 4.151281 |
| Duval | 62 | 12 | 45.14 | 242 | 06 | 06.46 | 4.245590 |
| Roky | 107 | 49 | 11.34 | 287 | 41 | 12.50 | 4.291917 |
| Dutch College | 294 | 37 | 01.31 | 114 | 46 | 01.80 | 4.366056 |
| Wilton | 256 | 57 | 48.28 | 77 | 09 | 25.30 | 4.444930 |

ROCK MOUND.

In Anderson Co., Kans., about 7 miles southeast of Waverly, on the north end of a mound in the SE. $\frac{1}{4}$ of sec. 3, T. 20, R. 17.

Permanent mark: Stone sunk 18 inches in the ground, the top being flush with surface, marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 20' 09'' .52$. Longitude, $95^{\circ} 31' 10'' .36$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Duval | 115 | 37 | 23.20 | 295 | 33 | 01.70 | 4.054732 |
| Dutch College | 262 | 33 | 10.07 | 82 | 44 | 26.50 | 4.426359 |
| Loamas | 202 | 08 | 39.33 | 22 | 10 | 56.01 | 4.151281 |

DUVAL.

In Coffey Co., Kans., about 3 miles southwest of Waverly. Station is the center of the chimney of Duval's house, in the SW. $\frac{1}{4}$ of sec. 22, T. 19, R. 16.

Permanent mark: Chimney.

[Latitude, 38° 22' 48"-40. Longitude, 95° 38' 72.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Roky | 167 | 40 | 56.96 | 347 | 39 | 36.73 | 4.162216 |
| Fillmore | 125 | 40 | 10.36 | 305 | 35 | 03.40 | 4.168496 |
| Allen | 96 | 36 | 14.90 | 276 | 31 | 52.96 | 4.013078 |
| Rock Mound | 295 | 33 | 01.70 | 115 | 37 | 23.20 | 4.054732 |
| Loamas | 242 | 06 | 06.46 | 62 | 12 | 45.14 | 4.245590 |

ROKY.

In Osage Co., Kans., 2 miles west of Melverne, on land owned by Mr. Jacob Roky, about 1,000 feet northwest from his house, in the northwest corner of sec. 8, T. 18, R. 16.

Permanent mark: Stone sunk 18 inches in the ground and the top flush with surface, marked with a cross and U. S. G. S.

[Latitude, 38° 30' 28"-72. Longitude, 95° 40' 19"-64.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Allen | 38 | 43 | 55.04 | 208 | 40 | 52.28 | 4.171384 |
| Fillmore | 57 | 43 | 57.51 | 237 | 40 | 09.78 | 4.020929 |
| Plumb | 90 | 27 | 18.28 | 270 | 13 | 59.09 | 4.492761 |
| Loamas | 287 | 41 | 12.50 | 107 | 49 | 11.34 | 4.291917 |
| Duval | 347 | 39 | 36.73 | 167 | 40 | 56.26 | 4.162216 |

ALLEN.

In Coffey Co., Kans., about 6 miles southeast from Lebo, on land owned by Clinton Allen, in the NE. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of sec. 21, T. 19, R. 15, about 300 feet south of section line and 500 feet west of one-half section line.

Permanent mark: Stone sunk 18 inches in the ground, top flush with surface, and marked with a cross and U. S. G. S.

[Latitude, 38° 23' 26"-62. Longitude, 95° 45' 13"-55.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Calvert | 100 | 43 | 54.50 | 280 | 36 | 37.71 | 4.239563 |
| Duval | 276 | 31 | 52.96 | 96 | 36 | 40.90 | 4.013078 |
| Roky | 208 | 40 | 52.28 | 28 | 43 | 55.04 | 4.171384 |
| Fillmore | 166 | 43 | 54.34 | 346 | 43 | 09.57 | 3.881425 |

FILLMORE.

In Osage Co., Kans., about 5 miles northeast of Lebo and one-half mile south of the Kansas Southern Railway, in sec. 29, T. 18, R. 15, 200 feet north of road on section line. Station is chimney of Fillmore's house.

Permanent mark: Chimney.

[Latitude, $38^{\circ} 27' 26''$.86. Longitude, $95^{\circ} 46' 25''$.60.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Allen..... | 346 | 43 | 09.57 | 166 | 43 | 54.34 | 3.881425 |
| Calvert..... | 74 | 44 | 05.80 | 254 | 37 | 33.47 | 4.200554 |
| Plumb..... | 104 | 40 | 51.89 | 234 | 31 | 20.89 | 4.361402 |
| Duval..... | 305 | 35 | 03.40 | 125 | 40 | 10.36 | 4.168496 |
| Roky..... | 237 | 40 | 09.78 | 57 | 43 | 57.51 | 4.020929 |

CALVERT.

In Lyon Co., Kans., 5 miles due west of Lebo and 13 miles east of Emporia, on land owned by Mr. Calvert. About 250 feet southwest of his house, in the NW. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of sec. 11, T. 19, R. 13.

Permanent mark: Stone sunk 18 inches in the ground, marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 25' 10''$.89. Longitude, $95^{\circ} 56' 56''$.69.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Plumb..... | 145 | 12 | 11.14 | 325 | 09 | 12.91 | 4.085110 |
| Chicago Mound... | 54 | 48 | 59.01 | 234 | 44 | 30.84 | 4.108214 |
| Allen..... | 280 | 36 | 37.71 | 100 | 43 | 54.50 | 4.239563 |
| Fillmore..... | 254 | 37 | 33.47 | 74 | 44 | 05.80 | 4.200554 |

PLUMB.

In Lyon Co., Kans., on land owned by Senator Plumb, about 12 miles northeast of Emporia and 3 miles southwest of Reading, in the SE. $\frac{1}{4}$ of sec. 1, T. 18, R. 12, 546 feet north and 1,518 feet west from the southeast corner of the section.

Permanent mark: Stone set 18 inches in the ground. Top flush with the surface and marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 30' 34''$.76. Longitude, $96^{\circ} 01' 43''$.20.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Chicago Mound... | 11 | 28 | 24.04 | 191 | 26 | 53.71 | 4.248911 |
| Stubbs..... | 82 | 16 | 14.70 | 262 | 06 | 01.70 | 4.381832 |
| Roky..... | 270 | 13 | 59.09 | 90 | 27 | 18.28 | 4.492761 |
| Fillmore..... | 284 | 31 | 20.89 | 104 | 40 | 51.89 | 4.361402 |

CHICAGO MOUND.

In Lyon Co., Kans., about 9 miles southeast of Emporia, in the NW. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 34, T. 19, R. 12. About 5 miles southwest of Neosho Rapids, on the Missouri, Kansas and Texas Railway.

Permanent mark: Stone sunk 18 inches in the ground. Top flush with surface, marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 21' 10''$ 91. Longitude, $96^{\circ} 04' 08''$ 52.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Jacobs Mound.... | 82 06 35.10 | 261 54 08.90 | 4.469905 |
| Stubbs | 124 47 16.66 | 304 38 35.00 | 4.394046 |
| Plumb | 191 26 53.71 | 11 28 24.04 | 4.248911 |

STUBBS.

In Lyon Co., Kans., about 5 miles southwest of Americus, in the SE. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 16, R. 9, 406 feet east and 296 feet north from the southwest corner of the section.

Permanent mark: Stone sunk 18 inches in the ground; top flush with the surface, marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 28' 48''$ 56. Longitude, $96^{\circ} 18' 08''$ 04.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Baker | 90 31 16.10 | 270 24 54.51 | 4.172151 |
| Jacobs Mound.... | 25 52 28.90 | 205 48 43.09 | 4.306163 |
| Chicago Mound.... | 304 38 35.00 | 124 47 16.66 | 4.394046 |
| Plumb | 262 06 01.70 | 82 16 14.70 | 4.381832 |

JACOBS MOUND.

In Chase Co., Kans., in the SE. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of sec. 15, T. 20., R. 9, about 6 miles south of Safford, on Atchison, Topeka and Santa Fe Railway.

Permanent mark: Stone sunk 18 inches in the ground, top flush with surface, marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 18' 57''$ 82. Longitude, $96^{\circ} 24' 11''$ 58.]

| To station.. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Baker | 161 44 05.89 | 341 41 30.80 | 4.285792 |
| Cattle Ranch | 126 37 26.57 | 306 29 27.47 | 4.367691 |
| Tedro | 93 22 17.56 | 273 13 57.41 | 4.292743 |
| Messer | 78 11 33.18 | ..... | 4.393927 |
| Stubbs | 205 48 43.09 | 25 52 28.90 | 4.306163 |
| Chicago Mound... | 261 54 08.90 | 82 06 35.10 | 4.469905 |

BAKER.

In Chase Co., Kans., about 8 miles northwest of Safford, in the SW. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 13, T. 18, R. 8, on a mound on land owned by H. L. Baker, and about three-fourths of a mile east of his house.

Permanent mark: Stone sunk 18 inches in the ground, top flush with surface, marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 28' 52'' \cdot 41$. Longitude, $96^{\circ} 28' 21'' \cdot 28$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cattle Ranch..... | 70 41 11·61 | 250 35 46·94 | 4·127547 |
| Tedro..... | 38 11 07·51 | 218 05 21·67 | 4·339938 |
| Jacobs Mound..... | 341 41 30·80 | 161 44 05·89 | 4·285792 |
| Stubbs..... | 270 24 54·51 | 90 31 16·10 | 4·172151 |

CATTLE RANCH.

In Chase Co., Kans., about 5 miles northeast of Elmdale and about 5 miles northwest of Strong, on a ranch owned by the Western Cattle Company, in the SE. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 35, T. 18, R. 7.

Permanent mark: Stone sunk 2 feet in the ground, top flush with surface, and marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 26' 28'' \cdot 24$. Longitude, $96^{\circ} 37' 03'' \cdot 25$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Tedro..... | 3 47 07·30 | 183 46 45·72 | 4·160752 |
| Weichaus..... | 49 44 00·17 | 229 39 43·59 | 4·118647 |
| Baker..... | 250 35 46·94 | 70 41 11·61 | 4·127547 |
| Jacobs Mound..... | 306 29 27·49 | 126 37 26·57 | 4·367691 |

TEDRO.

In Chase Co., Kans., about 5 miles south of Elmdale, on the Atchison, Topeka and Santa Fe Railway, in the NE. $\frac{1}{4}$ of the SW. $\frac{1}{4}$ of sec. 11, T. 20, R. 7, on an elevation about one-half mile southwest of the house of Reuben Tedro.

Permanent mark: Stone sunk 24 inches in the ground, top being flush with the surface, marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 19' 34'' \cdot 46$. Longitude, $96^{\circ} 37' 38'' \cdot 01$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Weichaus..... | 114 54 11·70 | 294 50 17·00 | 4·005410 |
| Messer..... | 36 41 00·71 | 216 39 02·34 | 3·890538 |
| Cattle Ranch..... | 183 46 45·72 | 3 47 07·30 | 4·106752 |
| Baker..... | 218 05 21·67 | 38 11 07·51 | 4·339938 |
| Jacobs Mound..... | 273 13 57·41 | 93 22 17·56 | 4·292743 |

MESSER.

In Chase Co., Kans., near the center of sec. 32, T. 20, R. 7, on an elevation about 150 yards west of — Messer's house. It is about 12 miles southwest of Cottonwood Falls and about 5 miles east-southeast of Clements, on the Atchison, Topeka and Santa Fe Railway.

Permanent mark: Earthen jar filled with ashes, 18 inches below surface, and over it a stone marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 16' 12''$. Longitude, $96^{\circ} 40' 49''$.00.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Weichaus | 156 34 23.69 | 336 32 27.57 | 4.058296 |
| McLane | 89 24 27.52 | 269 15 43.02 | 4.313610 |
| Tedro | 216 39 02.34 | 36 41 00.70 | 3.890538 |
| Jacobs Mound | | 78 11 33.18 | 4.393927 |

WEICHAUS.

In Chase Co., Kans., about 5 miles west of Elmdale, on the Atchison, Topeka and Santa Fe Railway. It is in the SW. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 26, T. 19, R. 6. On southern crest of ridge, west of Weichaus's house, 1,500 feet west and 195.5 feet north of the southeast corner of section 26.

Permanent mark: Bottle of ashes buried 2 feet below surface, over which is a stone marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 21' 52''$. Longitude, $96^{\circ} 43' 56''$.30.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| McLane | 56 14 39.74 | 236 07 50.80 | 4.285218 |
| Tedro | 294 50 17.00 | 114 54 11.70 | 4.005410 |
| Cattle Ranch | 229 39 43.59 | 49 44 00.17 | 4.118647 |

NEWHALL.

In Chase Co., Kans., about 6 or 8 miles southeast of the town of Florence, in yard of house owned by Mr. Newhall, and no surrounding objects except a few scattering trees northwest of the signal on flat-topped ridge.

Permanent mark: None.

[Latitude, $38^{\circ} 10' 30''$. Longitude, $96^{\circ} 53' 46''$.84.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Herron | 123 22 29.2 | 303 17 46.8 | 4.123743 |
| St. John | 75 22 58.5 | 255 19 08.9 | 3.970855 |
| McLane | 170 49 23.1 | 350 48 41.6 | 4.0093919 |

McLANE.

In Chase Co., Kans., in NE. $\frac{1}{4}$ of SE. $\frac{1}{4}$ of sec. 31, R. 5, T. 20, on land owned by Mr. McLane, on high ground about one-half mile northwest from house. Signal, lumber tripod.

Permanent mark: Stone buried flush with surface of ground and marked U. S. G. S. +, and later large wooden plug was placed.

[Latitude, $38^{\circ} 15' 57''$.32. Longitude, $96^{\circ} 54' 53''$.86.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Weichaus | 236 07 50.80 | 56 14 39.74 | 4.2852176 |
| Messer | 269 15 43.02 | 89 24 27.52 | 4.3136100 |
| Herron | 73 40 26.60 | 253 36 25.40 | 3.9944218 |
| Newhall | 350 48 41.60 | 170 49 23.10 | 4.0093919 |

HERRON.

In Marion Co., Kans., on a small knoll 5 miles south of Marion on public road a few hundred feet south of section corner.

Permanent mark: None.

[Latitude, $38^{\circ} 14' 27''$.16. Longitude, $97^{\circ} 01' 23''$.46.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Dunkard | 81 58 22.1 | 261 52 58.7 | 4.108467 |
| St. John | 347 55 32.7 | 167 56 25.2 | 3.995216 |
| McLane | 253 36 25.4 | 73 40 26.6 | 3.9944218 |
| Newhall | 303 17 46.8 | 123 22 29.2 | 4.123743 |

ST. JOHN.

In Marion Co., Kans., on rolling ridge about 7 miles south of signal Herron, in a large field at present used as a cow pasture.

Permanent mark: None.

[Latitude, $38^{\circ} 09' 13''$.46. Longitude, $96^{\circ} 59' 58''$.46.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Dunkard | 118 04 31.1 | 297 58 15.5 | 4.223999 |
| Nowt | 75 24 04.7 | 255 16 40.2 | 4.258168 |
| Herron | 167 56 25.2 | 347 55 32.7 | 3.995216 |

DUNKARD.

In Marion Co., Kans., in SW. $\frac{1}{4}$ of sec. 13, T. 21, R. 2 E., 380 feet east and 2,407 feet north of the southwest corner of the section.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 13' 28''$.69. Longitude, $97^{\circ} 10' 06''$.06.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Walton | 29 27 27.3 | 209 25 01.4 | 4.067905 |
| Bennett | 58 05 54.2 | 238 02 13.3 | 4.010395 |
| St. John | 297 58 15.5 | 118 04 31.1 | 4.223999 |

NEWT.

In Marion Co., Kans., on ridge about 3 miles east of the town of Walton. No close objects of prominence.

Permanent mark: None.

[Latitude, 38° 06' 44''-73. Longitude, 97° 11' 58''-24.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Walton | 126 59 50.2 | 306 58 33.7 | 3.577161 |
| Township corner .. | 63 00 53.4 | 242 58 32.4 | 3.795644 |
| St. John | 255 16 40.2 | 75 24 04.7 | 4.258168 |

WALTON.

In Harvey Co., Kans., nearly a mile northeast of the town of Walton, and about 1,000 feet southeast of the Atchison, Topeka and Santa Fe Railroad.

Permanent mark: None.

[Latitude, 38° 07' 58''-43. Longitude, 97° 14' 02''-11.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bennett | 148 15 26.7 | 328 14 11.9 | 3.748530 |
| Township corner .. | 26 30 32.4 | 206 29 27.9 | 3.756524 |
| Dunkard | 209 25 01.4 | 29 27 27.3 | 4.067905 |
| Newt | 306 68 33.7 | 126 59 50.2 | 3.577161 |

TOWNSHIP CORNER.

In Harvey Co., Kans., in southeast corner of sec. 36, T. 22, R. 1 E., 43 feet west and 235 feet north of township corner, townships 22 and 23, Rs. 1 and 2 E.

Permanent mark: Township corner.

[Latitude, 38° 05' 12''-73. Longitude, 97° 15' 46''-66.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Royer | 144 58 22.5 | 324 55 40 | 4.047730 |
| Newton | 59 58 48.1 | 239 55 47.2 | 3.917087 |
| Bennett | 177 39 33.5 | 357 39 23.3 | 3.994874 |
| Walton | 206 29 27.9 | 26 30 32.4 | 3.756524 |
| Newt | 242 58 32.4 | 63 00 53.4 | 3.795644 |

BENNETT.

In Marion Co., Kans., southeast corner of sec. 36, T. 21, R. 1 E., 546 feet north and 1,461 feet west of the southeast corner of the section, and about 75 feet northeast of Bennett's residence.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 10' 32''$.99. Longitude, $97^{\circ} 16' 03''$.24.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Royer..... | 83 01 33.7 | 262 59 01.2 | 3.781598 |
| Township corner. | 357 39 23.3 | 177 39 33.5 | 3.994874 |
| Dunkard..... | 238 02 13.3 | 58 05 54.2 | 4.010395 |
| Walton..... | 328 14 11.9 | 148 15 26.7 | 3.748530 |

ROYER.

In Harvey Co., Kans., on NE. $\frac{1}{4}$ of sec. 5, T. 22, R. 1 E., 12 feet west and 1,564 feet south of the northeast corner of the section.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 10' 09''$.10. Longitude, $97^{\circ} 20' 09''$.84.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hesston..... | 69 18 04.2 | 249 14 41.1 | 3.932405 |
| Newton..... | 3 10 35.3 | 183 10 16.7 | 4.123682 |
| Bennett..... | 262 59 01.2 | 83 01 33.7 | 3.781598 |
| Township corner. | 324 55 40 | 144 58 22.5 | 4.047736 |

NEWTON.

In the city of Newton, Harvey Co., Kans., in NW. $\frac{1}{4}$ of sec. 16, T. 23, R. 1 E., 85 feet north and 109 feet west of the center of the section. Center of the cupola of the opera house.

Permanent mark: Same.

[Latitude, $38^{\circ} 02' 58''$.56. Longitude, $97^{\circ} 20' 40''$.06.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hesston..... | 144 38 52.3 | 324 35 48.1 | 4.099182 |
| Ruth..... | 94 19 27.2 | 274 13 54.3 | 4.120651 |
| Royer..... | 183 10 16.7 | 3 10 35.3 | 4.123682 |
| Township corner. | 239 55 47.2 | 59 58 48.1 | 3.917087 |

HESSTON.

In Harvey Co., Kans., in NE. $\frac{1}{4}$ of sec. 16, T. 22, R. 1 W., 413 feet west and 869 feet south of the northeast corner of the section.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 08' 30''$.86. Longitude, $97^{\circ} 25' 38''$.62.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Black Kettle..... | 93 13 05.6 | 273 08 06.4 | 4.072347 |
| Ruth..... | 32 26 46.0 | 212 24 17.0 | 4.040248 |
| Royer..... | 249 14 41.1 | 69 18 04.2 | 3.932405 |
| Newton..... | 324 35 48.1 | 144 38 52.3 | 4.099182 |

RUTH.

In Harvey Co., Kans., near the center of the NE. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of sec. 13, T. 23, R. 2 W.

Permanent mark: The section corner.

[Latitude, 38° 03' 30''-50. Longitude, 97° 29' 40''-05.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Black Kettle..... | 149 | 11 | 11.5 | 329 | 08 | 41.6 | 4.062483 |
| Dwarf..... | 96 | 27 | 52.2 | 276 | 21 | 35.4 | 4.175894 |
| Hesston..... | 212 | 24 | 17.0 | 32 | 26 | 46.0 | 4.040248 |
| Newton..... | 274 | 13 | 54.3 | 94 | 19 | 27.2 | 4.120651 |

BLACK KETTLE.

In Harvey Co., Kans., in SE. $\frac{1}{4}$ of sec. 8, T. 22, R. 2 W., 1,186 feet north and 2,063 feet west of the southeast corner of the section.

Permanent mark: The section corner.

[Latitude, 38° 08' 52''-10. Longitude, 97° 33' 43''-00.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Leslie..... | 88 | 56 | 28.9 | 268 | 48 | 05.9 | 4.297218 |
| Dwarf..... | 47 | 27 | 49.9 | 227 | 24 | 02.6 | 4.085725 |
| Hesston..... | 273 | 08 | 06.4 | 93 | 13 | 05.6 | 4.072347 |
| Ruth..... | 329 | 08 | 41.6 | 149 | 11 | 11.5 | 4.062483 |

DWARF.

In Harvey Co., Kans., in SW. quarter of sec. 4, T. 23, R. 3 W., 72 feet east and 640 feet north of the southwest corner of the section, on a sand hill.

Permanent mark: The section corner.

[Latitude, 38° 04' 24''-78. Longitude, 97° 39' 51''-21.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Leslie..... | 125 | 54 | 10.6 | 305 | 49 | 35.5 | 4.127157 |
| Sheep Ranch..... | 88 | 03 | 09.5 | 267 | 57 | 41.7 | 4.112791 |
| Black Kettle..... | 227 | 24 | 02.6 | 47 | 27 | 49.9 | 4.085725 |
| Ruth..... | 276 | 21 | 35.4 | 96 | 27 | 52.2 | 4.175894 |

LESLIE.

In Reno Co., Kans., in SW. $\frac{1}{4}$ of sec. 8, T. 22, R. 4 W., 21 feet north and 1,510 feet east of the southwest corner of the section.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 08' 39''$.43. Longitude, $97^{\circ} 47' 17''$.01.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sand Hill..... | 97 31 59.3 | 277 26 07.1 | 4.146108 |
| Sheep Ranch..... | 14 08 27.9 | 194 07 34.9 | 3.932558 |
| Black Kettle..... | 268 48 05.9 | 88 56 28.9 | 4.297218 |
| Dwarf..... | 305 49 35.5 | 125 54 10.6 | 4.127157 |

SHEEP RANCH.

In Reno Co., Kans., in the NE. corner of sec. 13, T. 23, R. 5 W., 351 feet west and 4,565 feet north of the southeast corner of the section, on a sand hill on the west side of the road.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 04' 10''$.15. Longitude, $97^{\circ} 48' 42''$.82.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sand Hill..... | 130 40 59.9 | 310 36 01.0 | 4.191636 |
| Two..... | 85 28 11.5 | 265 20 20.1 | 4.271868 |
| Leslie..... | 194 07 34.9 | 14 08 27.9 | 3.932558 |
| Dwarf..... | 267 57 41.7 | 88 03 09.5 | 4.112791 |

SAND HILL.

In Reno Co., Kans., in the SW. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 2, T. 22, R. 6 W., 6 or 8 miles north and a little west of Hutchinson, on prominent sand dune.

Permanent rank: None.

[Latitude, $38^{\circ} 09' 38''$.57. Longitude, $97^{\circ} 56' 47''$.08.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lyons..... | 137 24 12.2 | 317 16 48.6 | 4.410211 |
| Sterling..... | 106 21 51.1 | 286 12 11.6 | 4.375840 |
| Leslie..... | 277 26 07.1 | 97 31 59.3 | 4.146108 |
| Sheep Ranch..... | 310 36 01.0 | 130 40 59.9 | 4.191636 |
| Two..... | 30 28 00.9 | 210 25 07.8 | 4.129792 |

TWO.

In Reno Co., Kans., in NW. $\frac{1}{4}$ of sec. 18, T. 23, R. 7 W., 273 feet south and 1,776 feet east of the northwest corner of the section.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 03' 21''$.56. Longitude, $98^{\circ} 01' 27''$.49.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sand Hill..... | 210 25 07.8 | 30 28 00.9 | 4.129792 |
| Sterling..... | 138 52 55.4 | 318 46 09.8 | 4.385499 |
| Sheep Ranch..... | 265 20 20.1 | 85 28 11.5 | 4.271868 |

LYONS.

In Rice Co., Kans., in the NE. $\frac{1}{4}$ of sec. 12, T. 20, R. 8 W., 19 feet west and 553 feet south of the northeast corner of the section, several miles east of Lyons.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 19' 51''$. Longitude, $98^{\circ} 08' 43''$. 70.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Millet | 79 37 01.7 | 259 29 10.8 | 4.273315 |
| Sterling | 23 39 17.3 | 203 37 00.7 | 4.126189 |
| Sand Hill | 317 16 48.6 | 137 24 12.2 | 4.410211 |

STERLING.

In Rice Co., Kans., in SW. $\frac{1}{4}$ of sec. 16, T. 21, R. 8 W., 286 feet west and 1,464 feet north of the south quarter corner of the section, being center of cupola of Sterling University.

Permanent mark: Same.

[Latitude, $38^{\circ} 13' 14''$. Longitude, $98^{\circ} 12' 24''$. 26.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Millet..... | 124 04 17.6 | 303 58 43.8 | 4.198967 |
| Drifting Sand..... | 73 01 47.5 | 252 52 51.5 | 4.343664 |
| Lyons..... | 203 37 00.7 | 23 39 17.3 | 4.126189 |
| Sand Hill..... | 286 12 11.6 | 106 21 51.1 | 4.375840 |
| Two..... | 318 46 09.8 | 138 52 55.4 | 4.385499 |

MILLET.

In Rice Co., Kans., in the SW. $\frac{1}{4}$ of the NE. $\frac{1}{4}$ of sec. 18, T. 20, R. 9 W. On north side of the public road.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 18' 01''$. Longitude, $98^{\circ} 21' 23''$. 26.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Raymond..... | 79 15 40.1 | 259 13 55.4 | 3.620867 |
| Drifting Sand..... | 27 31 50.9 | 207 28 28.0 | 4.237176 |
| Sterling..... | 303 58 43.8 | 124 04 17.6 | 4.198967 |
| Lyons..... | 259 29 10.8 | 79 37 01.7 | 4.273315 |

RAYMOND.

In Rice Co., Kans., in the SW. $\frac{1}{4}$ of sec. 23, T. 20, R. 10 W., 668 feet east and 1,336 feet south of the west quarter corner of the section.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 17' 36''$.29. Longitude, $98^{\circ} 24' 12''$.15.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pasture..... | 111 | 41 | 55.3 | 291 | 32 | 23.8 | 4.381532 |
| County Line..... | 77 | 30 | 37.1 | 257 | 23 | 39.4 | 4.225033 |
| Drifting Sand..... | 14 | 54 | 28.5 | 194 | 52 | 50.1 | 4.177247 |
| Millet..... | 259 | 13 | 55.4 | 79 | 15 | 40.1 | 3.620867 |

DRIFTING SAND.

In Reno Co., Kans., in SW. $\frac{1}{4}$ of sec. 8, T. 22, R. 10 W., 1,228 feet east and 3,760 feet south of the northwest corner of the section, on a prominent knoll.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 09' 44''$.89. Longitude, $98^{\circ} 26' 51''$.08.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Raymond..... | 194 | 52 | 50.1 | 14 | 54 | 28.5 | 4.177247 |
| County Line..... | 131 | 01 | 00.3 | 310 | 55 | 41.6 | 4.220210 |
| Millet..... | 207 | 28 | 28.0 | 27 | 31 | 50.9 | 4.237176 |
| Sterling..... | 252 | 52 | 51.5 | 73 | 01 | 47.5 | 4.343604 |

COUNTY LINE.

In Kansas, on county line between Stafford and Barton counties, 431 feet west of the southeast corner of sec. 36, T. 20, R. 12 W.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 15' 37''$.99. Longitude, $98^{\circ} 35' 26''$.38.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pasture..... | 154 | 23 | 26.6 | 334 | 20 | 53.3 | 4.142485 |
| Mound..... | 79 | 12 | 30.0 | 259 | 05 | 18.0 | 4.237523 |
| Drifting Sand..... | 310 | 55 | 41.6 | 131 | 01 | 00.3 | 4.220210 |
| Raymond..... | 257 | 23 | 39.4 | 77 | 30 | 37.1 | 4.225033 |

PASTURE.

In Barton Co., Kans., in the NE. $\frac{1}{4}$ of sec. 28, T. 19, R. 12 W., 963 feet south and 1,040 feet east of the northwest corner of the section. Several miles east of Great Bend, and 1 mile north of the Atchison, Topeka and Santa Fe Railroad, in a large cow pasture.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 22' 23''$.95. Longitude, $98^{\circ} 39' 33''$.57.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Cactus..... | 100 | 51 | 49.0 | 280 | 44 | 01.4 | 4.260639 |
| Mound..... | 34 | 48 | 51.4 | 214 | 44 | 12.1 | 4.283283 |
| Raymond..... | 291 | 32 | 23.8 | 111 | 41 | 55.3 | 4.381532 |
| County Line..... | 334 | 20 | 53.3 | 154 | 23 | 26.6 | 4.142485 |

MOUND.

In Stafford Co., Kans., in the NE. $\frac{1}{4}$ of sec. 18, T. 21, R. 13 W., 254 feet west and 196 feet south of the northeast corner of the section. On a small mound.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 13' 52''$.48. Longitude, $98^{\circ} 47' 04''$.24.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pawnee..... | 110 29 04.1 | 290 20 10.9 | 4.348960 |
| Ackerman..... | 24 04 46.3 | 204 02 29.6 | 4.120549 |
| Cactus..... | 159 08 43.6 | 339 05 36.1 | 4.314068 |
| Pasture..... | 214 44 12.1 | 34 48 51.4 | 4.283283 |
| County line | 259 05 18.0 | 79 12 30.0 | 4.237523 |

ACKERMAN.

In Stafford Co., Kans., in the SE. $\frac{1}{4}$ of sec. 22, T. 22, R. 14 W., 241 feet east and 273 feet south of the center of section 22.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 07' 21''$.59. Longitude, $98^{\circ} 50' 45''$.32.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pawnee..... | 141 56 07.7 | 321 49 31.9 | 4.401743 |
| Larned | 93 12 32.7 | 273 04 26.4 | 4.283578 |
| Mound | 204 02 29.6 | 24 04 46.3 | 4.120549 |

CACTUS.

In Barton Co., in the NE. $\frac{1}{4}$ of sec. 16, T. 19, R. 14 W., 21 feet south and 828 feet west of the northwest corner of the section, on public road northwest of Great Bend.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 24' 17''$.00. Longitude, $98^{\circ} 52' 06''$.63.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pawnee..... | 49 50 13.10 | 229 44 26.50 | 4.249488 |
| Mound | 339 05 36.10 | 159 08 43.60 | 4.314068 |
| Pasture..... | 280 44 00.14 | 100 51 49.00 | 4.269639 |

PAWNEE.

In Barton Co., Kans., in the SW. $\frac{1}{4}$ of sec. 19, T. 20, R. 15 W., 533 feet west and 1,027 feet south of the north quarter corner of the section on highest part of rolling ridge.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 18' 05'' .09$. Longitude, $99^{\circ} 01' 25'' .25$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Dugout | 74 | 21 | 27.7 | 254 | 13 | 49.5 | 4.271204 |
| Larned | 10 | 50 | 16.5 | 190 | 48 | 45.1 | 4.281684 |
| Mound | 290 | 20 | 10.9 | 110 | 29 | 04.1 | 4.348960 |
| Cactus | 229 | 44 | 26.5 | 49 | 50 | 13.1 | 4.249488 |
| Ackerman | 321 | 49 | 31.9 | 141 | 56 | 07.7 | 4.401743 |

LARNED.

In Pawnee Co., Kans., in the SE. $\frac{1}{4}$ of sec. 15, T. 22, R. 16 W., 644 feet north and 2,065 feet west of the southeast corner of the section, several miles south of Larned, on the highest mound in the vicinity.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 07' 55'' .74$. Longitude, $99^{\circ} 03' 52'' .94$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Dugout | 133 | 41 | 20.0 | 313 | 35 | 14.0 | 4.298871 |
| Garfield | 79 | 49 | 03.4 | 259 | 42 | 50.7 | 4.174463 |
| Pawnee | 190 | 48 | 45.1 | 10 | 50 | 16.5 | 4.281684 |
| Ackerman | 273 | 04 | 26.4 | 93 | 12 | 32.7 | 4.283578 |

DUGOUT.

In Pawnee Co., Kans., in the NW. $\frac{1}{4}$ of sec. 6, T. 21, R. 17 W., 1,362 feet east, and 1,723 feet south of the southwest corner of sec. 21, T. 20, R. 17. On highest ground near ruins of a sod house.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 15' 21'' .16$. Longitude, $99^{\circ} 13' 44'' .80$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Quarry | 89 | 55 | 03.0 | 269 | 47 | 53.5 | 4.227045 |
| Garfield | 1 | 00 | 38.4 | 181 | 00 | 31.1 | 4.214611 |
| Pawnee | 254 | 13 | 49.5 | 74 | 21 | 27.7 | 4.271204 |
| Larned | 313 | 35 | 14.0 | 133 | 41 | 20.0 | 4.298871 |

GARFIELD.

In Pawnee Co., Kans., in the SW. $\frac{1}{4}$ of sec. 30, T. 22, R. 17 W., 22 feet south and 2,047 feet east of the west quarter corner of the section. About 2 miles north of Garfield and one-fourth of a mile east of road.

Permanent mark: The section corner.

[Latitude, 38° 06' 29"-63. Longitude, 99° 13' 56"-68.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Quarry | 134 37 34.7 | 314 30 33.2 | 4.367248 |
| Burdett | 98 36 40.4 | 278 25 03.0 | 4.444370 |
| Dugout | 181 00 31.1 | 1 00 38.4 | 4.214611 |
| Larned | 259 42 50.7 | 79 49 03.4 | 4.174463 |

QUARRY.

In Pawnee Co., Kans., in NW. $\frac{1}{4}$ of sec. 5, T. 21, R. 19 W., 635 feet east and 2,275 feet south of the northwest corner of the section.

Permanent mark: Section corner.

[Latitude, 38° 15' 19"-81. Longitude, 99° 25' 18"-54.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Frank | 78 05 27.6 | 257 54 20.7 | 4.428074 |
| Burdett | 41 44 26.2 | 221 39 49.3 | 4.214248 |
| Dugout | 269 47 53.5 | 89 55 03.0 | 4.227045 |
| Garfield | 314 30 33.2 | 134 37 34.7 | 4.367248 |

BURDETT.

In Pawnee Co., Kans., in the NW. $\frac{1}{4}$ of sec. 17, T. 22, R. 20 W., 15 feet south and 1,326 feet east of the northwest corner of the section, on public road on ridge crossing it.

Permanent mark: The section corner.

[Latitude, 38° 08' 43"-23. Longitude, 99° 32' 46"-31.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Frank | 113 31 15.0 | 293 24 45.7 | 4.223071 |
| Last Chance | 28 23 13.8 | 208 21 06.3 | 4.025109 |
| Garfield | 278 25 03.0 | 98 36 40.4 | 4.444370 |
| Quarry | 221 39 49.3 | 41 44 26.2 | 4.214248 |

LAST CHANCE.

In Hodgeman Co., Kans., in SW. $\frac{1}{4}$ of sec. 14, T. 23, R. 21 W., 1,366 feet north and 397 feet east of the southwest corner of the section, a few hundred feet east of a stone dugout.

Permanent mark: The section corner.

[Latitude, 38° 03' 40"-85. Longitude, 99° 36' 12"-94.]

| To stations. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Orwell | 76 43 25.1 | 256 35 58.9 | 4.258737 |
| Cheese factory | 45 08 58.8 | 225 07 26.6 | 3.711399 |
| Frank | 147 12 36.0 | 327 08 14.7 | 4.279089 |
| Burdett | 208 21 06.3 | 28 23 13.8 | 4.025109 |

CHEESE FACTORY.

In Hodgeman Co., Kans., in SE. $\frac{1}{4}$ of sec. 29, T. 21, R. 23 W., 1,000 feet west and 14.5 feet north of the southeast corner of the section, 1 mile southwest of the cheese factory on public road.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 01' 43''$.15. Longitude, $99^{\circ} 38' 42''$.51.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| First View | 73 | 44 | 52.6 | 253 | 37 | 55.4 | 4.236135 |
| Spearville | 25 | 46 | 00.3 | 205 | 42 | 02.0 | 4.338358 |
| Orwell | 87 | 46 | 30.0 | 267 | 40 | 36.1 | 4.146807 |
| Last Chance | 225 | 07 | 26.6 | 45 | 08 | 58.8 | 3.711399 |

FRANK.

In Hodgeman Co., Kans., in the SE. $\frac{1}{4}$ of sec. 22, T. 21, R. 22 W., 566 feet north and 1,440 feet west of the southeast corner of the section.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 12' 19''$.09. Longitude, $99^{\circ} 43' 16''$.18.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Orwell | 19 | 59 | 42.8 | 199 | 56 | 37.2 | 4.331513 |
| Last Chance | 327 | 08 | 14.7 | 147 | 12 | 36.0 | 4.279089 |
| Quarry | 257 | 54 | 20.7 | 78 | 05 | 27.6 | 4.428074 |
| Burdett | 293 | 24 | 45.7 | 113 | 31 | 15.0 | 4.223071 |

SPEARVILLE.

In Ford Co., Kans., in town of Spearville, at the northeast end of the base line measured in 1889.

Permanent mark: A cubic yard of concrete underground, with brick pier capped with a heavy slab of sandstone above ground. East end of base line prolonged 50 feet and a large sandstone with copper bolt buried about 18 inches below surface.

[Latitude, $37^{\circ} 51' 06''$.34. Longitude, $99^{\circ} 45' 10''$.05.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Wright | 57 | 09 | 14.70 | 237 | 05 | 13.17 | 4.059556 |
| First View | 154 | 26 | 15.92 | 334 | 23 | 17.67 | 4.214979 |
| Purdyville | 119 | 30 | 52.45 | 299 | 23 | 27.49 | 4.308051 |

ORWELL.

In Hodgeman Co., Kans., in SW. $\frac{1}{4}$ of sec. 25, T. 23, R. 23 W., 830 feet north and 4,720 feet west of the southeast corner of the section.

Permanent mark: The section corner.

[Latitude, $38^{\circ} 01' 25''$.08. Longitude, $99^{\circ} 48' 16''$.96.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| First View..... | 30 27 30.5 | 210 26 27.0 | 3.695971 |
| Cheese factory ... | 267 40 36.1 | 87 46 30.0 | 4.146807 |
| Last Chance | 256 35 58.9 | 76 43 25.1 | 4.258737 |
| Frank | 199 56 37.2 | 19 59 42.8 | 4.331513 |

FIRST VIEW.

In Hodgeman Co., Kans., in SE. $\frac{1}{4}$ of sec. 3, T. 24 R. 23, W., 3 feet north and 287 feet east of the south quarter corner of the section, in road.

Permanent mark: The section corner.

[Latitude, $37^{\circ} 59' 06''$.27. Longitude, $99^{\circ} 50' 00''$.11.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wright..... | 6 53 17.3 | 186 52 13.6 | 4.325833 |
| Spearville..... | 334 23 21.2 | 154 26 19.5 | 4.214979 |

WRIGHT.

In Ford Co., Kans., at the southwest end of the Spearville base line, on highest ground in sec. 8, T. 26, R. 23 W., and just south of the Atchison, Topeka and Santa Fe Railroad, about 2 miles northeast of Wright.

Permanent mark: A cubical block of sandstone, 16 inches square, sunk 15 inches below the surface. Hole drilled in the top and a copper bolt 1 inch in diameter and 6 inches long inserted. Cross cut in the top of the bolt.

[Latitude, $37^{\circ} 47' 44''$.38. Longitude, $99^{\circ} 51' 43''$.91.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Spearville | 237 05 13.17 | 57 09 14.70 | 4.059556 |
| Purdyville..... | 153 33 07.03 | 333 29 44.12 | 4.258198 |
| Dodge..... | 82 26 03.26 | 262 19 25.23 | 4.205125 |
| Meridian | 118 12 50.87 | 298 07 50.16 | 4.133663 |
| First View..... | 186 52 13.6 | 6 53 17.3 | 4.325833 |

PURDYVILLE.

In Hodgeman Co., Kans., in section 21, near the southeast corner, 54.5 feet north of corner.

Permanent mark: Bottle placed 2 feet below surface, above which is placed a rock, marked thus \triangle , to note the center of the station.

[Latitude, $37^{\circ} 56' 30''$.51. Longitude, $99^{\circ} 57' 14''$.45.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Spearville | 299 23 27.49 | 119 30 52.45 | 4.308051 |
| Wright | 333 29 44.12 | 153 33 07.03 | 4.258198 |
| Dodge | 23 03 26.15 | 203 00 10.33 | 4.299657 |
| Snyder | 58 59 07.72 | 238 53 08.69 | 4.221898 |
| Meridian | 21 44 24.24 | 201 42 46.08 | 4.023153 |

MERIDIAN.

In Ford Co., Kans., near the center of the north side of sec. 30, T. 25, R. 24, and is on flat ground, a little west of the present location of the public road and on the eastern side of a cornfield.

Permanent mark: Bottle 26 inches below surface, above which is a sandstone rock, marked with a cross and U. S. G. S.

[Latitude, $37^{\circ} 51' 12''$.71. Longitude, $99^{\circ} 59' 54''$.26.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Purdyville | 201 42 46.08 | 21 44 24.24 | 4.023153 |
| Wright | 298 07 50.16 | 118 12 50.87 | 4.133663 |

DODGE.

In Ford Co., Kans., on the highest part of a hill in section 22, three-fourths mile west and one-fourth mile south of Soule College.

Permanent mark: Bottle 2 feet below surface, above which is a rock marked thus \triangle , to note the center of the station.

[Latitude, $37^{\circ} 49' 35''$.40. Longitude, $100^{\circ} 02' 33''$.52.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Purdyville | 203 00 10.33 | 23 03 26.15 | 4.299657 |
| Wright | 262 19 25.23 | 82 26 03.26 | 4.205125 |
| Snyder | 146 21 47.56 | 326 19 04.84 | 4.068561 |
| Grand View | 58 58 41.25 | 238 51 17.51 | 4.316707 |

SNYDER.

In Ford Co., Kans., on west side of sec. 19, T. 25, R. 25, a few hundred feet northeast of Joseph Ile's house and on the east side of the public road.

Permanent mark: Bottle $2\frac{1}{2}$ feet below surface, over which is placed a rock marked thus \triangle , to note the center of the station. Instrument elevated 26 feet.

[Latitude, $37^{\circ} 51' 51''$.54. Longitude, $100^{\circ} 06' 58''$.89.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|---------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Purdyville | 238 53. 08.69 | 58 59 07.72 | 4.221898 |
| Dodge | 326 19 04.84 | 146 21 47.56 | 4.068561 |
| Grand View | 28 51 31.52 | 208 46 49.89 | 4.368165 |
| Marble | 86 39 52.28 | 266 33 48.01 | 4.162381 |

GRANDVIEW.

In Gray Co., Kans., in the SW. $\frac{1}{4}$ of sec. 23, T. 27, R. 27.

Permanent mark: A bottle 2 feet under ground. A small mound is placed over the bottle. Four square holes act as witness marks to location.

[Latitude, $37^{\circ} 40' 48''$.17. Longitude, $100^{\circ} 14' 38''$.68.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Dodge | 238 51 17.51 | 58 58 41.25 | 4.316707 |
| Snyder | 208 46 49.89 | 28 51 31.52 | 4.368165 |
| Marble | 170 31 39.52 | 350 30 17.61 | 4.298094 |
| Cimarron | 155 16 24.85 | 335 13 20.97 | 4.244532 |
| Ingalls | 133 53 40.90 | 313 45 27.92 | 4.436316 |
| Inv | 105 47 51.95 | 285 39 25.16 | 4.324018 |

MARBLE.

In Gray Co., Kans., near the southwest corner of sec. 22, T. 25, R. 27. Instrument elevated 18 feet.

Permanent mark: A bottle 20 inches below surface and a limestone rock marked \triangle , above the bottle.

[Latitude, $37^{\circ} 51' 23''$.70. Longitude, $100^{\circ} 16' 52''$.41.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Grandview | 350 30 17.61 | 170 31 39.52 | 4.298094 |
| Snyder | 266 33 48.01 | 86 39 52.28 | 4.162381 |
| Cimarron | 48 10 44.03 | 228 09 01.83 | 3.737785 |
| Ingalls | 87 40 31.87 | 267 33 39.97 | 4.215472 |

CIMARRON.

In Gray Co., Kans., in the NE. $\frac{1}{4}$ of sec. 1, T. 26, R. 28.

Permanent mark: Bottle 30 inches below the surface, above which is a rock marked thus \triangle , noting center of the station.

[Latitude, $37^{\circ} 49' 25'' \cdot 42$. Longitude, $100^{\circ} 19' 39'' \cdot 01$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Marble | 228 | 09 | 01·83 | 48 | 10 | 44·03 | 3·737785 |
| Grandview | 335 | 13 | 20·97 | 155 | 16 | 24·85 | 4·244532 |

INGALLS.

In Gray Co., Kans., in the NE. $\frac{1}{4}$ of sec. 26, T. 25, R. 29, about $1\frac{3}{4}$ miles northwest of the railroad station.

Permanent mark: Three triangular holes cut in the ground at the apices of an equilateral triangle 20 feet on each side, and at the center of the triangle is a large limestone rock marked with a cross and U. S. G. S., and 27 inches below the surface is a bottle which marks the position of the instrument.

[Latitude, $37^{\circ} 51' 01'' \cdot 57$. Longitude, $100^{\circ} 28' 03'' \cdot 64$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Marble | 267 | 33 | 39·97 | 87 | 40 | 31·87 | 4·215472 |
| Grandview | 313 | 45 | 27·92 | 133 | 53 | 40·90 | 4·436316 |
| Ina | 2 | 30 | 50·63 | 182 | 30 | 36·13 | 4·120838 |
| Pierceville | 106 | 36 | 11·30 | 286 | 30 | 00·86 | 4·187146 |

INA.

In Gray Co., Kans., about 6 miles south of Ingallsville, and in the northeast quarter of section 3.

Permanent mark: Bottle placed 2 feet below surface, and a large limestone rock marked thus \triangle , noting center of station.

[Latitude, $37^{\circ} 43' 53'' \cdot 57$. Longitude, $100^{\circ} 28' 27'' \cdot 30$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Ingalls | 182 | 30 | 36·13 | 2 | 30 | 50·63 | 4·120838 |
| Grandview | 285 | 39 | 28·16 | 105 | 47 | 51·95 | 4·324018 |
| Pierceville | 141 | 09 | 11·85 | 321 | 03 | 16·41 | 4·353848 |
| Desolation | 103 | 07 | 48·80 | 282 | 59 | 51·04 | 4·292498 |

PIERCEVILLE.

In Gray Co., Kans., about one-quarter mile north of the quarter section corner between secs. 8, 17, T. 25, R. 30, 2 miles east and one-half mile north of Pierceville.

Permanent mark: Bottle 18 inches below surface, over which is a limestone rock marked thus \triangle ; 3 small triangular holes placed about

5 feet from the center, occupy the corners of an equilateral triangle as witness to the surface mark.

[Latitude, 37° 53' 23''-74. Longitude, 100° 38' 07''-09.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Ina..... | 321 03 16.41 | 141 09 11.85 | 4.353842 |
| Ingalls..... | 286 30 00.86 | 106 36 11.30 | 4.187146 |
| Desolation..... | 20 28 37.33 | 200 26 34.32 | 4.147090 |
| Bullard..... | 85 55 45.43 | 265 46 44.51 | 4.334122 |
| Mansfield..... | 130 40 13.54 | 310 35 42.47 | 4.151985 |

DESOLATION.

In Haskell Co., Kans., in the SE. $\frac{1}{4}$ of sec. 22, T. 26, R. 31. Instrument elevated 16 feet.

Permanent mark: Bottle 18 inches below surface, and above this is a large rock marked thus \triangle , which is flush with surface.

[Latitude, 37° 46' 17''-35. Longitude, 100° 41' 27''-65.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Ina..... | 282 59 51.04 | 103 07 48.80 | 4.292498 |
| Pierceville..... | 200 26 34.32 | 20 28 37.33 | 4.147090 |
| Bullard..... | 124 54 23.64 | 304 47 26.43 | 4.306967 |

MANSFIELD.

In Finney Co., Kans., 908 feet from the northeast corner of sec. 18, T. 24, R. 31. True bearing from section corner to the station is south 73° 43' west.

Permanent mark: Center of well distant from signal 100.3 feet. Azimuth from station to the well, 135° 29' 35''.

[Latitude, 37° 58' 23''-46. Longitude, 100° 45' 28''-05.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Bullard..... | 44 53 18.86 | 224 48 48.46 | 4.182856 |
| Pierceville..... | 310 35 42.47 | 130 40 13.54 | 4.151985 |

BULLARD.

In Finney Co., Kans., on highest sand hill in sec. 18, T. 25, R. 32, and a little east of the main road, south from Garden City, and three-eighths mile north 20° east of junction of roads southeast and southwest.

Permanent mark: Bottle 16 inches below surface, over which is a limestone rock marked thus \triangle and flush with surface. A mound of

sand 2 feet high and 4 feet base was made over this rock. The sand taken from 3 pits symmetrically placed about 7 feet from the rock.

[Latitude, $37^{\circ} 52' 33''$.13. Longitude, $100^{\circ} 52' 48''$.00.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pierceville..... | 265 46 44.51 | 85 55 45.43 | 4.334122 |
| Desolation..... | 304 47 26.43 | 124 54 23.64 | 4.306997 |
| Ada..... | 107 38 37.69 | 287 32 42.22 | 4.171252 |
| Mansfield..... | 224 48 48.46 | 44 53 18.86 | 4.182856 |

COYOTE.

In Finney Co., Kans., on the highest ground in the NE. $\frac{1}{4}$ of sec. 27, T. 23, R. 34.

Permanent mark: Bottle 28 inches below the surface, and over this a large limestone rock marked with a cross and U. S. G. S. Five feet north, 5 feet south 60° east, and five feet south 60° west are triangular holes as witness marks.

[Latitude, $38^{\circ} 01' 36''$.35. Longitude, $101^{\circ} 02' 05''$.96.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bullard..... | 320 49 42.15 | 140 55 25.29 | 4.334226 |
| Mansfield..... | 283 38 26.59 | 103 48 40.96 | 4.399038 |
| Lakin..... | 84 15 06.15 | 264 07 42.41 | 4.247095 |
| Ada..... | 2 22 23.50 | 182 22 10.70 | 4.089010 |

ADA.

In Finney Co., Kans., on the northeast end of a sand hill, which is very near to the township line and about one-fourth mile east of the southwest corner of sec. 31, T. 24, R. 34. This sand hill is the highest anywhere near except one-half mile northeast is a prominent sand hill higher than anything else for several miles around.

Permanent mark: Small stake driven in the ground with a nail in the top.

[Latitude $37^{\circ} 54' 58''$.57. Longitude $101^{\circ} 02' 26''$.76.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bullard..... | 287 32 42.22 | 107 38 37.69 | 4.171252 |
| Coyote..... | 182 22 10.70 | 2 22 23.50 | 4.089010 |
| Hummock..... | 78 21 37.29 | 258 14 33.50 | 4.235840 |

LAKIN.

In Kearny Co., Kans., 2,605 feet south $37^{\circ} 35'$ west from the northeast corner of sec. 35, T. 22, R. 36.

Permanent mark: Bottle 18 inches below surface, over which is a stone marked with a cross and U. S. G. S.

[Latitude, $38^{\circ} 00' 38''$.35. Longitude, $101^{\circ} 14' 06''$.41.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Coyote..... | 264 07 42.41 | 84 15 06.15 | 4.247095 |
| Ada..... | 301 27 53.79 | 121 35 04.18 | 4.301805 |
| Hummock..... | 359 01 17.24 | 179 01 23.24 | 4.145136 |
| Hartland..... | 51 22 15.51 | 231 17 03.95 | 4.199574 |

HUMMOCK.

In Kearny Co., Kans., a few hundred feet west of the NE. $\frac{1}{4}$, sec. 14, T. 25, R. 36, on high sand hill.

Permanent mark: Bottle 18 inches below surface, above which is a limestone rock marked thus \triangle . Rock is covered with a large mound of sand.

[Latitude, $37^{\circ} 53' 05''$.37. Longitude, $101^{\circ} 13' 56''$.65.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ada..... | 258 14 33.50 | 78 21 37.29 | 4.235840 |
| Lakin..... | 179 01 23.24 | 359 01 17.24 | 4.145136 |
| Basin..... | 55 32 47.76 | 235 26 50.99 | 4.236920 |
| Hartland..... | 107 56 25.79 | 287 51 08.68 | 4.122278 |

HARTLAND.

In Kearny Co., Kans., 35 feet south and 9 feet east of the west quarter corner of sec. 34, T. 24, R. 37.

Permanent mark: Bottle 18 inches below the surface at station.

[Latitude, $37^{\circ} 55' 17''$.46. Longitude, $101^{\circ} 22' 32''$.83.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lakin..... | 231 17 03.95 | 51 22 15.51 | 4.199574 |
| Hummock..... | 287 51 08.68 | 107 56 25.79 | 4.122278 |
| Basin..... | 6 35 23.49 | 186 34 43.37 | 4.144213 |

BASIN.

In Kearny Co., Kans., about 6 miles south of Hartland, in the SE. $\frac{1}{4}$ of sec. 8, T. 26, R. 37, on the east end of the highest sand hill in that vicinity.

Permanent mark: Bottle 24 inches below surface, above which is placed a limestone rock marked with a cross. A large mound of sand

covers the rock, and on top of the mound is a large rock not in a central position.

[Latitude, $37^{\circ} 47' 48''$.35. Longitude, $101^{\circ} 23' 38''$.21.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hummock | 235 26 50.99 | 55 32 47.76 | 4.236920 |
| Hartland | 186 34 43.37 | 6 35 23.49 | 4.144213 |

ECKMAN.

A triangulation station of the U. S. C. & G. Survey in Leavenworth Co., Kans., 537 feet southwest of the northeast corner of sec. 6, T. 12, R. 21, near Daisy P. O. Instrument mounted on tripod 50 feet high.

Permanent mark: Marble post.

[Latitude, $39^{\circ} 02' 37''$.37. Longitude, $95^{\circ} 00' 05''$.19.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blue Mound | 45 36 56.00 | 225 30 07.95 | 4.3399179 |
| Windmill | 103 57 41.22 | 283 49 48.33 | 4.2691600 |
| University | 65 46 44.07 | 245 37 35.84 | 4.3617100 |

BLUE MOUND.

In Douglas Co., Kans., 6 miles southeast of Lawrence, near center of sec. 22, T. 13, R. 20. Instrument elevated 20 feet.

Permanent mark: Rock marked U. S. C. S.

[Latitude, $38^{\circ} 54' 20''$.72. Longitude, $95^{\circ} 10' 53''$.95.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Eckman | 225 30 07.95 | 45 36 56.00 | 4.3399179 |
| University | 137 33 01.48 | 317 30 41.74 | 3.89943 |

UNIVERSITY.

In Douglas Co., Kans., in SE. $\frac{1}{4}$ of sec. 36, T. 12, R. 19, 43 feet north and 647 feet west of southeast corner of the section on middle tower of the university.

Permanent mark: Middle tower of the university.

[Latitude, $38^{\circ} 57' 30''$.48. Longitude, $95^{\circ} 14' 36''$.32.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Eckman | 245 37 35.84 | 65 46 44.07 | 4.36171 |
| Blue Mound | 317 30 41.74 | 137 33 01.48 | 3.89943 |

WINDMILL.

In Jefferson Co., Kans., in NE. $\frac{1}{4}$ sec. 20, T. 11, R. 20, 764 feet north and 1,092 feet west of east quarter corner of the section.

Permanent mark: Rock.

[Latitude, 39° 05' 02"-12. Longitude, 95° 12' 35"-59.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Blue Mound | 352 | 56 | 25.49 | 172 | 57 | 29.45 | 4.29948 |
| Eckman | 283 | 49 | 48.33 | 103 | 57 | 41.22 | 4.26916 |
| Lecompton | 61 | 48 | 37.02 | 241 | 41 | 12.22 | 4.28508 |

LECOMPTON.

In Douglas Co., Kans., in SW. $\frac{1}{4}$ sec. 15, T. 12, R. 18, 4 feet north and 950 feet east of southwest corner of the section.

Permanent mark: Section corner.

[Latitude, 39° 00' 06"-17. Longitude, 95° 24' 21"-74.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| University | 288 | 45 | 47.24 | 108 | 51 | 55.51 | 4.17281 |
| Windmill | 241 | 41 | 12.22 | 61 | 48 | 37.02 | 4.28508 |
| Newman | 153 | 14 | 32.17 | 333 | 11 | 38.71 | 4.16693 |

PERRY.

In Jefferson Co., Kans., in NW. $\frac{1}{4}$ of sec. 7, T. 11, R. 19 E., 670 feet south and 885 feet west of north quarter corner of the section. Instrument on platform 14 feet high.

Permanent mark: Rock sunk in the ground marked with cross.

[Latitude, 39° 56' 56"-78. Longitude, 95° 20' 53"-40.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| University | 332 | 31 | 17.23 | 152 | 35 | 14.74 | 4.29397 |
| Windmill | 286 | 25 | 23.13 | 106 | 30 | 40.00 | 4.09600 |
| Ozawke | 191 | 53 | 38.77 | 11 | 54 | 14.18 | 3.81515 |
| Newman | 92 | 15 | 51.70 | 272 | 10 | 46.57 | 4.06547 |

OZAWKE.

In Jefferson Co., Kans., in NE. $\frac{1}{4}$ sec. 19, T. 10, R. 19, 169 feet south 1,115 feet west of the northeast corner of the section.

Instrument on chimney of house. Permanent mark, same.

[Latitude, $39^{\circ} 10' 24'' \cdot 10$. Longitude, $95^{\circ} 19' 57'' \cdot 30$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Newman..... | 65 | 24 | 57.16 | 245 | 19 | 16.44 | 4.15406 |
| Perry..... | 11 | 54 | 14.18 | 191 | 53 | 38.77 | 3.81515 |
| Meriden..... | 97 | 35 | 55.37 | 277 | 26 | 37.25 | 4.33010 |
| Rock Creek..... | 122 | 11 | 02.11 | 302 | 03 | 52.12 | 4.28472 |

NEWMAN.

In Jefferson Co., Kans., in SW. $\frac{1}{4}$ sec. 1, T. 11, R. 17, 188 feet east and 1,104 feet north of southwest corner of the section.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 07' 11'' \cdot 39$. Longitude, $95^{\circ} 28' 57'' \cdot 02$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Lecompton..... | 333 | 11 | 38.71 | 153 | 14 | 32.17 | 4.16696 |
| Perry..... | 272 | 10 | 46.57 | 92 | 15 | 51.70 | 4.06547 |
| Meriden..... | 136 | 41 | 11.34 | 316 | 37 | 34.35 | 4.07990 |
| Rock Creek..... | 168 | 15 | 30.35 | 348 | 14 | 01.67 | 4.21833 |
| Ozawke..... | 245 | 19 | 16.44 | 65 | 24 | 57.16 | 4.15406 |

MERIDEN.

In Shawnee Co., Kans., in NE. $\frac{1}{4}$ sec. 12, T. 10, R. 16, 496 feet east and 1,025 feet north of the center of the section.

Permanent mark: Section stone.

[Latitude, $39^{\circ} 11' 54'' \cdot 86$. Longitude, $95^{\circ} 34' 40'' \cdot 64$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Newman..... | 316 | 37 | 34.35 | 136 | 41 | 11.34 | 4.07990 |
| Ozawke..... | 277 | 26 | 37.25 | 97 | 35 | 55.37 | 4.33010 |
| Skinnerhorn..... | 110 | 29 | 07.89 | 290 | 24 | 41.57 | 4.03282 |
| Cope..... | 165 | 37 | 53.60 | 345 | 36 | 47.18 | 4.00606 |

ROCK CREEK.

In Jefferson Co., Kans., in SE. $\frac{1}{4}$ sec. 16, T. 9, R. 17, 948 feet south and 1,563 feet west of the east quarter corner of the section.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 15' 56'' \cdot 26$. Longitude, $95^{\circ} 31' 17'' \cdot 35$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Newman..... | 348 | 14 | 01.67 | 168 | 15 | 30.35 | 4.21833 |
| Ozawke..... | 302 | 03 | 52.12 | 122 | 11 | 02.11 | 4.28472 |
| Cope..... | 107 | 52 | 17.55 | 287 | 49 | 02.38 | 3.89003 |

COPE.

In Jackson Co., Kans., in NW. $\frac{1}{4}$ of sec. 11, T. 9, R. 16, 33 feet east and 1,059 feet south of the northwest corner of the section. Instrument elevated 20 feet.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 17' 13''$.39. Longitude, $95^{\circ} 36' 25''$.64.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Meriden | 345 36 47.18 | 165 37 53.60 | 4.00606 |
| Rock creek | 287 49 02.38 | 107 52 17.55 | 3.89003 |
| Cedar | 205 57 11.31 | 25 59 12.16 | 4.02101 |
| Skimmerhorn | 51 24 53.24 | 231 21 33.12 | 3.98690 |
| Railroad | 114 08 36.93 | 294 04 34.49 | 4.00201 |

CEDAR.

In Jefferson Co., Kans., in NE. $\frac{1}{4}$ of sec. 7, T. 8, R. 17, 15 feet west and 768 feet north of east quarter corner of the section.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 22' 20''$.01. Longitude, $95^{\circ} 33' 13''$.35.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cope..... | 25 59 12.16 | 205 57 11.31 | 4.02101 |
| Railroad..... | 68 48 39.00 | 248 42 34.43 | 4.16944 |

RAILROAD.

In Jackson Co., Kans., in NW. $\frac{1}{4}$ of sec. 26, T. 8, R. 15, 806 feet south and 1,497 feet east of the northwest corner of the section. Instrument elevated 20 feet.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 19' 26''$.47. Longitude, $95^{\circ} 42' 48''$.38.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cope..... | 294 04 34.49 | 114 08 36.93 | 4.00201 |
| Skimmerhorn..... | 351 04 38.44 | 171 05 20.54 | 4.01213 |
| Cedar..... | 248 42 34.43 | 68 48 39.00 | 4.16944 |
| Agency..... | 50 36 29.05 | 230 31 49.29 | 4.13703 |
| Pottawatomie | 131 11 36.89 | 311 06 32.52 | 4.18342 |

SKIMMERHORN.

In Jackson Co., Kans., in SW. $\frac{1}{4}$ of sec. 25, T. 9, R. 15, 99 feet north and 1,445 feet east of the southwest corner of the section. Instrument on chimney of Skimmerhorn's house.

Permanent mark: Same.

[Latitude, $39^{\circ} 13' 57''$.05. Longitude, $95^{\circ} 41' 41''$.87.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Meriden | 290 | 24 | 41.57 | 110 | 29 | 07.89 | 4.03282 |
| Cope | 231 | 21 | 33.12 | 51 | 24 | 53.24 | 3.98690 |
| Agency | 96 | 49 | 59.23 | 276 | 44 | 37.69 | 4.08909 |
| Railroad | 171 | 05 | 20.54 | 351 | 04 | 38.44 | 4.01213 |

AGENCY.

In Jackson Co., Kans., in NE. $\frac{1}{4}$ of sec. 27, T. 9, R. 14, 294 feet south and 1,163 feet west of the northeast corner of the section. Instrument elevated 12 feet.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 14' 44''$.10. Longitude, $95^{\circ} 50' 10''$.20.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Skimmerhorn | 276 | 44 | 37.69 | 96 | 49 | 59.23 | 4.08909 |
| Railroad | 230 | 31 | 49.29 | 50 | 36 | 29.05 | 4.13703 |
| St. Marys | 98 | 14 | 22.08 | 278 | 04 | 11.44 | 4.36866 |
| Soldier | 138 | 49 | 35.52 | 318 | 44 | 53.39 | 4.20952 |
| Pottawatomie | 177 | 13 | 19.50 | 357 | 12 | 55.40 | 4.27343 |

POTTAWATOMIE.

In Jackson Co., Kans., 482 feet east and 2,263 feet south of the south-east corner of sec. 21, T. 7, R. 14.

Permanent mark: Rock marked with cross.

[Latitude, $39^{\circ} 24' 52''$.00. Longitude, $95^{\circ} 50' 48''$.21.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Railroad | 311 | 06 | 32.52 | 131 | 11 | 36.89 | 4.18342 |
| Agency | 357 | 12 | 55.40 | 177 | 13 | 19.50 | 4.27343 |
| Soldier | 56 | 06 | 27.06 | 236 | 02 | 08.54 | 4.07010 |

SOLDIER.

In Jackson Co., Kans., in NW. $\frac{1}{4}$ of sec. 15, T. 8, R. 13, 77 feet east and 2,639 feet south of the northwest corner of the section.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 21' 19''$.29. Longitude, $95^{\circ} 57' 35''$.63.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Agency | 318 | 44 | 53.39 | 138 | 49 | 35.52 | 4.20952 |
| Pottawatomie | 236 | 02 | 08.54 | 56 | 06 | 27.06 | 4.07010 |
| Vienna | 138 | 31 | 43.28 | 318 | 27 | 09.39 | 4.19241 |
| St. Marys | 54 | 33 | 32.69 | 234 | 28 | 03.56 | 4.18421 |

ST. MARYS.

In Pottawatomie Co., Kans., in NW. $\frac{1}{4}$ of sec. 17, T. 9, R. 12, 194 feet south and 1,591 feet east of the northwest corner of the section.

Permanent mark: The section corner.

[Latitude, 39° 16' 31''-60. Longitude, 96° 06' 15''-10.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Agency..... | 278 | 04 | 11.44 | 98 | 14 | 22.08 | 4.36866 |
| Soldier..... | 234 | 28 | 03.56 | 54 | 33 | 32.69 | 4.18421 |
| Louisville..... | 117 | 57 | 17.17 | 297 | 48 | 03.77 | 4.37407 |
| Blaine..... | 142 | 55 | 11.67 | 322 | 47 | 01.73 | 4.48573 |
| Vienna..... | 185 | 51 | 05.70 | 5 | 52 | 01.53 | 4.31477 |

VIENNA.

In Pottawatomie Co., Kans., 14 miles north of St. Marys and 6 miles southeast of Havensville, on highest part of ridge running north and south. Instrument elevated 18 feet.

Permanent mark: Large wooden plug.

[Latitude, 39° 27' 37''-49. Longitude, 96° 04' 47''-07.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Soldier..... | 318 | 27 | 09.39 | 138 | 31 | 43.28 | 4.19241 |
| St. Marys..... | 5 | 52 | 01.53 | 185 | 51 | 05.70 | 4.31477 |
| Louisville..... | 67 | 42 | 02.40 | 247 | 31 | 52.03 | 4.39565 |
| Blaine..... | 100 | 41 | 56.67 | 280 | 32 | 49.81 | 4.32050 |

LOUISVILLE.

In Pottawatomie Co., Kans., in NW. $\frac{1}{4}$ of sec. 7, T. 8, R. 10, 1,092 feet south and 1,238 feet west of the north quarter corner of the section.

Permanent mark: The section corner.

[Latitude, 39° 22' 30''-40. Longitude, 96° 20' 48''-35.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| St. Marys..... | 297 | 48 | 03.77 | 117 | 57 | 17.17 | 4.37407 |
| Vienna..... | 247 | 31 | 52.03 | 67 | 42 | 02.40 | 4.39565 |
| Stockdale..... | 78 | 34 | 21.16 | 258 | 27 | 14.46 | 4.21585 |
| Fostoria..... | 143 | 54 | 27.83 | 323 | 50 | 41.88 | 4.15939 |

BLAINE.

In Pottawatomie Co., Kans., in SE. $\frac{1}{4}$, sec. 29, T. 6, R. 10, 308 feet north and 1,329 feet west of the southeast corner of the section. Instrument elevated 24 feet.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 29' 42''$.52. Longitude, $96^{\circ} 19' 07''$.22.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| St. Marys..... | 322 | 47 | 01.73 | 142 | 55 | 11.67 | 4.48573 |
| Vienna | 280 | 32 | 49.81 | 100 | 41 | 56.67 | 4.32050 |
| Fostoria | 81 | 21 | 27.88 | 261 | 16 | 37.35 | 4.04316 |

FOSTORIA.

In Pottawatomie Co., Kans., in NE. $\frac{1}{4}$ of sec. 6, T. 7, R. 9, 20 feet south and 273 feet west of the northeast corner of the section.

Permanent mark: The section corner.

[Latitude $39^{\circ} 28' 48''$.46. Longitude, $96^{\circ} 26' 44''$.12.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Blaine | 261 | 16 | 37.35 | 81 | 21 | 27.88 | 4.04316 |
| Louisville | 323 | 50 | 41.88 | 143 | 54 | 27.83 | 4.15939 |
| Stockdale | 26 | 57 | 28.45 | 206 | 54 | 07.14 | 4.22398 |
| Olesburg | 62 | 01 | 12.24 | 241 | 57 | 22.87 | 3.99006 |
| Springside | 144 | 57 | 31.61 | 324 | 55 | 09.14 | 3.96900 |

STOCKDALE.

In Pottawatomie Co., Kans., in NW. $\frac{1}{4}$ of sec. 21, T. 8, R. 8, 1,564 feet south and 1,187 feet east of northwest corner of the section.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 20' 44''$.26. Longitude, $96^{\circ} 32' 01''$.20.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Louisville | 258 | 27 | 14.46 | 78 | 34 | 21.16 | 4.21585 |
| Fostoria | 206 | 54 | 07.14 | 26 | 57 | 28.45 | 4.22398 |
| Leonardville | 100 | 19 | 44.85 | 280 | 10 | 02.17 | 4.34929 |
| Olesburg | 174 | 12 | 40.79 | 354 | 12 | 12.95 | 4.01684 |

OLESBURG.

In Pottawatomie Co., Kans., in SW. $\frac{1}{4}$ of sec. 17, T. 7, R. 8, 494 feet east and 684 feet north of the south quarter corner of the section. Instrument elevated 12 feet.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 26' 19''$.60. Longitude, $96^{\circ} 32' 45''$.05.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Stockdale..... | 354 | 12 | 12.95 | 174 | 12 | 40.79 | 4.01684 |
| Fostoria | 241 | 57 | 22.87 | 62 | 01 | 12.24 | 3.99006 |
| Springside..... | 194 | 59 | 56.80 | 15 | 01 | 23.90 | 4.10185 |
| Leonardville..... | 73 | 09 | 37.16 | 253 | 00 | 21.75 | 4.33999 |
| Randolph..... | 121 | 37 | 36.39 | 301 | 29 | 59.01 | 4.30479 |

SPRINGSIDE.

In Pottawatomie Co., Kans., 9 miles north and 2 miles east of Olesburg, on a prominent mound on east side of the Blue River.

Permanent mark: Stone set 6 inches below the surface; surface mark, wooden stake.

[Latitude, $39^{\circ} 32' 55''$. Longitude, $96^{\circ} 30' 28''$.01.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Fostoria | 324 55 09.14 | 144 57 31.61 | 3.96900 |
| Olesburg | 15 01 23.90 | 194 59 56.80 | 4.10185 |

LEONARDVILLE.

In Riley Co., Kans., in SW. $\frac{1}{4}$ of sec. 5, T. 8, R. 6, 609 feet east and 1,112 feet north of the southwest corner of the section.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 22' 53''$. Longitude, $96^{\circ} 47' 10''$.91.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Olesburg | 253 00 21.75 | 73 09 37.16 | 4.33999 |
| Stockdale | 280 10 02.17 | 100 19 44.85 | 4.34929 |
| Randolph | 192 22 51.81 | 12 24 30.69 | 4.23879 |

RANDOLPH.

In Riley Co., Kans., in NW. $\frac{1}{4}$ of sec. 15, T. 6, R. 6, 2 feet west and 1,592 feet south of the north quarter corner of the section.

Permanent mark: The section corner.

[Latitude, $39^{\circ} 32' 02''$. Longitude, $96^{\circ} 44' 44''$.33.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Olesburg | 301 29 59.01 | 121 37 36.39 | 4.30479 |
| Leonardville | 12 24 30.69 | 192 22 51.81 | 4.23879 |

FREY.

Triangulation station of the U. S. C. & G. S. in Dickinson Co., Kans., in sec. 11, T. 12, R. 2 E., 725 feet east and 10 feet south of supposed center of the section.

Permanent mark: Rock with cross cut in the top.

[Latitude, $39^{\circ} 01' 31''$. Longitude, $97^{\circ} 10' 24''$.56.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wilmer | 227 02 55.22 | 47 07 58.89 | 4.198968 |
| Taylor | 317 26 31.48 | 137 32 46.92 | 4.327989 |
| Vine Creek | 114 46 07.41 | 294 37 56.73 | 4.313964 |

WILMER.

Triangulation station of the U. S. C. & G. S. in Dickinson Co., Kans., in sec. 1, T. 11, R. 3 E., 1,023 feet north and 689 feet west of the south-east corner of the section.

Permanent mark: Rock with cross cut in the top.

[Latitude $39^{\circ} 07' 20''$.-93. Longitude $77^{\circ} 02' 22''$.-80.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Vine Creek | 86 02 24.91 | 265 49 09.80 | 4.482266 |
| Frey | 47 07 58.89 | 227 02 55.22 | 4.198968 |
| Butler | 128 18 14.75 | 308 09 55.01 | 4.383160 |

VINE CREEK.

Triangulation station of the U. S. C. & G. S. in Ottawa Co., Kans., on highest point of land in vicinity and just east of the road.

Permanent mark: Rock with cross cut in the top.

[Latitude, $39^{\circ} 06' 11''$.-06. Longitude, $97^{\circ} 23' 23''$.-18.]

| To station. | Azimuth. | Back azimuth. | Log dist. |
|----------------|--------------|---------------|-----------|
| | ° ' " | ° ' " | Meters. |
| Wilmer | 265 49 09.80 | 86 02 24.91 | 4.482266 |
| Frey | 294 37 56.73 | 114 46 07.41 | 4.313964 |
| Monument | 144 43 43.12 | 324 39 29.09 | 4.222941 |
| Butler | 213 19 51.44 | 33 24 48.06 | 4.311482 |

MONUMENT.

In Ottawa Co., Kans., on east side of sec. 35, T. 9, R. 2 W., on a rocky hill near a monument of loosely piled rock.

Permanent mark: Cross cut in large solid rock.

[Latitude, $39^{\circ} 13' 33''$.-24. Longitude, $97^{\circ} 30' 05''$.-41.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Butler | 260 29 24.18 | 80 38 35.64 | 4.326176 |
| Vine Creek | 324 39 29.09 | 144 43 43.12 | 4.222941 |
| Sulphur Springs | 177 31 34.34 | 357 31 10.92 | 4.311352 |
| Table Mound | 243 34 03.83 | 63 42 35.65 | 4.335128 |

BUTLER

In Clay Co., Kans., on east side of sec. 24, T. 9, R. 1 E., on land owned by F. A. Butler.

Permanent mark: Rock with cross cut in the top.

[Latitude, 39° 15' 25"-88. Longitude, 97° 15' 33"-67.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wilmer..... | 308 09 55.01 | 128 18 14.75 | 4.383160 |
| Vine Creek..... | 33 24 48.06 | 213 19 51.44 | 4.311482 |
| Monument..... | 80 38 35.64 | 260 29 24.18 | 4.326176 |
| Table Mound..... | 166 08 42.57 | 346 08 02.59 | 3.800471 |

TABLE MOUND.

In Clay Co., Kans., on east side of sec. 35, T. 8, R. 1 E., on land owned by James Kerr.

Permanent mark: Large rock placed in the ground with cross cut in the top.

[Latitude, 39° 18' 44"-74. Longitude, 97° 16' 36"-81.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Butler..... | 346 08 02.59 | 166 08 42.57 | 3.800471 |
| Monument..... | 63 42 35.05 | 243 34 03.83 | 4.335128 |
| Sulphur Springs.. | 118 16 41.14 | 298 07 44.88 | 4.361168 |
| Renshawe..... | 194 05 28.03 | 14 08 31.93 | 4.453124 |

SULPHUR SPRINGS.

In Cloud Co., Kans., in the SE. $\frac{1}{4}$ of the SW. $\frac{1}{4}$ of sec. 26, T. 7, R. 2 W., on land owned by Delilah Pearson, on highest mound on the east side of the ridge north of the road.

Permanent mark: Cross cut on top of large rock below surface.

[Latitude, 39° 24' 36"-77. Longitude, 97° 30' 42"-37.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Table Mound..... | 298 07 44.88 | 118 16 41.14 | 4.361168 |
| Monument..... | 357 31 10.92 | 177 31 34.34 | 4.311352 |
| Concordia..... | 131 54 17.53 | 311 48 01.06 | 4.278919 |
| Wayne..... | 180 56 51.05 | 0 57 05.08 | 4.501595 |
| Renshawe..... | 238 19 16.55 | 58 31 18.32 | 4.502986 |

RENSHAWE.

In Clay Co., Kans., near the center of sec. 3, T. 6, R. 2 E., on high, rocky ground.

Permanent mark: Cross cut on top of rock placed below the surface.

[Latitude, 39° 33' 37"-45. Longitude, 97° 11' 47"-30.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Table Mound..... | 14 08 31.93 | 194 05 28.03 | 4.453124 |
| Sulphur Springs.. | 58 31 18.32 | 238 19 16.55 | 4.502986 |
| Wayne..... | 119 40 02.75 | 299 28 12.85 | 4.484583 |

WAYNE.

In Republic Co., Kans., in the NE. $\frac{1}{4}$ of sec. 23, T. 4, R. 2 W. on a high flat ridge in a pasture.

Permanent mark: U. S. G. S. cut in a rock.

[Latitude, $39^{\circ} 41' 45''$.81. Longitude, $97^{\circ} 30' 20''$.34.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Renshawe | 299 | 28 | 12.85 | 119 | 40 | 02.75 | 4.484583 |
| Sulphur Springs.. | 0 | 57 | 05.08 | 180 | 56 | 51.05 | 4.501595 |
| Concordia | 37 | 37 | 18.92 | 217 | 30 | 47.27 | 4.380851 |
| Minersville | 80 | 00 | 05.99 | 259 | 52 | 40.20 | 4.227801 |

CONCORDIA.

In Cloud Co., Kans., in the NE. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of sec. 20, T. 6, R. 3 W., several miles southwest of Concordia.

Permanent mark: Eighteen inches under ground, a small, flat rock; over this, and just below surface, a large chalk rock with U. S. G. S. and cross cut in the top.

[Latitude, $39^{\circ} 31' 28''$.03. Longitude, $97^{\circ} 40' 34''$.64.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Wayne | 217 | 30 | 47.27 | 37 | 37 | 18.92 | 4.380851 |
| Sulphur Springs.. | 311 | 48 | 01.06 | 131 | 54 | 17.53 | 4.278919 |
| Scottsville | 94 | 24 | 35.07 | 274 | 13 | 53.67 | 4.382625 |
| Jamestown | 135 | 27 | 10.66 | 315 | 20 | 44.24 | 4.313986 |
| Minersville | 172 | 55 | 29.44 | 352 | 54 | 36.00 | 4.210146 |

MINERSVILLE.

In Republic Co., Kans., in the NW. $\frac{1}{4}$ of sec. 31, T. 4, R. 3, on the south side of the public road.

Permanent mark: A large rock marked with cross and U. S. G. S. cut in top.

[Latitude, $39^{\circ} 40' 10''$.09. Longitude, $97^{\circ} 41' 58''$.48.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Wayne | 259 | 52 | 40.20 | 80 | 00 | 05.99 | 4.227801 |
| Concordia | 352 | 54 | 36.00 | 172 | 55 | 29.44 | 4.210146 |
| Jamestown | 83 | 30 | 19.23 | 263 | 24 | 45.73 | 4.098179 |

JAMESTOWN.

In Republic Co., Kans., in the SW. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 35, T. 4, R. 5, 4 or 5 miles north of Jamestown.

Permanent mark: Stone 18 inches below surface; also a surface stone marked with cross and U. S. G. S. cut in the top.

[Latitude, 39° 39' 23"-77. Longitude, 97° 50' 40"-98.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Minersville..... | 263 24 45.73 | 83 30 19.23 | 4.098179 |
| Concordia..... | 315 20 44.24 | 135 27 10.66 | 4.313986 |
| Scottsville..... | 36 43 15.66 | 216 38 59.85 | 4.204883 |
| Pointed Hill..... | 113 12 20.25 | 293 02 44.42 | 4.368385 |

SCOTTSVILLE.

In Mitchell Co., Kans., in town of Scottsville, in the SE. $\frac{1}{4}$ of sec. 11, T. 6, R. 6. Instrument elevated 20 feet.

Permanent mark: Rock with cross and U. S. G. S. cut in the top and a jug buried underneath it.

[Latitude, 39° 32' 26"-99. Longitude, 97° 57' 22"-31.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Jamestown..... | 216 38 59.85 | 36 43 15.66 | 4.204883 |
| Concordia..... | 274 13 53.67 | 94 24 35.07 | 4.382625 |
| Church..... | 30 24 50.66 | 210 19 17.36 | 4.394697 |
| Cemetery..... | 108 43 27.10 | 288 35 08.48 | 4.294904 |
| Pointed Hill..... | 151 36 35.25 | 331 31 16.16 | 4.398771 |

POINTED HILL.

In Jewell Co., Kans., in the NE. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of sec. 3, T. 4, R. 7, 4 miles north and 4 miles east of Jewell City, on the end of Pointed Hill.

Permanent mark: Rock with cross and U. S. G. S. cut in the top.

[Latitude, 39° 44' 21"-20. Longitude, 98° 05' 42"-48.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Scottsville..... | 331 31 16.16 | 151 36 35.25 | 4.398771 |
| Jamestown..... | 293 02 44.42 | 113 12 20.25 | 4.368385 |
| Cemetery..... | 23 13 13.99 | 203 10 13.61 | 4.233009 |

CHURCH.

In Mitchell Co., Kans., about 1 mile southwest of two churches, 7 miles south of Beloit, near the center of the NE. $\frac{1}{4}$ of sec. 21, T. 8, R. 7.

Permanent mark: Rock with cross and U. S. G. S. cut in the top.

[Latitude, 39° 20' 52"-77. Longitude, 98° 06' 06"-93.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cemetery..... | 167 28 24.32 | 347 25 40.22 | 4.453258 |
| Scottsville..... | 210 19 17.36 | 30 24 50.66 | 4.394697 |
| Blue Hill..... | 88 19 13.56 | 268 11 02.73 | 4.268287 |

CEMETERY.

In Jewell Co., Kans., in the SW. $\frac{1}{4}$ of the SW. $\frac{1}{4}$ of sec. 24, T. 5, R. 8, 6 miles south of Jewell City and one-half mile west, on the north side of the road across from the cemetery.

Permanent mark: Rock, bottle underneath.

[Latitude, 39° 35' 51''-53. Longitude, 98° 10' 25''-06.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Scottsville | 288 35 08.48 | 108 43 27.10 | 4.294904 |
| Pointed Hill | 203 10 13.61 | 23 13 13.99 | 4.233009 |
| Church | 347 25 40.22 | 167 28 24.32 | 4.453258 |
| Blue Hill | 23 36 37.39 | 203 31 09.34 | 4.489339 |
| Old Well | 93 03 20.34 | 272 48 17.77 | 4.529188 |

BLUE HILL.

In Mitchell Co., Kans., on Blue Hill.

Permanent mark: Rock with cross and U. S. G. S. cut in the top.

[Latitude, 39° 20' 34''-43. Longitude, 98° 19' 01''-13.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cemetery | 203 31 09.34 | 23 36 37.39 | 4.489339 |
| Church | 268 11 02.73 | 88 19 13.56 | 4.268287 |
| Tipton | 96 08 17.74 | 276 00 05.38 | 4.271773 |
| Old Well | 144 27 23.82 | 324 17 51.78 | 4.567271 |

TIPTON.

In Osborne Co., Kans., on the east side of sec. 15, T. 8, R. 11, on high hill 2 miles west of the town.

Permanent mark: Large limestone rock with cross cut and U. S. G. S. on top. Bottom of bottle placed 2 inches below the rock.

[Latitude, 39° 21' 38''-54. Longitude, 98° 31' 57''-62.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blue Hill | 276 00 05.38 | 96 08 17.74 | 4.271773 |
| Old Well | 174 00 48.96 | 353 59 30.59 | 4.450081 |
| Lawrence | 122 38 06.38 | 302 25 42.34 | 4.521395 |

OLD WELL.

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

Permanent mark: Cross and U. S. G. S. cut in large rock and a bottle top set underneath the rock.

[Latitude, 39° 36' 47"-61. Longitude, 98° 34' 00"-86.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blue Hill | 324 17 51.78 | 144 27 23.82 | 4.567271 |
| Cemetery | 272 48 17.77 | 93 03 20.34 | 4.529188 |
| Tipton | 353 59 30.59 | 174 00 48.96 | 4.450081 |
| Lawrence | 67 58 03.61 | 247 46 56.08 | 4.431416 |
| School | 111 17 52.44 | 291 12 22.56 | 4.121627 |

SCHOOL.

In Smith Co., Kans., near a schoolhouse on the northeast corner of the yard, and near the corner of the section.

Permanent mark: Stone marked with cross and U. S. G. S.

[Latitude, 39° 39' 23"-13. Longitude, 98° 42' 38"-01.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lawrence | 40 17 20.06 | 220 11 41.79 | 4.292411 |
| Old Well | 291 12 22.56 | 111 17 52.44 | 4.121627 |
| Engstrom | 71 04 28.91 | 250 53 20.28 | 4.422513 |
| Hardlee | 136 11 47.03 | 316 02 33.86 | 4.472943 |

LAWRENCE.

In Osborne Co., Kans., on a swell of ground near the center of the west side of sec. 23, T. 6, R. 14, and about on highest point.

Permanent mark: Cross and U. S. G. S. cut on top of large flat stone; jug, with cross cut on it, is underneath the flat stone.

[Latitude, 39° 31' 17"-82. Longitude, 98° 51' 28"-82.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Tipton | 302 25 42.34 | 122 38 06.38 | 4.521395 |
| Old Well | 247 46 56.08 | 67 58 03.61 | 4.431416 |
| Engstrom | 117 13 09.69 | 297 07 40.01 | 4.142870 |
| School | 220 11 41.79 | 40 17 20.06 | 4.292411 |

HARDILEE.

In Smith Co., Kans., on the highest point of ground in sec. 20, T. 2, R. 14, near the center of the SE. $\frac{1}{4}$.

Permanent mark: White sandstone rock, marked with a cross and U. S. G. S.

[Latitude, 39° 50' 57"-55. Longitude, 98° 57' 03"-13.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Engstrom | 8 17 34.11 | 188 15 36.90 | 4.482210 |
| School | 316 02 33.80 | 136 11 47.03 | 4.472943 |
| Blue Mound | 86 02 23.31 | 265 54 30.50 | 4.245229 |

ENGSTROM.

In Smith Co., Kans., on the north slope of a hill in the NW. $\frac{1}{4}$ of sec. 34, T. 5, R. 15.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $39^{\circ} 34' 43''$.59. Longitude, $99^{\circ} 00' 06''$.57.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lawrence..... | 297 07 40.01 | 117 13 09.69 | 4.142876 |
| School..... | 250 53 20.28 | 71 04 28.91 | 4.422513 |
| Twin Mound..... | 98 33 06.14 | 278 21 10.20 | 4.432896 |
| Blue Mound..... | 155 24 42.87 | 335 18 48.60 | 4.500885 |
| Hardilee..... | 188 15 36.90 | 8 17 34.11 | 4.482210 |

BLUE MOUND.

In Phillips Co., Kans., on the highest ground in the NW. $\frac{1}{4}$ of sec. 32, T. 2, R. 16, and about half a mile S. 60° W. of mound of the same name.

Permanent mark: An inverted bottle placed 14 inches under ground and a surface mark of white limestone 18 inches square, marked with a cross and U. S. G. S.

[Latitude, $39^{\circ} 50' 17''$.51. Longitude, $99^{\circ} 09' 21''$.08.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Engstrom..... | 335 18 48.60 | 155 24 42.87 | 4.500885 |
| Hardilee..... | 265 54 30.50 | 86 02 23.31 | 4.245229 |
| Plaster Mound... | 76 18 23.88 | 256 04 57.19 | 4.489504 |
| Twin Mound..... | 28 40 22.04 | 208 34 18.55 | 4.451406 |

TWIN MOUND.

In Phillips Co., Kans., a little over 1 mile southwest of mounds of this name. Near the center of the SE. $\frac{1}{4}$ of sec. 14, T. 5, R. 18.

Permanent mark: A bottle 30 inches below the surface and a large sandstone rock flush with surface, upon which is cut a cross.

[Latitude, $39^{\circ} 36' 52''$.73. Longitude, $99^{\circ} 18' 49''$.82.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Engstrom..... | 278 21 10.20 | 98 33 06.14 | 4.432896 |
| Blue..... | 208 34 18.55 | 28 40 22.04 | 4.451406 |
| Rock Mound..... | 80 56 27.40 | 260 50 22.45 | 4.140899 |
| Plaster Mound... | 136 43 01.80 | 316 35 40.24 | 4.380216 |

ROCK MOUND.

In Phillips Co., Kans., near the southwest part of a prominent mound in sec. 28, T. 5, R. 19.

Permanent mark: A bottle 2 feet underground, and a large sandstone rock a few inches above ground on which a cross is cut.

[Latitude, 39° 35' 41"-72. Longitude, 99° 28' 22"-30.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Twin Mound | 260 50 22.45 | 80 56 27.40 | 4.140899 |
| Plaster Mound | 171 48 15.07 | 351 46 59.16 | 4.297703 |
| Densmore | 88 18 10.65 | 268 09 34.95 | 4.285951 |

PLASTER MOUND.

In Phillips Co., Kans., within a few feet of the stone north of sec. 30, W. $\frac{1}{4}$, T. 3, R. 19. On public road. Instrument elevated 14 feet.

Permanent mark: A bottle 18 inches below the surface and a cross cut on small limestone rock.

[Latitude, 39° 46' 18"-67. Longitude, 99° 30' 21"-19.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Twin Mound | 316 35 40.24 | 136 43 01.80 | 4.380216 |
| Blue Mound | 256 04 57.19 | 76 18 23.88 | 4.489504 |
| Stahl | 81 03 25.30 | 260 51 27.71 | 4.432182 |
| Densmore | 39 09 50.51 | 219 02 29.75 | 4.416348 |
| Rock Mound | 351 46 59.16 | 171 48 15.07 | 4.297703 |

DENSMORE.

In Norton Co., Kans., about 5 miles southeast of Densmore, between sections 28 and 33, T. 5, R. 21.

Permanent mark: A broken bottle 20 inches below surface and large surface rock of white limestone with cross cut on top.

[Latitude, 39° 35' 22"-38. Longitude, 99° 41' 51"-48.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rock Mound | 268 09 34.95 | 88 18 10.65 | 4.285951 |
| Plaster Mound | 219 02 29.75 | 39 09 50.51 | 4.416348 |
| Windmill | 76 17 58.46 | 256 10 07.79 | 4.259061 |
| Stahl | 147 15 43.17 | 327 11 07.53 | 4.279125 |

STAHL.

In Norton Co., Kans., on highest ground in the NE. $\frac{1}{4}$ of the SE. $\frac{1}{4}$ of sec. 5, T. 4, R. 22., on land owned by Stahl.

Permanent mark: Bottle placed 22 inches below the surface; surface mark, a large white limestone rock on which a cross is cut.

[Latitude, $39^{\circ} 44' 00''$.81. Longitude, $99^{\circ} 49' 03''$.34.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Densmore..... | 327 | 11 | 07.53 | 147 | 15 | 43.17 | 4.279125 |
| Plaster Mound..... | 260 | 51 | 27.71 | 81 | 03 | 25.30 | 4.432182 |
| Windmill..... | 19 | 50 | 54.40 | 199 | 47 | 38.54 | 4.334216 |
| Wakeman..... | 78 | 15 | 12.86 | 258 | 07 | 46.99 | 4.229905 |

WINDMILL.

In Graham Co., Kans., 1 mile S. 70° W. of 2 windmills. which are very prominent landmarks for many miles.

Permanent mark: Rock with cross and U. S. G. S. cut in the top.

[Latitude, $39^{\circ} 33' 02''$.28. Longitude, $99^{\circ} 54' 10''$.34.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Densmore..... | 256 | 10 | 07.79 | 76 | 17 | 58.46 | 4.259061 |
| Stahl..... | 199 | 47 | 38.54 | 19 | 50 | 54.40 | 4.334216 |
| Lenora..... | 104 | 55 | 00.15 | 284 | 49 | 56.89 | 4.070397 |
| Wakeman..... | 151 | 04 | 00.44 | 330 | 59 | 51.23 | 4.284254 |

WAKEMAN.

In Norton Co., Kans., located on summit of gently rolling ridge, about 6 miles north of Lenora.

Permanent mark: Large rock with cross and U. S. G. S. cut on top, and two bottles buried beneath, 12 and 30 inches below surface.

[Latitude, $39^{\circ} 42' 08''$.15. Longitude, $100^{\circ} 00' 41''$.09.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Windmill..... | 330 | 59 | 51.23 | 151 | 04 | 00.44 | 4.284254 |
| Stahl..... | 258 | 07 | 46.99 | 78 | 15 | 12.86 | 4.229905 |
| Lenora..... | 8 | 23 | 24.00 | 188 | 22 | 29.53 | 4.145046 |

LENORA.

In Norton Co., Kans., located on a prominent, pointed peak, 2 or 3 miles south of Lenora.

Permanent mark: Large rock with cross and U. S. G. S. cut in the top, and two bottles buried beneath, 12 and 30 inches below the surface.

[Latitude, $39^{\circ} 34' 40''$.17. Longitude, $100^{\circ} 02' 06''$.47.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Windmill..... | 284 | 49 | 56.89 | 104 | 55 | 00.15 | 4.070397 |
| Wakeman..... | 188 | 22 | 29.53 | 8 | 23 | 24.00 | 4.145046 |

POSITIONS OF TOWNSHIP AND SECTION CORNERS,
SCHOOLHOUSES, CHURCHES, ETC.

Corner Ts. 20 and 21, Rs. 19 and 20, Anderson Co., Kans. Latitude, $38^{\circ} 15' 39''$. Longitude, $95^{\circ} 14' 54''$.33.

Corner T. 19 and 20, R. 19 and 20, Anderson Co., Kans. Latitude, $38^{\circ} 20' 52''$.61. Longitude, $95^{\circ} 14' 53''$.47.

Northwest corner sec. 28, T. 19, R. 12, Barton Co., Kans. Latitude, $38^{\circ} 22' 33''$.29. Longitude, $98^{\circ} 39' 46''$.92.

Northeast corner sec. 16, T. 19, R. 14, Barton Co., Kans. Latitude, $38^{\circ} 24' 17''$.21. Longitude, $98^{\circ} 51' 56''$.28.

Northwest corner sec. 19, T. 20, R. 15, Barton Co., Kans. Latitude, $38^{\circ} 18' 15''$.26. Longitude, $99^{\circ} 01' 53''$.60.

Southeast corner sec. 36, T. 20, R. 12, Barton and Stafford counties, Kans. Latitude, $38^{\circ} 15' 37''$.92. Longitude, $98^{\circ} 35' 22''$.11.

Cupola of court-house, Cottonwood Falls, Chase Co., Kans. Latitude, $38^{\circ} 22' 18''$.47. Longitude, $96^{\circ} 32' 28''$.30.

Corner T. 20 and 21, R. 5 and 6, Chase Co., Kans. Latitude, $38^{\circ} 15' 45''$.68. Longitude, $96^{\circ} 49' 07''$.73.

Corner T. 20 and 21, R. 6 and 7, Chase Co., Kans. Latitude $38^{\circ} 15' 45''$.39. Longitude, $96^{\circ} 42' 29''$.86.

Corner T. 19 and 20, R. 7 and 8, Chase Co., Kans. Latitude, $38^{\circ} 20' 57''$.74. Longitude, $96^{\circ} 35' 52''$.40.

Corner T. 19 and 20, R. 6 and 7, Chase Co., Kans. Latitude, $38^{\circ} 20' 57''$.83. Longitude, $96^{\circ} 42' 30''$.25.

Corner T. 18 and 19, R. 7 and 8, Chase Co., Kans. Latitude, $38^{\circ} 26' 11''$.61. Longitude, $96^{\circ} 35' 50''$.45.

Southeast corner sec. 35, T. 8, R. 1 E., Clay Co., Kans. Latitude, $39^{\circ} 18' 29''$.1. Longitude, $97^{\circ} 16' 36''$.7.

One-quarter corner secs. 24 and 19, T. 9, R. 1 and 2 E., Clay Co., Kans. Latitude, $39^{\circ} 15' 27''$.02. Longitude, $97^{\circ} 15' 32''$.88

One-quarter north corner sec. 20, T. 6, R. 3, Cloud Co., Kans. Latitude, $39^{\circ} 31' 34''$.49. Longitude, $97^{\circ} 40' 34''$.29.

One-quarter south corner sec. 26, T. 7, R. 2, Cloud Co., Kans. Latitude, $39^{\circ} 24' 35''$.86. Longitude, $97^{\circ} 30' 43''$.88.

Corner T. 18 and 19, R. 13 and 14, Coffey Co., Kans. Latitude, $38^{\circ} 26' 05''$.58. Longitude, $95^{\circ} 54' 45''$.04.

Corner T. 18 and 19, R. 14 and 15, Coffey Co., Kans. Latitude, $38^{\circ} 26' 05''$.34. Longitude, $95^{\circ} 48' 06''$.91.

Corner T. 19 and 20, R. 14 and 15, Coffey Co., Kans. Latitude, $38^{\circ} 20' 51''$.74. Longitude, $95^{\circ} 48' 07''$.69.

Corner T. 19 and 20, R. 16 and 17, Coffey Co., Kans. Latitude, $38^{\circ} 20' 53''$.15. Longitude, $95^{\circ} 34' 53''$.15.

Schoolhouse, Lebo, Coffey Co., Kans. Latitude, $38^{\circ} 25' 07''$.59. Longitude, $95^{\circ} 51' 29''$.45.

Center of sec. 11, T. 12, R. 2, Dickinson Co., Kans. Latitude, $39^{\circ} 01' 31''$. Longitude, $97^{\circ} 10' 33''$.73.

Southeast corner sec. 1, T. 11, R. 3, Dickinson Co., Kans. Latitude, $39^{\circ} 07' 10''$. Longitude, $97^{\circ} 02' 13''$.08.

State line, R. 6, Douglas Co., Kans. Latitude, $39^{\circ} 32' 24''$.73. Longitude, $97^{\circ} 57' 25''$.56.

Southwest corner sec. 22, T. 13, R. 20, Douglas Co., Kans. Latitude, $38^{\circ} 54' 50''$.74. Longitude, $95^{\circ} 11' 08''$.03.

Southeast corner sec. 36, T. 12, R. 19, Douglas Co., Kans. Latitude, $38^{\circ} 57' 30''$.06. Longitude, $95^{\circ} 14' 28''$.13.

Southwest corner sec. 15, T. 12, R. 18, Douglas Co., Kans. Latitude, $39^{\circ} 00' 06''$.13. Longitude, $95^{\circ} 24' 33''$.79.

Garden City, north schoolhouse, Finney Co., Kans. Latitude, $37^{\circ} 58' 19''$.70. Longitude, $100^{\circ} 52' 23''$.70.

Garden City, south schoolhouse, Finney Co., Kans. Latitude, $37^{\circ} 57' 39''$.18. Longitude, $100^{\circ} 52' 14''$.77.

Garden City standpipe, Finney Co., Kans. Latitude, $37^{\circ} 57' 50''$.35. Longitude, $100^{\circ} 52' 41''$.89.

Pierceville schoolhouse, Finney Co., Kans. Latitude, $37^{\circ} 53' 01''$.31. Longitude, $100^{\circ} 40' 19''$.97.

Northeast corner sec. 15, T. 24, R. 34, Finney Co., Kans. Latitude, $37^{\circ} 58' 25''$.84. Longitude, $101^{\circ} 01' 43''$.08.

Northwest corner sec. 15, T. 24, R. 34, Finney Co., Kans. Latitude, $37^{\circ} 58' 25''$.27. Longitude, $101^{\circ} 02' 49''$.03.

Northwest corner sec. 27, T. 23, R. 34, Finney Co., Kans. Latitude, $38^{\circ} 01' 53''$.62. Longitude, $101^{\circ} 02' 47''$.72.

North one-quarter corner sec. 30, T. 25, R. 32, Finney Co., Kans. Latitude $37^{\circ} 51' 29''$.25. Longitude, $100^{\circ} 52' 23''$.63.

Southeast corner sec. 36, T. 26, R. 31, Finney Co., Kans. Latitude, $37^{\circ} 44' 03''$.73. Longitude, $100^{\circ} 39' 10''$.82.

Northeast corner sec. 18, T. 24, R. 31, Finney Co., Kans. Latitude, $37^{\circ} 58' 25''$.98. Longitude, $100^{\circ} 45' 17''$.15.

Northeast corner sec. 22, T. 26, R. 25, Ford Co., Kans. Latitude, $37^{\circ} 46' 46''$.72. Longitude, $100^{\circ} 01' 54''$.87.

North one-quarter corner sec. 30, T. 25, R. 24, Ford Co., Kans. Latitude, $37^{\circ} 51' 41''$.31. Longitude, $99^{\circ} 52' 57''$.20.

Northeast corner sec. 29, T. 25, R. 22, Ford Co., Kans. Latitude, $37^{\circ} 51' 15''$.57. Longitude, $99^{\circ} 45' 06''$.54.

Southwest corner sec. 8, T. 26, R. 23, Ford Co., Kans. Latitude, $37^{\circ} 47' 34''$.78. Longitude, $99^{\circ} 52' 06''$.17.

Corner T. 18 and 19, R. 17 and 18, Franklin Co., Kans. Latitude, $38^{\circ} 26' 06''$.60. Longitude, $95^{\circ} 28' 14''$.58.

Cupola of church, Richmond, Franklin Co., Kans. Latitude, $38^{\circ} 34' 14''$.64. Longitude, $95^{\circ} 15' 10''$.71.

Cross on church, Emerald, Franklin Co., Kans. Latitude, $38^{\circ} 23' 13''$.58. Longitude, $95^{\circ} 27' 09''$.65.

Schoolhouse about 4 miles east of Mansfield, Gray Co., Kans. Latitude, $37^{\circ} 56' 11''$.52. Longitude, $100^{\circ} 41' 58''$.42.

Cimarron standpipe, Gray Co., Kans. Latitude, $37^{\circ} 49' 00''$.32. Longitude, $100^{\circ} 20' 48''$.05.

Cimarron schoolhouse, Gray Co., Kans. Latitude, $37^{\circ} 48' 31''$.02. Longitude, $100^{\circ} 20' 40''$.80.

Grandview schoolhouse, Gray Co., Kans. Latitude, $37^{\circ} 51' 21''$.97. Longitude, $100^{\circ} 20' 07''$.73.

Pretty Prairie schoolhouse, Gray Co., Kans. Latitude, $37^{\circ} 50' 26''$.24. Longitude, $100^{\circ} 15' 47''$.05.

Northwest corner sec. 6, T. 27, R. 30, Gray Co., Kans. Latitude, $37^{\circ} 44' 03''$.73. Longitude, $100^{\circ} 39' 10''$.82.

East quarter corner sec. 26, T. 25, R. 29, Gray Co., Kans. Latitude, $37^{\circ} 50' 56''$.11. Longitude, $100^{\circ} 27' 49''$.80.

North quarter corner sec. 3, T. 27, R. 29, Gray Co., Kans. Latitude, $37^{\circ} 44' 11''$.57. Longitude, $100^{\circ} 28' 40''$.47.

Southwest corner sec. 19, T. 25, R. 27, Gray Co., Kans. Latitude, $37^{\circ} 51' 20''$.61. Longitude, $100^{\circ} 20' 09''$.49.

Southeast corner sec. 27, T. 25, R. 27, Gray Co., Kans. Latitude, $37^{\circ} 50' 27''$.35. Longitude, $100^{\circ} 15' 45''$.94.

Southwest corner sec. 31, T. 25, R. 27, Gray Co., Kans. Latitude, $37^{\circ} 49' 36''$.18. Longitude, $100^{\circ} 20' 09''$.60.

Southwest corner sec. 22, T. 25, R. 27, Gray Co., Kans. Latitude, $37^{\circ} 51' 20''$.10. Longitude, $100^{\circ} 16' 52''$.56.

South quarter corner sec. 23, T. 27, R. 27, Gray Co., Kans. Latitude, $37^{\circ} 40' 42''$.46. Longitude, $100^{\circ} 14' 26''$.80.

Northwest corner sec. 8, T. 25, R. 30, Gray Co., Kans. Latitude, $37^{\circ} 54' 01''$.44. Longitude, $100^{\circ} 38' 42''$.51.

Northeast corner sec. 16, T. 22, R. 1 W., Harvey Co., Kans. Latitude, $38^{\circ} 08' 39''$.46. Longitude, $97^{\circ} 25' 33''$.46.

Southwest corner sec. 33, T. 21, R. 1 E., Harvey Co., Kans. Latitude, $38^{\circ} 10' 24''$.77. Longitude, $97^{\circ} 20' 09''$.69.

Southeast corner sec. 8, T. 22, R. 2, Harvey Co., Kans. Latitude, $38^{\circ} 08' 40''$.37. Longitude, $97^{\circ} 33' 17''$.20.

Southeast corner sec. 36, T. 22, R. 1 E. Harvey Co., Kans. Latitude, $38^{\circ} 05' 10''$.40. Longitude, $97^{\circ} 15' 46''$.12.

Southwest corner sec. 4, T. 23, R. 3 W., Harvey and Reno counties, Kans. Latitude, $38^{\circ} 04' 18''$.44. Longitude, $97^{\circ} 39' 50''$.32.

Northwest corner sec. 19, T. 25, R. 25, Hodgeman Co., Kans. Latitude, $37^{\circ} 52' 09''$.59. Longitude, $100^{\circ} 06' 59''$.15.

Southeast corner sec. 21, T. 24, R. 24, Hodgeman Co., Kans. Latitude, $37^{\circ} 56' 29''$.98. Longitude, $99^{\circ} 57' 14''$.34.

Southeast corner sec. 22, T. 21, R. 22, Hodgeman Co., Kans. Latitude, $38^{\circ} 12' 13''$.49. Longitude, $99^{\circ} 42' 58''$.18.

Southwest corner sec. 14, T. 23, R. 21, Hodgeman Co., Kans. Latitude, $38^{\circ} 03' 27''$.33. Longitude, $99^{\circ} 36' 17''$.90.

Southeast corner sec. 29, T. 23, R. 21, Hodgeman Co., Kans. Latitude, $38^{\circ} 01' 42''$.99. Longitude, $99^{\circ} 38' 30''$.01.

Southeast corner sec. 3, T. 24, R. 23 W., Hodgeman Co., Kans. Latitude, $37^{\circ} 59' 06''$.21. Longitude, $99^{\circ} 49' 30''$.70.

Southeast corner sec. 25, T. 23, R. 23, Hodgeman Co., Kans. Latitude, $38^{\circ} 01' 16''$.87. Longitude, $99^{\circ} 47' 17''$.96.

Southeast corner sec. 21, T. 7, R. 14, Jackson Co., Kans. Latitude, $39^{\circ} 25' 15''$.38. Longitude, $95^{\circ} 50' 54''$.35.

Northwest corner sec. 15, T. 8, R. 13, Jackson Co., Kans. Latitude, $39^{\circ} 21' 45''$.40. Longitude, $95^{\circ} 57' 36''$.61.

Northwest corner sec. 27, T. 9, R. 14, Jackson Co., Kans. Latitude, $39^{\circ} 14' 47''$.01. Longitude, $95^{\circ} 49' 55''$.40.

Southwest corner sec. 25, T. 9, R. 15, Jackson Co., Kans. Latitude, $39^{\circ} 13' 56''$.07. Longitude, $95^{\circ} 42' 00''$.24.

Northwest corner sec. 26, T. 8, R. 15, Jackson Co., Kans. Latitude, $39^{\circ} 19' 34''$.45. Longitude, $95^{\circ} 43' 07''$.45.

Northwest corner sec. 11, T. 9, R. 16, Jackson Co., Kans. Latitude, $39^{\circ} 17' 23''$.86. Longitude, $95^{\circ} 36' 26''$.06.

North quarter corner sec. 7, T. 11, R. 19, Jefferson Co., Kans. Latitude, $39^{\circ} 07' 03''$.40. Longitude, $95^{\circ} 20' 42''$.15.

East quarter corner sec. 20, T. 11, R. 20, Jefferson Co., Kans. Latitude, $39^{\circ} 04' 54''$.57. Longitude, $95^{\circ} 12' 21''$.73.

Northeast corner sec. 19, T. 19, R. 19, Jefferson Co., Kans. Latitude, $39^{\circ} 10' 25''$.77. Longitude, $95^{\circ} 19' 43''$.14.

Southwest corner sec. 1, T. 11, R. 17, Jefferson Co., Kans. Latitude, $39^{\circ} 07' 00''$.46. Longitude, $95^{\circ} 28' 59''$.40.

East quarter corner sec. 16, T. 9, R. 17, Jefferson Co., Kans. Latitude, $39^{\circ} 16' 05''$.63. Longitude, $95^{\circ} 30' 57''$.47.

East quarter corner sec. 7, T. 8, R. 17, Jefferson Co., Kans. Latitude, $39^{\circ} 22' 12''$.42. Longitude, $95^{\circ} 33' 12''$.80.

Southwest corner sec. 24, T. 5, R. 8, Jewell Co., Kans. Latitude, $39^{\circ} 35' 51''$.40. Longitude, $98^{\circ} 10' 32''$.90.

Quarter north corner sec. 3, T. 4, R. 7, Jewell Co., Kans. Latitude, $39^{\circ} 44' 32''$.04. Longitude, $98^{\circ} 05' 47''$.87.

Hartland schoolhouse, Kearny Co., Kans. Latitude, $37^{\circ} 53' 21''$.06. Longitude, $101^{\circ} 22' 03''$.49.

Lakin schoolhouse, Kearny Co., Kans. Latitude, $37^{\circ} 56' 30''$.75. Longitude, $101^{\circ} 15' 27''$.00.

Deerfield schoolhouse, Kearny Co., Kans. Latitude, $37^{\circ} 58' 54''$.76. Longitude, $101^{\circ} 08' 06''$.13.

West quarter corner sec. 34, T. 24, R. 37, Kearny Co., Kans. Latitude, $37^{\circ} 55' 17''$.81. Longitude, $101^{\circ} 22' 32''$.94.

Northwest corner sec. 11, T. 25, R. 36, Kearny Co., Kans. Latitude, $37^{\circ} 54' 00''$.98. Longitude, $101^{\circ} 14' 53''$.67.

Northeast corner sec. 35, T. 22, R. 36, Kearny Co., Kans. Latitude, $38^{\circ} 00' 58''$.76. Longitude, $101^{\circ} 13' 46''$.56.

Northeast corner sec. 6, T. 12, R. 12, Leavenworth Co., Kans. Latitude, $39^{\circ} 02' 42'' \cdot 60$. Longitude, $95^{\circ} 00' 03'' \cdot 84$.

Corner Towns 19 and 20, Ranges 22 and 23, Linn Co., Kans. Latitude, $38^{\circ} 20' 48'' \cdot 72$. Longitude, $94^{\circ} 55' 02'' \cdot 97$.

Corner Towns 19 and 20, State line, Linn Co., Kans. Latitude, $38^{\circ} 20' 47'' \cdot 52$. Longitude, $94^{\circ} 36' 45'' \cdot 42$.

Corner Towns 19 and 20, Ranges 12 and 13, Lyon Co., Kans. Latitude, $38^{\circ} 20' 54'' \cdot 26$. Longitude, $96^{\circ} 01' 25'' \cdot 50$.

Corner Towns 17 and 18, Ranges 12 and 13, Lyon Co., Kans. Latitude, $38^{\circ} 31' 21'' \cdot 70$. Longitude, $96^{\circ} 01' 24'' \cdot 07$.

Cupola of State normal school, Emporia, Lyon Co., Kans. Latitude, $38^{\circ} 24' 50'' \cdot 96$. Longitude, $96^{\circ} 10' 47'' \cdot 52$.

Southwest corner sec. 13, T. 21, R. 2 E., Marion Co., Kans. Latitude, $38^{\circ} 13' 04'' \cdot 86$. Longitude, $97^{\circ} 10' 10'' \cdot 83$.

Northeast corner sec. 16, T. 23, R. 1 E., Marion Co., Kans. Latitude, $38^{\circ} 02' 57'' \cdot 72$. Longitude, $97^{\circ} 20' 38'' \cdot 70$.

Southeast corner sec. 36, T. 21, R. 1 E., Marion and Harvey counties, Kans. Latitude, $38^{\circ} 10' 27'' \cdot 58$. Longitude, $97^{\circ} 15' 44'' \cdot 98$.

Corner Towns 20 and 21, Ranges 4 and 5, Marion Co., Kans. Latitude, $38^{\circ} 15' 45'' \cdot 45$. Longitude, $96^{\circ} 55' 45'' \cdot 11$.

Corner Towns 17 and 18, Ranges 20 and 21, Miami Co., Kans. Latitude, $38^{\circ} 31' 19'' \cdot 21$. Longitude, $95^{\circ} 08' 15'' \cdot 30$.

Corner Towns 17 and 18, Ranges 22 and 23, Miami Co., Kans. Latitude, $38^{\circ} 31' 16'' \cdot 29$. Longitude, $94^{\circ} 55' 03'' \cdot 33$.

Corner Towns 18 and 19, Ranges 24 and 25, Miami Co., Kans. Latitude, $38^{\circ} 26' 02'' \cdot 63$. Longitude, $94^{\circ} 41' 43'' \cdot 13$.

Southwest corner sec. 15, T. 8, R. 7, Mitchell Co., Kans. Latitude $39^{\circ} 21' 04'' \cdot 73$. Longitude, $98^{\circ} 05' 50'' \cdot 81$.

One quarter south corner sec. 11, T. 6, R. 6, Mitchell Co., Kans. Latitude, $39^{\circ} 32' 24'' \cdot 73$. Longitude, $97^{\circ} 57' 25'' \cdot 56$.

Corner Towns 17 and 18, Ranges 8 and 9, Morris Co., Kans. Latitude, $38^{\circ} 31' 23'' \cdot 60$. Longitude, $96^{\circ} 27' 51'' \cdot 51$.

Southwest corner sec. 33, T. 5, R. 24, Norton Co., Kans. Latitude, $39^{\circ} 34' 05'' \cdot 50$. Longitude, $100^{\circ} 02' 23'' \cdot 00$.

Southeast corner sec. 5, T. 4, R. 22, Norton Co., Kans. Latitude, $39^{\circ} 43' 38'' \cdot 57$. Longitude, $99^{\circ} 48' 55'' \cdot 11$.

Corner Towns 17 and 18, Ranges 15 and 16, Osage Co., Kans. Latitude, $38^{\circ} 31' 23'' \cdot 42$. Longitude, $95^{\circ} 41' 29'' \cdot 02$.

One-quarter east corner sec. 15, T. 8, R. 11, Osborne Co., Kans. Latitude, $39^{\circ} 21' 39'' \cdot 38$. Longitude, $98^{\circ} 31' 38'' \cdot 08$.

One-quarter west corner sec. 23, T. 6, R. 14, Osborne Co., Kans. Latitude, $39^{\circ} 31' 09'' \cdot 68$. Longitude, $98^{\circ} 51' 32'' \cdot 13$.

Southwest corner sec. 36, T. 9, R. 2 W., Ottawa Co., Kans. Latitude, $39^{\circ} 13' 18'' \cdot 8$. Longitude, $97^{\circ} 30' 12'' \cdot 6$.

Northwest corner sec. 13, T. 11, R. 1, Ottawa Co., Kans. Latitude, $39^{\circ} 06' 15'' \cdot 63$. Longitude, $97^{\circ} 23' 23'' \cdot 79$.

Northwest corner sec. 6, T. 21, R. 17, Pawnee Co., Kans. Latitude, $38^{\circ} 15' 38'' \cdot 22$. Longitude, $99^{\circ} 14' 01'' \cdot 82$.

Northwest corner sec. 30, T. 22, R. 17, Pawnee Co., Kans. Latitude, $38^{\circ} 06' 55'' \cdot 99$. Longitude, $99^{\circ} 14' 22'' \cdot 27$.

Northwest corner sec. 5, T. 21, R. 19, Pawnee Co., Kans. Latitude, $38^{\circ} 15' 42'' \cdot 32$. Longitude, $99^{\circ} 25' 26'' \cdot 48$.

Northwest corner sec. 17, T. 22, R. 20, Pawnee Co., Kans. Latitude, $38^{\circ} 08' 43'' \cdot 37$. Longitude, $99^{\circ} 33' 02'' \cdot 88$.

Northwest corner sec. 28, T. 5, R. 19, Phillips Co., Kans. Latitude, $39^{\circ} 35' 52'' \cdot 18$. Longitude, $99^{\circ} 28' 41'' \cdot 34$.

One-quarter south corner sec. 14, T. 5, R. 18, Phillips Co., Kans. Latitude, $39^{\circ} 36' 44'' \cdot 73$. Longitude, $99^{\circ} 19' 06'' \cdot 61$.

One-quarter north corner sec. 32, T. 2, R. 16, Phillips Co., Kans. Latitude, $39^{\circ} 50' 39'' \cdot 66$. Longitude, $99^{\circ} 09' 04'' \cdot 78$.

Northwest corner sec. 21, T. 8, R. 8, Pottawatomie Co. Kans. Latitude, $39^{\circ} 20' 59'' \cdot 72$. Longitude, $96^{\circ} 32' 16'' \cdot 32$.

Southwest corner sec. 5, T. 8, R. 6, Pottawatomie Co., Kans. Latitude $39^{\circ} 22' 47'' \cdot 20$. Longitude, $96^{\circ} 47' 34'' \cdot 08$.

Northeast corner sec. 6, T. 7, R. 9, Pottawatomie Co., Kans. Latitude, $39^{\circ} 28' 48'' \cdot 65$. Longitude, $96^{\circ} 26' 40'' \cdot 66$.

One-quarter south corner sec. 17, T. 7, R. 8, Pottawatomie Co., Kans. Latitude, $39^{\circ} 26' 12'' \cdot 84$. Longitude, $96^{\circ} 32' 51'' \cdot 35$.

Southeast corner sec. 29, T. 6, R. 10, Pottawatomie Co., Kans. Latitude, $39^{\circ} 29' 39'' \cdot 48$. Longitude, $96^{\circ} 18' 50'' \cdot 25$.

One-quarter north corner sec. 7, T. 8, R. 10, Pottawatomie Co., Kans. Latitude, $39^{\circ} 22' 41'' \cdot 20$. Longitude, $96^{\circ} 20' 32'' \cdot 57$.

Northwest corner sec. 17, T. 9, R. 12, Pottawatomie Co., Kans. Latitude, $39^{\circ} 16' 33'' \cdot 52$. Longitude, $96^{\circ} 06' 35'' \cdot 33$.

Northeast corner sec. 13, T. 23, R. 5, Reno Co., Kans. Latitude, $38^{\circ} 03' 24'' \cdot 96$. Longitude, $97^{\circ} 48' 38'' \cdot 43$.

Southwest corner section 8, T. 22, R. 4, Reno Co., Kans. Latitude, $38^{\circ} 08' 39'' \cdot 22$. Longitude, $97^{\circ} 47' 35'' \cdot 89$.

Northwest corner sec. 18, T. 23, R. 7, Reno Co., Kans. Latitude, $38^{\circ} 03' 24'' \cdot 26$. Longitude, $98^{\circ} 01' 49'' \cdot 70$.

Northwest corner sec. 8, T. 22, R. 10, Reno Co., Kans. Latitude, $38^{\circ} 10' 22'' \cdot 12$. Longitude $98^{\circ} 27' 06'' \cdot 43$.

One-quarter south corner sec. 35, T. 5, R. 4, Republic Co., Kans. Latitude, $39^{\circ} 39' 17'' \cdot 65$. Longitude, $97^{\circ} 50' 50'' \cdot 43$.

One-quarter south corner sec. 30, T. 4, R. 3, Republic Co., Kans. Latitude, $39^{\circ} 40' 10'' \cdot 17$. Longitude, $97^{\circ} 41' 50'' \cdot 57$.

Northeast corner sec. 23, T. 4, R. 2 W., Republic Co., Kans. Latitude $39^{\circ} 41' 59'' \cdot 0$. Longitude, $97^{\circ} 29' 46'' \cdot 7$.

Southeast corner section 16, T. 21, R. 8, Rice Co., Kans. Latitude, $38^{\circ} 13' 00'' \cdot 15$. Longitude, $98^{\circ} 12' 53'' \cdot 68$.

Northeast corner section 12, T. 20, R. 8, Rice Co., Kans. Latitude, $38^{\circ} 19' 57'' \cdot 41$. Longitude, $98^{\circ} 08' 43'' \cdot 50$.

Southwest corner section 23, T. 20, R. 10, Rice Co., Kans. Latitude, $38^{\circ} 17' 23'' \cdot 38$. Longitude, $98^{\circ} 24' 20'' \cdot 49$.

One-quarter north corner sec. 15, T. 6, R. 6, Riley Co., Kans. Latitude, $39^{\circ} 32' 17'' \cdot 77$. Longitude, $96^{\circ} 44' 44'' \cdot 30$.

Center of sec. 12, T. 10, R. 16, Shawnee Co., Kans. Latitude, $39^{\circ} 11' 44'' \cdot 71$. Longitude, $95^{\circ} 34' 46'' \cdot 93$.

Southeast corner sec. 16, T. 5, R. 11, Smith Co., Kans. Latitude, $39^{\circ} 36' 44'' \cdot 32$. Longitude, $98^{\circ} 33' 40'' \cdot 50$.

One-quarter west corner sec. 30, T. 2, R. 14, Smith Co., Kans. Latitude, $39^{\circ} 51' 06'' \cdot 93$. Longitude, $98^{\circ} 57' 15'' \cdot 75$.

One-quarter north corner sec. 34, T. 5, R. 15, Smith Co., Kans. Latitude, $39^{\circ} 35' 01'' \cdot 40$. Longitude, $99^{\circ} 00' 03'' \cdot 34$.

Northeast corner sec. 18, T. 21, R. 13, Stafford Co., Kans. Latitude, $38^{\circ} 13' 54'' \cdot 42$. Longitude, $98^{\circ} 47' 01'' \cdot 07$.

Corner Ts. 42 and 43, state line, Bates Co., Mo. Latitude, $38^{\circ} 28' 43'' \cdot 66$. Longitude, $94^{\circ} 36' 44'' \cdot 57$.

Corner Ts. 40 and 41, Rs. 30 and 31, Bates Co., Mo. Latitude, $38^{\circ} 18' 29'' \cdot 52$. Longitude, $94^{\circ} 17' 28'' \cdot 44$.

Corner Ts. 17 and 18, state line, Cass Co., Mo. Latitude, $38^{\circ} 31' 11'' \cdot 86$. Longitude, $94^{\circ} 36' 42'' \cdot 39$.

TEXAS.

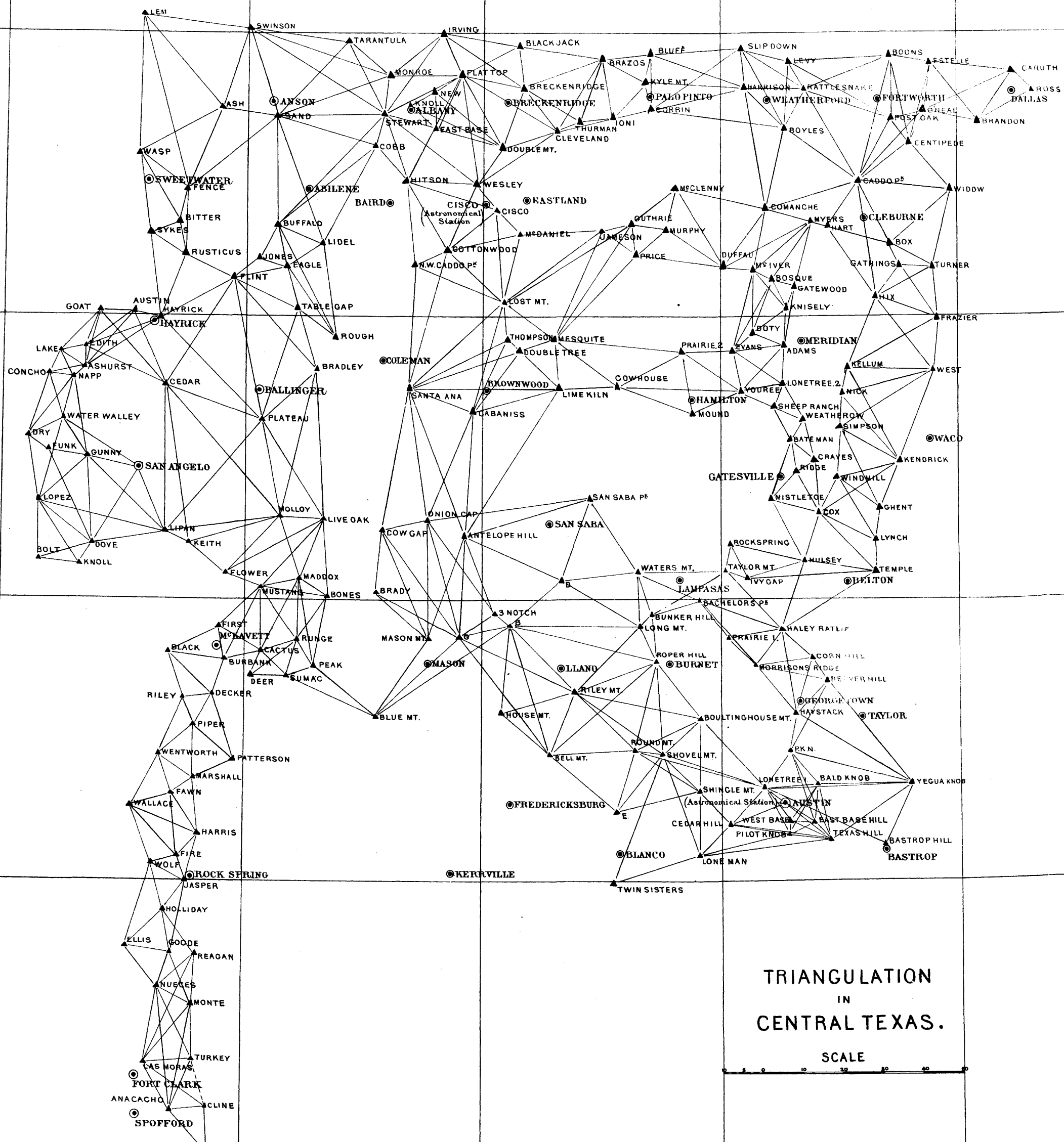
METHODS OF WORK.

Triangulation has been carried on in Texas in two general localities, namely: Middle Texas, or the area between longitude $96^{\circ} 30'$ and 101° , and Transpecos Texas. The work in the latter region extends from the western portion of the State as far eastward as longitude 103° , and covers the territory between the Rio Grande and the New Mexico boundary line. It embraces an area of about 15,000 square miles, and may be described as a belt about 60 miles in width extending from El Paso about 250 miles down the Rio Grande. The triangulation east of the Pecos covers an area of about 50,000 square miles, which is approximately included in a four-sided figure, with Dallas, Roby in Fisher County, Brackettville, and Bastrop at the corners.

Work upon the eastern triangulation was commenced in the vicinity of Austin in the summer of 1884. A base line was measured by E. M. Douglas, assisted by C. H. Fitch, with four meter bars. The location of this base is about ten miles southeast from Austin, near Onion Creek, and its adopted length 10,307.201 meters, or about 6.4 miles. Details relating to the Austin base line can be found in the administrative report of Mr. Henry Gannett contained in the Sixth Annual Report, 1884-'85. The development from this base included the location of a point in Austin, the astronomical position of which had been previously determined by the U. S. Coast and Geodetic Survey, and from this point the geodetic positions of the various triangulation points were derived. The azimuth of the Austin base line was determined by Prof. A. H. Thompson.

The work in Texas remained for two seasons under charge of Mr. Douglas. He was relieved in 1886 by Mr. R. U. Goode, under whose direction all operations in Texas have since been conducted except a small amount of work around Sierra Blanca in connection with the establishment of the one hundred and fifth meridian, as hereinafter explained. The triangulation was extended year by year northward and westward from Austin, and in 1889 a base line of verification was measured near Albany, partially along a railroad tangent through the town, and new astronomic and azimuth determinations were made.

The Albany base line is about 9 miles in length and was measured twice with a 300-foot steel tape stretched under a tension of 20 pounds. The tape was supported by stakes at intervals of 50 feet,



which were aligned and brought to the grade established by more substantial supports, the latter having been previously set in the ground 300 feet apart, and upon which markings of the extremities of the tape were made. The two direct measurements differed by 0.167 feet, but when temperature corrections were applied the resulting discrepancy was somewhat greater, owing possibly to difficulty experienced at the time of measurement in obtaining the true temperature of the tape. The adopted length of the line after applying the corrections for temperature, length of tape, difference on posts, inclination, sag, and sea level, was 45793.652 feet.

The triangulation was extended from the Albany base eastward 150 miles to Dallas, then southward to Temple, where another check was obtained by joining with distances from Austin base. The work has also been carried 250 miles southward and 100 miles westward from Albany. This work as above was executed principally by Charles F. Urquhart. After the measurement of the Albany base observations for azimuth were obtained each year.

The instruments used in this work were an 8-inch theodolite with verniers reading to 10 seconds in 1884-'85-'86, and afterwards an instrument with an 11-inch Gambey circle reading by microscopes to single seconds. Various methods of observations were used, principally, however, that of directions, and the whole system of triangulation, both east and west of Pecos river, has been divided into convenient figures and adjusted by the method of least squares, while station adjustments by the same method were also made whenever necessary.

Triangulation was commenced in Transpecos Texas, near Sierra Blanca, in the spring of 1890. Prof. R. S. Woodward measured a base line along the Texas and Pacific Railway and determined the astronomical position of a pier at Sierra Blanca, near the western extremity of the base line, and Mr. A. P. Davis developed a small system of triangulation around Sierra Blanca for the purpose of locating on the earth's surface the one hundred and fifth meridian. For a full description of the above operations see Bulletin 70. The work was continued in this locality in 1891 by Mr. R. U. Goode, who extended the system northward and westward, and in 1892 by Mr. Charles F. Urquhart eastward and southward.

The signals used in the middle portions of the State were usually made from sawed lumber, the instruments resting on the ground or elevated as the circumstances required. In the latter cases a scaffold for the support of the observer was always erected around an interior tripod on which the instrument rested. In a few instances when it was not necessary to elevate the instrument above the surface of the ground, trees, when found suitably located, were trimmed and the tops used for signals. In the Transpecos regions the triangulation stations were usually at the summit of sharp and well-defined peaks, and conical piles of stone from 8 to 12 feet in height were used as signals.

POSITIONS AND DESCRIPTIONS OF STATIONS.

ROSS.

In Dallas Co., Tex., about 8 miles east of Dallas; 50 yards west of Mr. Ross's residence and about one-half mile north of the Texas and Pacific Railroad. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 47' 19''$.39. Longitude, $96^{\circ} 39' 49''$.01.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Branden | 63 01 47.88 | 242 53 37.16 | 4.423700 |
| Caruth | 128 35 33.33 | 308 31 59.54 | 4.117911 |

CARUTH.

In Dallas Co., Tex., about 6 miles north from the city of Dallas, on Mrs. Caruth's residence.

Permanent mark: South chimney of house.

[Latitude, $32^{\circ} 51' 44''$.85. Longitude, $96^{\circ} 46' 23''$.42.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Estelle | 96 44 45.88 | 276 33 48.45 | 4.500987 |
| Branden | 33 27 29.94 | 213 22 52.23 | 4.384618 |
| Ross | 308 31 59.54 | 128 35 33.33 | 4.117911 |

BRANDEN.

In Dallas Co., Tex., about 12 miles southwest from Dallas and $2\frac{1}{2}$ miles west of Duncanville, on land owned by Mrs. Brandenburg, and 200 yards southwest from her house. Instrument elevated 24 feet.

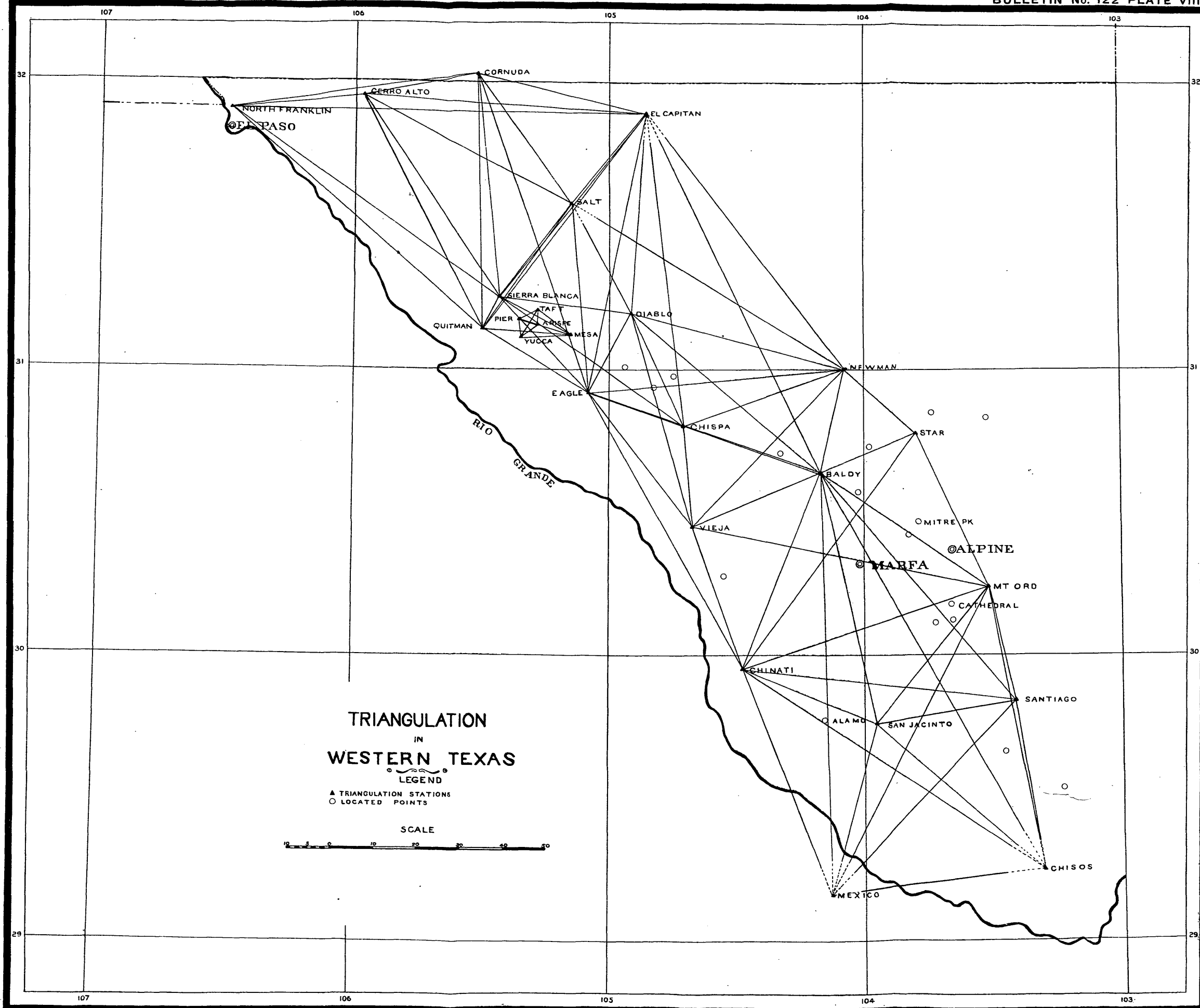
Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 40' 47''$.93. Longitude, $96^{\circ} 54' 56''$.48.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Estelle | 142 49 48.88 | 322 43 30.99 | 4.477489 |
| O'Neal | 102 46 51.03 | 282 39 48.04 | 4.320285 |
| Ross | 242 53 37.16 | 63 01 47.88 | 4.423700 |
| Caruth | 213 22 52.23 | 33 27 29.94 | 4.384618 |

ESTELLE.

In Tarrant Co., Tex., about 5 miles southwest from Grapevine and 1 mile west of the Arlington and Grapevine road, on land owned by the Estelle estate. Instrument elevated 30 feet.



Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 53' 44"-08. Longitude, 97° 06' 34"-46.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Boons | 99 51 50.19 | 279 46 22.20 | 4.201987 |
| Post Oak | 35 03 08.14 | 214 57 45.41 | 4.431753 |
| Caruth | 276 33 48.45 | 96 44 45.88 | 4.500987 |
| Branden | 322 43 30.99 | 142 49 48.88 | 4.477489 |
| O'Neal | 6 32 18.16 | 186 31 32.13 | 4.288511 |

O'NEAL.

In Tarrant Co., Tex., 3 miles southwest from Arlington, on land owned by Mr. J. J. O'Neal, and about 100 yards north of his residence. Instrument elevated 35 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 43' 17"-38. Longitude, 97° 07' 59"-43.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Estelle | 186 31 32.13 | 6 32 18.16 | 4.288511 |
| Boons | 148 32 25.32 | 328 27 44.15 | 4.412058 |
| Branden | 282 39 48.04 | 102 46 51.03 | 4.320285 |

POST OAK.

In Tarrant Co., Tex., on land owned by Mr. R. E. Maddox, about 6 miles south of Fort Worth and 1 mile east from the Fort Worth and Mansfield road, on the highest of two timbered knolls. Instrument was elevated 35 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 41' 45"-52. Longitude, 97° 16' 30"-30.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Caddo Peak | 27 50 56.64 | 207 46 39.85 | 4.425651 |
| Rattlesnake | 108 53 29.14 | 288 41 33.70 | 4.560725 |
| Centipede | 324 34 05.32 | 144 36 27.24 | 4.073005 |
| Estelle | 214 57 45.41 | 35 03 08.14 | 4.431753 |
| Boons | 179 31 42.03 | 359 31 37.76 | 4.395540 |

CENTIPEDE.

In Tarrant Co., Tex., about 5 miles southeast of Kennedale and about 1½ miles southwest of the Fort Worth brickyard. On land owned by Mrs. Eliza Turner, and about one-fourth mile east of her residence. Instrument elevated 35 feet.

[Latitude, 32° 36' 32"-51. Longitude, 97° 12' 07"-25.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Post Oak | 144 36 27.24 | 324 34 05.32 | 4.073005 |
| Caddo Peak | 54 14 42.97 | 234 08 04.97 | 4.376649 |

BOONS.

In Tarrant Co., Tex., about 14 miles north of Fort Worth on the middle one of three wooded knolls, one-fourth mile east of Mr. Boon's residence and 3 miles south of Keller. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 55' 12''$.22. Longitude, $97^{\circ} 16' 38''$.17.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Rattlesnake | 69 | 04 | 48.10 | 248 | 52 | 54.76 | 4.563701 |
| Post Oak | 359 | 31 | 37.76 | 179 | 31 | 42.03 | 4.395340 |
| O'Neal | 328 | 27 | 44.15 | 148 | 32 | 25.32 | 4.412058 |
| Estelle | 279 | 46 | 22.20 | 99 | 51 | 50.19 | 4.201987 |

RATTLESNAKE.

In Parker Co., Tex., in a pasture owned by Mr. Louch, about 12 miles east of Weatherford and 2 miles north of the Weatherford and Fort Worth road.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 48' 05''$.84. Longitude, $97^{\circ} 38' 32''$.84.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Levy | 149 | 10 | 06.50 | 329 | 07 | 54.20 | 4.092315 |
| Harrison | 90 | 58 | 46.37 | 270 | 50 | 35.84 | 4.372177 |
| Boons | 248 | 52 | 54.76 | 69 | 04 | 48.10 | 4.563701 |
| Post Oak | 288 | 41 | 33.70 | 108 | 53 | 29.14 | 4.560725 |
| Caddo Peak | 327 | 56 | 26.38 | 148 | 04 | 02.60 | 4.619141 |
| Boyles | 27 | 50 | 44.85 | 207 | 47 | 56.97 | 4.238593 |

LEVY.

In Parker Co., Tex., 10 miles north of Weatherford, on the Weatherford and Springtown road, and 2 miles east of Cartersville, on land owned by Mr. Levy, who lives in Weatherford.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 53' 50''$.54. Longitude, $97^{\circ} 42' 36''$.74.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Slipdown | 105 | 57 | 53.44 | 285 | 51 | 20.46 | 4.290824 |
| Harrison | 59 | 16 | 35.60 | 239 | 10 | 36.74 | 4.301491 |
| Rattlesnake | 329 | 07 | 54.20 | 149 | 10 | 06.50 | 4.092315 |

SLIPDOWN.

In Parker Co., Tex., on land owned by Robert Owen. About 4 miles southwest of Poolville, on the Weatherford and Gibtown road, and 7 miles from Gibtown. Known locally as Slipdown Mountain. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 39° 56' 44"-38. Longitude, 97° 54' 39"-80.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kyle Mountain ... | 70 34 09.86 | 250 20 52.58 | 4.607483 |
| Bluff..... | 89 46 20.80 | 266 33 38.37 | 4.562188 |
| Levy..... | 285 51 20.46 | 105 57 53.44 | 4.290824 |
| Harrison..... | 354 08 29.18 | 174 09 02.57 | 4.195368 |

HARRISON.

In Parker Co., Tex., about 7 miles from Weatherford and one-half mile north from the Weatherford and Palo Pinto road, in small grove of live-oak trees.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 48' 18"-01. Longitude, 97° 53' 38"-28.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kyle..... | 93 03 56.18 | 272 50 07.07 | 4.600462 |
| Slipdown..... | 174 09 02.57 | 354 08 29.18 | 4.195368 |
| Boyles..... | 315 19 33.12 | 135 24 54.85 | 4.343432 |
| Rattlesnake..... | 270 50 35.84 | 90 58 46.37 | 4.372177 |
| Levy..... | 239 10 36.74 | 59 16 35.60 | 4.301491 |

BOYLES.

In Parker Co., Tex., about 7 miles southeast of Weatherford, on land owned by J. W. Boyles, and just south of the railroad at his residence.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 39' 48"-57. Longitude, 97° 43' 43"-31.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Harrison..... | 135 24 54.85 | 315 19 33.12 | 4.343432 |
| Rattlesnake..... | 207 47 56.97 | 27 50 44.85 | 4.238563 |
| Caddo Peak..... | 303 25 05.36 | 123 35 27.87 | 4.558347 |

BLUFF.

In Palo Pinto Co., Tex., about 10 miles north of the town of Palo Pinto, and 1 mile west from the Palo Pinto and Jacksboro road; on the highest part of a ridge and near the bluff.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 55' 35"-49. Longitude, 98° 18' 02"-09.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kyle..... | 8 33 45.40 | 188 33 09.50 | 4.062742 |
| Brazos..... | 83 56 15.45 | 263 49 40.42 | 4.278668 |
| Slipdown..... | 266 33 38.37 | 86 46 20.80 | 4.562188 |

KYLE.

In Palo Pinto Co., Tex., on the highest point of Kyle Mountain, about 4 miles north of the town of Palo Pinto.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 49' 24"-60. Longitude, 98° 19' 08"-23.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Ioni | 42 52 34.36 | 222 48 05.26 | 4.279609 |
| Brazos | 118 44 20.34 | 298 38 21.75 | 4.291895 |
| Slipdown | 250 20 52.58 | 70 34 09.86 | 4.607483 |
| Harrison | 272 50 07.07 | 93 03 56.18 | 4.600462 |
| Corbin | 349 16 00.77 | 169 16 41.73 | 4.024591 |
| Bluff | 188 33 09.50 | 8 33 45.40 | 4.062742 |

CORBIN.

In Palo Pinto Co., Tex., about 3 miles south of the town of Palo Pinto, and one-half mile east from the Palo Pinto and Gordon road. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S. near a tree with the limbs cut off.

[Latitude, 32° 43' 47"-07. Longitude, 98° 17' 52"-54.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Ioni | 76 37 03.48 | 256 31 53.82 | 4.185868 |
| Kyle | 169 16 41.73 | 349 16 00.77 | 4.024591 |

IONI.

In Palo Pinto Co., Tex., on the highest point of a ridge, 1 mile south of Metcalf's Gap, and 12 miles west from Palo Pinto.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 41' 51"-43. Longitude, 98° 27' 25"-52.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Cleveland | 77 27 18.73 | 257 19 44.50 | 4.351462 |
| Brazos | 169 41 35.15 | 349 40 06.58 | 4.375572 |
| Corbin | 256 31 53.82 | 76 37 03.48 | 4.185868 |
| Kyle | 222 48 05.26 | 42 52 34.36 | 4.279609 |

BRAZOS.

In Palo Pinto Co., Tex., on the highest point of mountain, about 1 mile north from Randall's store.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 54' 29"-77. Longitude, 98° 30' 09"-01.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Cleveland..... | 32 01 15.76 | 211 55 08.74 | 4.522671 |
| Breckenridge..... | 68 57 44.14 | 248 47 02.42 | 4.518170 |
| Bluff..... | 263 49 40.42 | 83 56 15.45 | 4.278668 |
| Kyle..... | 298 38 21.75 | 118 44 20.34 | 4.291895 |
| Ioni..... | 349 40 06.58 | 169 41 35.15 | 4.375572 |
| Thurman..... | 19 45 51.86 | 199 42 45.53 | 4.423297 |

THURMAN.

In Stevens Co., Tex., near Palo Pinto county line. About 5 miles southeast from Caddo, and one-half mile south from road between Caddo and Gordon. Instrument elevated 20 feet.

Permanent mark: Stone marked with cross and U. S. G. S.

[Latitude, 32° 40' 59"-96. Longitude, 98° 35' 53"-02.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Breckenridge..... | 120 56 36.69 | 300 49 02.98 | 4.405645 |
| Brazos..... | 199 42 45.53 | 19 45 51.86 | 4.423297 |

CLEVELAND.

In Stevens Co., Tex., on school land about 5 miles south from where the Breckenridge and Palo Pinto road crosses Cedar Creek, and about 200 yards east from the road between Cedar Creek and Ranger. On a wooded knoll. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 39' 12"-25. Longitude, 98° 41' 26"-88.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Breckenridge..... | 141 16 42.28 | 321 12 09.25 | 4.322317 |
| Double Mountain..... | 70 32 26.33 | 250 25 05.18 | 4.354817 |
| Ioni..... | 257 19 44.50 | 77 27 18.73 | 4.351462 |
| Brazos..... | 211 55 08.74 | 32 01 15.76 | 4.522671 |

BRECKENRIDGE.

In Stevens Co., Tex., on a high, wooded, ridge, about 7 miles from the town of Breckenridge and about 200 yards south from the Breckenridge and Graham road. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 48' 03''-95. Longitude, 98° 49' 51''-89.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Flat Top | 103 | 53 | 13.47 | 282 | 44 | 39.66 | 4.404595 |
| Double Mountains .. | 18 | 50 | 59.18 | 198 | 48 | 09.91 | 4.403059 |
| Brazos | 248 | 47 | 02.42 | 68 | 57 | 44.14 | 4.518170 |
| Thurman | 300 | 49 | 02.98 | 120 | 56 | 36.69 | 4.405645 |
| Black Jack | 172 | 26 | 09.16 | 352 | 25 | 22.02 | 4.233842 |
| Cleveland | 321 | 12 | 09.25 | 141 | 16 | 42.28 | 4.322317 |

BLACK JACK.

In Stevens or Young county, Tex., near their boundary line. About 5 miles northeast from Crystal Falls, and a little east from the road between Crystal Falls and Belknap. Instrument elevated 24 feet.

Permanent mark: Rock marked with a cross and U. S. G. S.

[Latitude, 32° 57' 15''-29. Longitude, 98° 51' 18''-72.]

| station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Flat Top | 64 | 02 | 44.01 | 243 | 54 | 56.30 | 4.396152 |
| Breckenridge | 352 | 25 | 22.02 | 172 | 26 | 09.16 | 4.233843 |

DOUBLE MOUNTAINS.

In Stevens Co., Tex., about 17 miles south of Breckenridge, on eastern of two hills, known as Double Mountains. The Breckenridge and Cisco road passes very near the mountains.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 35' 06''-69. Longitude, 98° 55' 05''-25.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Hitson | 72 | 28 | 02.10 | 252 | 15 | 15.52 | 4.591453 |
| Stewart | 106 | 48 | 24.59 | 286 | 32 | 10.33 | 4.691354 |
| Breckenridge | 198 | 48 | 09.91 | 18 | 50 | 59.18 | 4.403059 |
| Cleveland | 250 | 25 | 05.18 | 70 | 32 | 26.33 | 4.354817 |
| New | 130 | 29 | 23.93 | 310 | 20 | 07.88 | 4.546872 |
| East Base | 106 | 23 | 06.91 | 286 | 14 | 01.94 | 4.438721 |
| Flat Top | 151 | 12 | 35.41 | 331 | 06 | 52.48 | 4.534696 |

FLAT TOP.

On line between Shackelford and Stevens counties, Tex., on the eastern extremity of a hill known as Flat Top mountain. About one-half mile north of the Albany and Crystal Falls road, 14 miles from Breckenridge, 10 miles from Fort Griffin, and 12 miles from Albany.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 51' 20"-75. Longitude, 99° 05' 39"-68.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Stewart..... | 62 31 41.97 | 242 21 07.64 | 4.536396 |
| Double Mountains | 331 06 52.48 | 151 12 35.41 | 4.534696 |
| Black Jack..... | 243 54 56.30 | 61 02 44.01 | 4.396152 |
| Breckenridge..... | 283 44 39.66 | 103 53 13.47 | 4.404595 |
| New..... | 55 08 23.56 | 235 04 49.36 | 4.097992 |
| Irving..... | 154 26 17.89 | 334 23 45.90 | 4.225965 |
| Monroe..... | 88 16 49.82 | 268 06 47.71 | 4.460537 |

IRVING.

In Throckmorton Co., Tex., about 5 miles northeast of Fort Griffin and one mile north from road between Fort Griffin and Belknap, on a post-oak ridge. The only post-oak in the country. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 59' 33"-38. Longitude, 99° 10' 19"-31.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Monroe..... | 53 21 22.07 | 233 13 50.83 | 4.429910 |
| Flat Top..... | 334 23 45.90 | 154 26 17.89 | 4.225965 |

EAST BASE.

In Shackelford Co., Tex., on land owned by Mr. Henry Palm. On a ridge $7\frac{3}{4}$ miles southeast from Albany, and just east of Hubbard Creek.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 39' 17"-06. Longitude, 99° 11' 56"-21.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| New..... | 178 09 53.23 | 358 09 43.16 | 4.179927 |
| Double Mountains | 286 14 01.94 | 106 23 06.91 | 4.438721 |
| Knoll..... | 131 01 35.12 | 310 57 52.34 | 4.153292 |

KNOLL.

In Shackelford Co., Tex., on land owned by Mr. Strum, about 1 mile northwest from Albany and one-fourth mile north from the Albany and Haskell road.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 44' 20"-15. Longitude, 99° 18' 48"-62.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| East Base..... | 310 57 52.34 | 131 01 35.12 | 4.153292 |
| New..... | 240 30 51.27 | 60 34 24.38 | 4.070818 |

NEW.

In Shackelford Co., Tex., on vacant land, about 7 miles from Albany. About 1 mile west from the Albany and Crystal Falls road, and just south from a sheep ranch.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 47' 28''$.06. Longitude, $99^{\circ} 12' 14''$.84.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Flat Top..... | 235 04 49.36 | 55 08 23.56 | 4.097992 |
| Double Mountains | 310 20 07.88 | 130 29 23.93 | 4.546872 |
| East Base..... | 358 09 43.16 | 178 09 53.23 | 4.179927 |
| Knoll..... | 60 34 24.38 | 240 30 51.27 | 4.070818 |

MONROE.

In Shackelford Co., Tex., in the Monroe pasture, on a knoll $3\frac{1}{2}$ miles north of a point on the Albany and Haskell road, and about 7 miles from Albany.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 50' 51''$.24. Longitude, $99^{\circ} 24' 09''$.62.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Stewart..... | 6 05 56.12 | 186 05 22.80 | 4.178596 |
| Flat Top..... | 268 06 47.71 | 88 16 49.82 | 4.490537 |
| Tarantula..... | 131 04 00.21 | 310 58 27.72 | 4.323818 |
| Irving..... | 233 13 50.83 | 53 21 22.07 | 4.429910 |

STEWART.

In Shackelford Co., Tex., in Charles Stewart's pasture, about 9 miles west from Albany and one-eighth mile north from the point where the Albany and Rising Sun road crosses a high ridge; about $1\frac{1}{4}$ miles north of George Coates' house.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 42' 44''$.26. Longitude, $99^{\circ} 25' 11''$.16.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hitson..... | 339 01 52.01 | 159 05 16.94 | 4.443369 |
| Double Mountains | 286 32 10.33 | 106 48 24.59 | 4.691354 |
| Cobb..... | 14 12 45.00 | 194 11 39.85 | 4.107991 |
| Sand..... | 88 57 31.73 | 268 42 40.49 | 4.633122 |
| Tarantula..... | 153 38 29.43 | 333. 33 30.92 | 4.507755 |
| Monroe..... | 186 05 22.80 | 6 05 56.12 | 4.178596 |
| Flat Top..... | 242 21 07.64 | 62 31 41.97 | 4.536396 |

COBB.

In Shackelford Co., Tex., in a pasture known as the "Old government pasture." About 2 miles south from where the Albany and Abilene road crosses the western most of three benches.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 36' 00" 71. Longitude, 99° 29' 11" 90.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sand..... | 106 17 34.44 | 286 03 49.70 | 4.617837 |
| Stewart..... | 194 11 39.85 | 14 12 45.00 | 4.107991 |
| Abilene..... | 58. 19 58.00 | 238 10 35.19 | 4.507314 |
| Lidel..... | 29 20 47.83 | 209 13 30.08 | 4.639462 |
| Buffalo..... | 51 30 46.05 | 231 17 22.56 | 4.699218 |

TARANTULA.

In Haskell Co., Tex., about one-half mile from the southern edge of Haskell Co., on southernmost of two flat-topped hills. It is 300 yards west from the Albany and Haskell road, at a point 18 miles from Haskell; eighteenth mile-post nearly opposite the hill.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 58' 20" 32. Longitude, 99° 34' 21" 57.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Monroe..... | 310 58 27.72 | 131 04 00.21 | 4.323818 |
| Stewart..... | 333 33 30.92 | 153 38 29.43 | 4.507755 |
| Anson..... | 51 55 00.79 | 231 44 30.34 | 4.584558 |
| Sand..... | 43 58 23.07 | 223 48 28.05 | 4.615150 |
| Haskell..... | 144 18 57.33 | 324 18 44.49 | 4.406066 |
| Swinson..... | 94 04 46.70 | 276 51 02.78 | 4.597397 |

HASKELL.

In Haskell Co., Tex. Not occupied. The cupola on the court-house in Haskell, county seat of Haskell County.

Permanent mark: Cupola.

[Latitude, 33° 09' 31" 57. Longitude, 99° 43' 54" 96.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Tarantula..... | 324 13 44.49 | 144 18 57.33 | 4.406066 |
| Swinson..... | 56 58 55.12 | 236 50 22.15 | 4.463680 |

SWINSON.

In Stonewall Co., Tex., in the southeast corner of the county, on the eastern edge of Flat Top Mountain, about 2 miles east of the Anson and Rayner road.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 33° 00' 56"-10. Longitude, 99° 59' 34"-60.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Tarantula | 276 | 51 | 02.78 | 94 | 04 | 46.70 | 4.597397 |
| Sand | 342 | 38 | 23.37 | 162 | 42 | 08.06 | 4.558089 |
| Anson | 342 | 14 | 03.69 | 162 | 17 | 14.43 | 4.476653 |
| Ash | 18 | 27 | 17.17 | 198 | 23 | 37.24 | 4.522820 |
| Haskell | 236 | 50 | 22.15 | 56 | 58 | 55.12 | 4.463688 |
| Lem | 97 | 54 | 38.12 | 277 | 39 | 27.50 | 4.621348 |

SAND.

In Jones Co., Tex., on a sand hill about 2 miles east of the Abilene and Anson road and 3 miles southeast of Anson. All country near the signal covered with thick brush. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 42' 15"-00. Longitude, 99° 52' 40"-50.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Tarantula | 223 | 48 | 28.05 | 43 | 58 | 23.97 | 4.615150 |
| Stewart | 268 | 42 | 40.49 | 88 | 57 | 31.73 | 4.633122 |
| Abilene | 336 | 12 | 05.54 | 156 | 16 | 24.36 | 4.492986 |
| Buffalo | 358 | 53 | 43.03 | 178 | 53 | 59.97 | 4.631206 |
| Cobb | 286 | 03 | 49.70 | 106 | 17 | 34.44 | 4.617837 |
| Ash | 97 | 46 | 04.50 | 277 | 38 | 41.67 | 4.333057 |
| Swinson | 162 | 42 | 08.06 | 342 | 38 | 23.37 | 4.558089 |

ANSON.

In Jones Co., Tex. Not occupied. The cupola on the court-house in Anson, the county seat of Jones County.

Permanent mark: Cupola.

[Latitude, 32° 45' 29"-54. Longitude, 99° 53' 43"-33.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Swinson | 162 | 17 | 14.43 | 342 | 14 | 03.69 | 4.476653 |
| Tarantula | 231 | 44 | 30.34 | 51 | 55 | 00.79 | 4.584558 |

ASH.

In Jones Co., Tex., very near the Fisher line, on the highest of two sand hills, about 4 miles north from where Mukel and Newman road crosses Clear Fork of the Brazos River, about 2½ miles north of the pasture fence.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 45' 49"-63. Longitude, 100° 06' 19"-79.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Swinson | 198 23 37.24 | 18 27 17.17 | 4.522820 |
| Sand | 277 38 41.67 | 97 46 04.50 | 4.333057 |
| Wasp | 60 45 09.27 | 240 34 13.10 | 4.560635 |
| Fence | 22 00 33.83 | 201 56 09.78 | 4.533666 |
| Lem | 140 22 14.14 | 320 11 26.93 | 4.685400 |

LEM.

In Stonewall Co., Tex., on the easternmost of the Double Mountains, in the Hetson pasture. The Double mountains are well known points.
Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 33° 03' 59"-68. Longitude, 100° 26' 11"-37.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Swinson | 277 39 07.50 | 97 53 38.12 | 4.621348 |
| Ash | 320 11 26.93 | 140 22 14.14 | 4.685400 |
| Wasp | 360 40 08.53 | 180 39 55.17 | 4.741118 |

WASP.

In Fisher Co., Tex., about 6 miles a little west of north from Sweetwater, on highest knoll, about one-half mile west from the Sweetwater and Roby road.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 34' 11"-27. Longitude, 100° 26' 36"-03.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lem | 180 39 55.17 | 360 40 08.53 | 4.741118 |
| Ash | 240 34 13.10 | 60 45 09.27 | 4.560635 |
| Sweetwater | 342 16 44.21 | 162 17 55.14 | 4.053811 |
| Sykes | 351 38 24.91 | 171 39 57.85 | 4.494016 |
| Bitter | 329 17 14.51 | 149 22 35.58 | 4.486311 |
| Fence | 306 09 14.08 | 126 15 44.22 | 4.370810 |

SWEETWATER.

In Nolan Co., Tex. Not occupied. Cupola of the court-house at Sweetwater.

Permanent mark: Cupola.

[Latitude, 32° 28' 31"-23. Longitude, 100° 24' 24"-09.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wasp | 162 17 55.14 | 342 16 44.21 | 4.053811 |
| Fence | 281 13 25.27 | 101 18 44.09 | 4.199196 |

FENCE.

In Nolan Co., Tex., in northern edge of the county and 10 miles a little south of east from Sweetwater; about 1 mile south of the western edge of mountains and on the highest point. A fence running north and south passes within a few yards of the signal. No road near.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 26' 40''$.88. Longitude, $100^{\circ} 14' 30''$.05.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wasp..... | 126 15 44.22 | 306 09 14.08 | 4.370810 |
| Ash..... | 201 56 09.78 | 22 00 33.83 | 4.533666 |
| Sweetwater..... | 101 18 44.09 | 281 13 25.27 | 4.199196 |
| Bitter..... | 14 58 10.60 | 194 57 02.25 | 4.111270 |

BITTER.

In Nolan Co., Tex., about 1 mile south from Bitter Creek, on the northern edge of a large mesquite ridge, known as "The divide," about 4 miles northeast from a blacksmith shop on the Sweetwater and Ballinger road, 18 miles from Sweetwater. Instrument elevated 15 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 19' 55''$.64. Longitude, $100^{\circ} 16' 37''$.66.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wasp..... | 149 22 35.58 | 329 17 14.51 | 4.486311 |
| Fence..... | 194 57 02.25 | 14 58 10.60 | 4.111270 |
| Rusticus..... | 350 32 47.53 | 170 33 33.19 | 4.134598 |
| Sykes..... | 67 58 55.75 | 247 55 08.54 | 4.079070 |

SYKES.

In Nolan Co., Tex., in a pasture owned by Mr. Sykes, about 100 yards east from the old Sweetwater and Hayrick road and $1\frac{1}{2}$ miles south of Mr. Sykes's residence; about 13 miles from Sweetwater. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 17' 29''$.43. Longitude, $100^{\circ} 23' 42''$.72.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wasp..... | 171 39 57.85 | 351 38 24.91 | 4.494016 |
| Bitter..... | 247 55 08.54 | 67 58 55.75 | 4.079070 |
| Rusticus..... | 303 45 16.31 | 123 49 48.77 | 4.206340 |

RUSTICUS.

In Nolan Co., Tex., about 50 yards west from the Sweetwater and Ballinger road, at a point between the twenty-first and twenty-second mileposts from Sweetwater. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 12' 39''-04. Longitude, 100° 15' 12''-15.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sykes..... | 123 49 48.77 | 303 45 16.31 | 4.206340 |
| Bitter | 170 33 33.19 | 350 32 47.53 | 4.134598 |

FLINT.

In Taylor Co., Tex., in western part of the county, about 2 miles northwest of Mount Moro P. O. and about 1 mile west from Bluff Creek, on westernmost of two high points on southern edge of ridge. Three knolls at the end of the ridge.

[Latitude, 32° 07' 48''-43. Longitude, 100° 02' 41''-13.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Plateau..... | 348 42 49.01 | 168 46 31.55 | 4.753889 |
| Hayrick | 61 47 30.82 | 241 37 53.52 | 4.510510 |

HAYRICK.

In Coke Co., Tex., about 2½ miles a little north of east from the town of Hayrick, county seat of Coke County, on the highest point of ridge, about three-fourths of a mile north from Nipple peak.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 59' 29''-96. Longitude, 100° 20' 48''-70.]

| To station. | Azimuth. | Back azimuth. | Dist. log. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Plateau..... | 315 19 25.36 | 135 32 40.73 | 4.752501 |
| Cedar..... | 355 52 46.50 | 175 53 24.39 | 4.419665 |
| Flint | 241 37 53.52 | 61 47 30.82 | 4.510510 |
| Austin | 101 31 52.52 | 281 28 17.37 | 4.036429 |
| Robert Lee | 50 19 38.93 | 230 15 16.95 | 4.228032 |
| Edith..... | 70 12 40.32 | 250 02 35.12 | 4.504418 |

AUSTIN.

In Coke Co., Tex., on a high point on a prairie ridge, about 10 miles north from Robert Lee and about 1 mile northeast of Mr. Austin's ranch.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 00' 40''$.36. Longitude, $100^{\circ} 27' 34''$.69.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Hayrick | 281 | 28 | 17.37 | 101 | 31 | 52.52 | 4.036429 |
| Cedar | 336 | 06 | 04.37 | 156 | 10 | 16.72 | 4.491870 |
| Ashurst | 41 | 37 | 49.89 | 221 | 31 | 15.22 | 4.470706 |
| Edith | 56 | 08 | 28.93 | 236 | 01 | 58.43 | 4.368296 |
| Goat | 92 | 01 | 17.03 | 271 | 56 | 34.51 | 4.145985 |
| Robert Leo | 10 | 14 | 32.57 | 190 | 13 | 45.38 | 4.119880 |
| Lake | 61 | 50 | 25.53 | 241 | 40 | 40.07 | 4.518436 |

GOAT.

In Coke Co., Tex., on the highest point near western end of ridge north of the Colorado River and in the northwest corner of the county, about 3 miles north of the Colorado River.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 00' 56''$.09. Longitude, $100^{\circ} 36' 27''$.63.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Austin | 271 | 56 | 34.51 | 92 | 01 | 17.03 | 4.145985 |
| Cedar | 317 | 18 | 24.72 | 137 | 27 | 18.59 | 4.593599 |
| Ashurst | 19 | 58 | 00.93 | 193 | 50 | 07.97 | 4.367062 |
| Edith | 21 | 43 | 57.96 | 201 | 42 | 08.80 | 4.162697 |
| Lake | 43 | 09 | 10.66 | 223 | 04 | 07.13 | 4.343381 |

ROBERT LEE.

In Coke Co., Tex., cupola of the court-house at Robert Lee, county seat of Coke Co.

Permanent mark: Cupola.

[Latitude, $31^{\circ} 53' 39''$.29. Longitude, $100^{\circ} 29' 03''$.87.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Austin | 190 | 13 | 45.38 | 10 | 14 | 32.57 | 4.119880 |
| Hayrick | 230 | 15 | 16.95 | 50 | 19 | 38.93 | 4.228032 |

EDITH.

In Coke Co., Tex., on the northern side of ridge south of the Colorado River, about 3 or 4 miles west from the discontinued post-office Edith.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 53' 37''$.40. Longitude, $100^{\circ} 39' 52''$.57.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Lake | 75 | 05 | 52.01 | 255 | 02 | 37.24 | 4.001330 |
| Goat | 201 | 42 | 08.80 | 21 | 43 | 57.26 | 4.162697 |
| Austin | 236 | 01 | 58.43 | 56 | 08 | 28.93 | 4.368296 |
| Hayrick | 250 | 02 | 35.12 | 70 | 12 | 40.32 | 4.504418 |
| Cedar | 295 | 33 | 58.37 | 115 | 44 | 39.40 | 4.549806 |
| Ashurst | 1 | 26 | 54.12 | 181 | 26 | 49.51 | 3.958473 |

LAKE.

Near the boundary line between Coke and Tom Green counties, Tex., on a prairie or mesquite ridge; about 8 miles northwest of Ashurst; about 3 miles west of ranch and farm with two windmills near house; about 200 yards north of the Colorado City road.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 52' 13"-50. Longitude, 100° 46' 01"-34.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Goat..... | 223 | 04 | 07.13 | 43 | 09 | 10.66 | 4.343381 |
| Austin..... | 241 | 40 | 40.07 | 61 | 50 | 25.53 | 4.518436 |
| Edith..... | 255 | 02 | 37.24 | 75 | 05 | 52.01 | 4.001330 |
| Ashurst..... | 304 | 27 | 08.75 | 124 | 30 | 18.65 | 4.060096 |
| Napp..... | 335 | 20 | 56.70 | 155 | 22 | 31.87 | 4.056368 |
| Concho..... | 28 | 47 | 26.85 | 208 | 45 | 47.18 | 4.013821 |

ASHURST.

In Coke Co., Tex., on a high prairie or mesquite ridge, in the western part of Mr. Ashurst's pasture, about three-fourths of a mile west from most western windmill; about 15 miles southwest from Robert Lee, and about 2 miles north from source of Grape Creek.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 48' 42"-42. Longitude, 100° 40' 01"-30.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Napp..... | 50 | 50 | 35.93 | 330 | 49 | 01.33 | 3.784802 |
| Concho..... | 80 | 02 | 14.39 | 259 | 57 | 25.08 | 4.166284 |
| Lake..... | 124 | 30 | 18.69 | 304 | 27 | 08.75 | 4.060096 |
| Edith..... | 181 | 26 | 49.51 | 1 | 26 | 54.12 | 3.958479 |
| Goat..... | 193 | 56 | 07.97 | 13 | 58 | 00.93 | 4.367062 |
| Austin..... | 221 | 31 | 15.22 | 41 | 37 | 49.89 | 4.470706 |

NAPP.

In Coke Co., Tex., on prairie or mesquite ridge in the northeast corner of Mr. Napp's pasture, about 4 miles southwest from station Ashurst; about 10 miles north of Water Valley.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 46' 37"-47. Longitude, 100° 43' 00"-86.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Lake..... | 155 | 22 | 37.24 | 335 | 21 | 02.07 | 4.0563773 |
| Ashurst..... | 230 | 48 | 56.00 | 50 | 50 | 30.60 | 3.7848272 |
| Gunny..... | 348 | 12 | 31.30 | 168 | 14 | 38.97 | 4.4953233 |
| Water Valley..... | 12 | 17 | 43.78 | 192 | 16 | 32.84 | 4.2228443 |
| Concho..... | 97 | 39 | 01.86 | 277 | 35 | 47.26 | 3.9915558 |

CONCHO.

In Tom Green Co., Tex., on Prairie Mountain, about 6 or 7 miles northwest from Water Valley and about 4 miles north of the Concho river. The Water Valley and Sterling road passes about 2 miles south of the station.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 47' 19''$.71. Longitude, $100^{\circ} 49' 10''$.33.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Lako | 208 | 45 | 47.31 | 28 | 47 | 26.98 | 4.1383080 |
| Ashurst | 259 | 57 | 25.08 | 80 | 02 | 14.39 | 4.1662840 |
| Napp | 277 | 35 | 47.26 | 97 | 39 | 01.86 | 3.9915558 |
| Dry | 17 | 07 | 15.61 | 197 | 04 | 48.59 | 4.3992513 |
| Water Valley | 340 | 40 | 32.59 | 160 | 42 | 35.83 | 4.2712291 |

WATER VALLEY.

In Sterling Co., Tex. Occupied 1893. On central part of flat portion of hill west of North Concho, and about $2\frac{1}{2}$ miles southwest from Water Valley P. O. The hill is west of a low gap in range of hills southwest from Water Valley P. O. The center of station is marked by a 2 by 4 scantling, set vertically in ground and wired out.

A stone marked $\frac{U}{G} \frac{S}{S}$ is permanent mark and is 4.26 feet south 32° 42' west from center of station.

[Latitude, $31^{\circ} 37' 47''$.51. Longitude, $100^{\circ} 45' 15''$.85.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Concho | 160 | 42 | 35.83 | 340 | 40 | 32.59 | 4.2712291 |
| Napp | 192 | 16 | 32.84 | 12 | 17 | 43.78 | 4.2228443 |
| Dry | 64 | 58 | 05.45 | 244 | 53 | 35.91 | 4.1752614 |
| Gunny | 325 | 09 | 14.13 | 145 | 12 | 31.60 | 4.2411204 |
| Lopez | 16 | 14 | 25.40 | 196 | 11 | 23.34 | 4.5178321 |

DRY.

In Tom Green Co., Tex., in Funk's pasture, at head of Dry Creek, about 10 miles southwest from Water Valley P. O. The station is in a light grove of mesquite. Signal is at top of 16-foot observing platform. Center is marked by cross on rock sunk in ground and

marked $\frac{U}{G} \frac{S}{S}$

[Latitude, $31^{\circ} 34' 21''$.64. Longitude, $100^{\circ} 53' 50''$.27.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Water Valley | 244 | 53 | 35.91 | 64 | 58 | 05.45 | 4.1752614 |
| Concho | 197 | 04 | 48.59 | 17 | 07 | 15.61 | 4.3992513 |

FUNK.

In Irion Co., Tex., in Funk's pasture, about 10 or 12 feet east of line of fence, through which road from San Angelo to Kiowa Creek passes, and about 2 miles north of the Kiowa Creek road. The gate through which the road goes is about 2 miles west from first house on right of road after crossing Dry Rocky Creek going westward. Signal is at top of 12-foot observing platform. Center of station is marked by a rock, sunk in ground, on which is cut $\frac{U}{G} \frac{S}{S}$

[Latitude, $31^{\circ} 31' 20''$.22. Longitude, $100^{\circ} 48' 47''$.32.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gunny..... | 278 39 01.43 | 98 44 09.13 | 4.1963012 |
| Lopez..... | 10 25 13.80 | 190 24 02.29 | 4.3018760 |

GUNNY.

In Irion Co., Tex., on knoll near head of and between two branches of Live Oak Creek and about 4 miles north of the San Angelo and Camp Charlotte road. The road crosses Live Oak Creek about 14 miles west of San Angelo. Signal is at top of 12-foot observing platform. Center is marked by a rock sunk in the ground with $\frac{U}{G} \frac{S}{S}$ cut on it.

[Latitude, $31^{\circ} 30' 03''$.10. Longitude, $100^{\circ} 38' 58''$.62.]

| To station. | Azimuth. | Backazimuth. | Log. dist. |
|------------------|--------------|--------------|------------|
| | ° ' " | ° ' " | Meters. |
| Napp..... | 168 14 38.97 | 348 12 31.90 | 4.4953233 |
| Water Valley.... | 145 12 31.60 | 325 09 14.13 | 4.2411204 |
| Dove..... | 356 22 33.57 | 176 23 15.49 | 4.5282371 |
| Funk..... | 98 44 09.13 | 278 39 01.43 | 4.1963012 |
| Lopez..... | 47 55 55.70 | 227 49 37.30 | 4.4123757 |

LOPEZ.

In Irion Co., Tex., on easternmost of the Lopez peaks, about 6 miles northwest of Sherwood. Road from Sherwood to Komer's ranch passes about one-half mile west of station. Signal: Scantling set in pile of rocks. Rock marking station is 6.04 feet south $62^{\circ} 58'$ east from center.

[Latitude, $31^{\circ} 20' 40''$.27. Longitude, $100^{\circ} 51' 04''$.44.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gunny..... | 227 49 37.30 | 47 55 55.70 | 4.4123757 |
| Water Valley.... | 196 11 23.34 | 16 14 25.40 | 4.5178321 |
| Bolt..... | 358 54 21.07 | 178 54 29.61 | 4.3584995 |
| Dove..... | 307 24 10.17 | 127 31 08.76 | 4.4293467 |
| Funk..... | 190 24 02.29 | 10 25 13.80 | 4.3018760 |

BOLT.

In Irion Co., Tex., on northeastern end of high flat ridge, between Dove and Spring creeks, about 8 miles (about 20° south of west) from spring at head of Dove Creek and about $3\frac{1}{2}$ miles north of county line between Irion and Schleicher counties. Signal: Piece of scantling bolted to stump of mesquite tree. Stone marked $\frac{U}{G} \frac{S}{S}$ is 4 feet, south $65^\circ 53'$ east, from center of station.

[Latitude, $31^\circ 08' 19''$.11. Longitude, $100^\circ 50' 47''$.98.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Dove | 252 | 44 | 00.72 | 72 | 50 | 49.55 | 4.3404490 |
| Lopez | 178 | 54 | 29.61 | 358 | 54 | 21.07 | 4.3584995 |

DOVE.

In Tom Green Co., Tex. Occupied 1893. On flat-topped hill, about 5 miles south from Knickerbocker. The station is near middle of hill, and its center is marked by a rock let in ground and marked $\frac{U}{G} \frac{S}{S}$. Signal at top of 12-foot observing platform.

[Latitude, $31^\circ 11' 49''$.51. Longitude, $100^\circ 37' 38''$.05.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Lopez | 127 | 31 | 08.76 | 307 | 24 | 10.17 | 4.4293467 |
| Gunny | 176 | 23 | 15.49 | 356 | 22 | 33.57 | 4.5282371 |
| Bolt | 72 | 50 | 49.55 | 252 | 44 | 00.72 | 4.3404490 |

LIPAN.

In Tom Green Co., Tex., in Keith's pasture on a high mountain, about $4\frac{1}{2}$ miles west from Keith's residence, which is 18 miles from San Angelo, on the San Angelo and Fort McKavett road. A lone peak is about 1 mile east from station.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $21^\circ 14' 17''$.14. Longitude, $100^\circ 19' 20''$.68.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Plateau | 220 | 50 | 17.65 | 41 | 02 | 38.66 | 4.757885 |
| Molloy | 262 | 38 | 21.50 | 82 | 52 | 52.58 | 4.651065 |
| San Angelo | 156 | 22 | 57.66 | 336 | 19 | 21.54 | 4.437322 |
| Cedar | 179 | 34 | 19.25 | 359 | 34 | 10.75 | 4.758451 |

KEITH.

In Tom Green Co., Tex., in Keith's pasture, about $3\frac{1}{2}$ miles south-east from his residence, and on the highest point of ridge. All of the short trees or brush near the signal have been cut down.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 11' 54''$.22. Longitude, $100^{\circ} 13' 44''$.55.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Molloy..... | 254 07 15.15 | 74 18 51.70 | 4.507360 |
| Flower..... | 310 27 46.61 | 130 32 13.04 | 4.253929 |
| San Angelo..... | 140 04 30.85 | 325 58 00.10 | 4.550798 |

SAN ANGELO.

The point located is the cupola of the court-house at San Angelo, Tom Green Co., Tex., and was not occupied.

Permanent mark: Cupola.

[Latitude, $31^{\circ} 27' 51''$.31. Longitude, $100^{\circ} 26' 16''$.06.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Keith..... | 325 58 00.10 | 146 04 30.85 | 4.550798 |
| Lipan..... | 336 19 21.54 | 156 22 57.66 | 4.437322 |

CEDAR.

In Coke Co., Tex., on northeasternmost part of ridge which forms the divide between the Concho and Colorado rivers; about 1 mile a little north of west from a sharp point known as Margaret Peak.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 45' 18''$.85. Longitude, $100^{\circ} 19' 36''$.94.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Plataan..... | 290 18 03.76 | 110 30 38.78 | 4.606208 |
| Lipan..... | 359 34 10.75 | 179 34 19.25 | 4.758451 |
| Hayrick..... | 175 53 24.39 | 355 52 76.50 | 4.752501 |
| Edith..... | 115 44 39.40 | 295 33 58.37 | 4.549806 |
| Goat..... | 137 27 18.59 | 317 18 24.72 | 4.593599 |
| Austin..... | 156 10 16.72 | 336 06 04.37 | 4.491870 |

FLOWER.

In Menard Co., Tex., near the northwestern corner of the county, on highest point of a ridge $2\frac{1}{2}$ miles due north of Mr. Skudder's windmill.

Bull. 122—15

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 05' 35''$. Longitude, $100^{\circ} 05' 09''$. 43.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Molloy..... | 225 | 13 | 43.51 | 45 | 20 | 52.23 | 4.489129 |
| Mustang..... | 290 | 56 | 37.72 | 111 | 01 | 21.08 | 4.192866 |
| Keith..... | 130 | 32 | 13.04 | 310 | 27 | 46.61 | 4.253929 |

MOLLOY.

In Concho Co., Tex., in the Molloy pasture; about 16 miles south of Paint Rock; about 6 miles north of Eden; about one-half mile east of the Paint Rock and Eden road; about one-fourth mile south of the Molloy water tank; and about 200 yards west from a grove of live oak trees. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 17' 20''$. 35. Longitude, $99^{\circ} 51' 21''$. 63.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Plateau..... | 169 | 44 | 58.29 | 349 | 42 | 43.58 | 4.582362 |
| Lipan..... | 82 | 52 | 52.88 | 262 | 38 | 21.50 | 4.651065 |
| Maddox..... | 341 | 09 | 21.32 | 161 | 12 | 01.55 | 4.404850 |
| Live Oak..... | 270 | 22 | 20.66 | 90 | 28 | 31.20 | 4.275801 |
| Keith..... | 74 | 18 | 51.70 | 254 | 07 | 15.15 | 4.567360 |
| Flower..... | 45 | 20 | 52.23 | 220 | 13 | 43.51 | 4.489129 |
| Mustang..... | 15 | 09 | 37.94 | 195 | 07 | 13.69 | 4.451199 |

LIVE OAK.

In Concho Co., Tex., about $1\frac{1}{2}$ miles west of Walupe Gap and on the highest point of the ridge; about 4 miles north of the Eden and Brady road, at the tenth milepost from Eden.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 17' 15''$. 82. Longitude, $99^{\circ} 39' 28''$. 17.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Plateau..... | 145 | 52 | 34.27 | 325 | 44 | 07.22 | 4.659379 |
| Bradley..... | 176 | 57 | 10.82 | 356 | 56 | 09.25 | 4.765113 |
| Bones..... | 359 | 28 | 54.07 | 179 | 28 | 59.53 | 4.490477 |
| Maddox..... | 24 | 08 | 19.05 | 204 | 04 | 49.90 | 4.418098 |
| Molloy..... | 90 | 28 | 31.23 | 270 | 22 | 20.66 | 4.275801 |

PLATEAU.

In Runnels Co., Tex., about $8\frac{1}{2}$ miles south a little east of Ballinger; about 2 miles east of the Ballinger and Paint Rock road. Instrument elevated 12 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 37' 41''-66. Longitude, 99° 55' 39''-75.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Flint | 168 | 46 | 24.89 | 348 | 42 | 42.31 | 4.753890 |
| Molloy | 349 | 42 | 43.58 | 169 | 44 | 58.29 | 4.582362 |
| Lipan | 41 | 02 | 38.66 | 220 | 50 | 17.65 | 4.757885 |
| Cedar | 290 | 18 | 03.76 | 110 | 30 | 38.78 | 4.606208 |
| Hayrick | 135 | 32 | 40.73 | 315 | 19 | 25.36 | 4.752501 |
| Bradley | 227 | 43 | 56.72 | 47 | 51 | 25.68 | 4.482166 |
| Live Oak | 325 | 24 | 07.22 | 145 | 52 | 34.27 | 4.659379 |

BRADLEY.

In Coleman Co., Tex., very near the Runnels line; about 2 miles north of Talpa, a station on the Gulf, Colorado and Santa Fe Railway; about 3 miles south of Pecan Spring; on southern point of a ridge, and in Mr. Bradley's pasture.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 48' 43''-66. Longitude, 99° 41' 25''-84.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Plateau | 47 | 51 | 25.68 | 227 | 43 | 56.72 | 4.482166 |
| Table Gap | 159 | 46 | 29.03 | 339 | 43 | 35.26 | 4.397060 |
| Live Oak | 356 | 56 | 09.25 | 176 | 57 | 10.82 | 4.765113 |
| Ballinger | 71 | 44 | 28.49 | 251 | 36 | 26.97 | 4.403896 |

TABLE GAP.

In Runnels Co., Tex., very near the Taylor County line; about 4 miles west from Content P. O.; on the highest point of ridge, and about 2 miles east from Table Gap.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 01' 23''-63. Longitude, 99° 46' 54''-52.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Eagle | 164 | 50 | 39.48 | 344 | 49 | 08.44 | 4.234767 |
| Lidel | 200 | 16 | 24.37 | 20 | 19 | 39.25 | 4.442051 |
| Bradley | 339 | 43 | 35.26 | 159 | 46 | 29.03 | 4.397060 |
| Flint | 115 | 35 | 14.05 | 295 | 26 | 51.32 | 4.439516 |
| Rough | 304 | 53 | 09.79 | 124 | 58 | 32.58 | 4.290545 |
| Ballinger | 26 | 10 | 35.80 | 206 | 05 | 26.44 | 4.543438 |

ROUGH.

In Coleman Co., Tex.; highest point on a high ridge south of Rough Creek, about 4 miles north of Glen Cove. All timber cleared from the hill except one tree. (Not occupied.)

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 55' 20''$.70. Longitude, $99^{\circ} 36' 44''$.93.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Table Gap | 124 | 58 | 32.58 | 304 | 53 | 09.79 | 4.290545 |
| Lidel. | 170 | 16 | 11.38 | 350 | 14 | 02.14 | 4.576069 |

EAGLE.

In Taylor Co., Tex., about a mile east of Guion and about a mile west of Bald Eagle Peak, on highest point of the ridge.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 10' 21''$.65. Longitude, $99^{\circ} 49' 45''$.86.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Buffalo | 166 | 59 | 10.13 | 346 | 57 | 53.77 | 4.220735 |
| Lidel | 236 | 16 | 57.82 | 56 | 21 | 44.44 | 4.228388 |
| Jones | 105 | 44 | 54.65 | 285 | 41 | 12.08 | 4.055775 |
| Table Gap | 344 | 49 | 08.44 | 104 | 50 | 39.48 | 4.234767 |
| Flint | 76 | 58 | 43.48 | 256 | 51 | 50.88 | 4.319290 |

JONES.

In Taylor Co., Tex., about 10 miles from Buffalo Gap and about 50 yards north of the Buffalo Gap and Fort Chadburn road where it crosses the summit of the ridge near the heads of two Elm creeks, one running south and the other northeast.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 12' 01''$.65. Longitude, $99^{\circ} 56' 43''$.69.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Buffalo | 208 | 42 | 42.96 | 28 | 45 | 09.59 | 4.174870 |
| Eagle | 285 | 41 | 12.08 | 105 | 44 | 54.65 | 4.055775 |

LIDEL.

In Taylor Co., Tex., near the head of Lidel Creek, about one-half mile north from Buffalo Spring and about one-fourth mile east from the Mountain Abilene and Coleman road where it crosses the mountains about 13 miles south of Abilene.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 15' 26''$.24. Longitude, $99^{\circ} 40' 48''$.20.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Buffalo | 110 | 59 | 02.98 | 290 | 52 | 59.33 | 4.280402 |
| Cobb | 209 | 13 | 30.08 | 29 | 20 | 47.83 | 4.639462 |
| Table Gap | 20 | 19 | 39.25 | 200 | 16 | 24.37 | 4.412051 |
| Eagle | 56 | 21 | 14.44 | 236 | 16 | 57.82 | 4.228386 |
| Rough | 350 | 14 | 02.14 | 170 | 16 | 11.38 | 4.576069 |

BUFFALO.

In Taylor Co., Tex., about 3 miles northwest from Buffalo Gap, on the highest and northernmost part of the mountains, and about $2\frac{1}{2}$ miles west from where the Abilene and Buffalo Gap road crosses Elm Creek.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 19' 07''$.47. Longitude, $99^{\circ} 52' 08''$.98.]

| To Station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Sand..... | 178 | 53 | 59.97 | 358 | 53 | 43.03 | 4.631206 |
| Cobb..... | 231 | 17 | 22.56 | 51 | 30 | 46.05 | 4.699218 |
| Jones..... | 28 | 45 | 09.59 | 208 | 42 | 42.96 | 4.174870 |
| Eagle..... | 346 | 57 | 53.77 | 166 | 59 | 10.13 | 4.220735 |
| Lidel..... | 290 | 52 | 59.33 | 110 | 59 | 02.98 | 4.280402 |

ABILENE.

In Taylor Co., Tex.; large iron water-tank on west side of Abilene, county seat of Taylor County. Not occupied.

Permanent mark: Tank.

[Latitude, $32^{\circ} 26' 51''$.39. Longitude, $99^{\circ} 44' 39''$.80.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Sand..... | 156 | 16 | 24.36 | 336 | 12 | 05.54 | 4.492986 |
| Cobb..... | 238 | 10 | 35.19 | 58 | 19 | 58.60 | 4.507314 |

HITSON.

In Callahan Co., Tex., on westernmost of two hills known as the Hitson Mountains, about 6 miles south from where the Baird and Albany road crosses Hubbard Creek.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 28' 42''$.69. Longitude, $99^{\circ} 18' 50''$.74.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Wesly..... | 273 | 42 | 53.74 | 93 | 52 | 14.51 | 4.496739 |
| Cottonwood..... | 331 | 19 | 10.65 | 151 | 24 | 21.02 | 4.500268 |
| Double Mountains | 252 | 15 | 15.52 | 72 | 28 | 02.10 | 4.591453 |
| Stewart..... | 159 | 05 | 16.94 | 339 | 01 | 52.01 | 4.443369 |

WESLY.

In Eastland Co., Tex., about 6 miles northwest of Cisco, on a wooded peak about 2 miles west from Cedar Mountain. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 27' 43''$.99. Longitude, $99^{\circ} 01' 26''$.22.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Derrick..... | 333 | 10 | 25.57 | 153 | 11 | 46.46 | 3.941327 |
| Cottonwood | 25 | 06 | 31.29 | 205 | 02 | 22.75 | 4.457345 |
| Hiltson..... | 93 | 52 | 14.51 | 273 | 42 | 53.74 | 4.436739 |

CISCO.

In Eastland Co., Tex., 3 miles from the town of Cisco, and about 100 yards south of the Cisco and Carbon road. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 22' 04''$.81. Longitude, $98^{\circ} 56' 19''$.87.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Lost Mountain.... | 356 | 22 | 33.22 | 176 | 23 | 19.31 | 4.555001 |
| Cottonwood..... | 51 | 55 | 13.14 | 231 | 48 | 25.05 | 4.404943 |

M^CDANIEL.

In Eastman Co., Tex., about $1\frac{1}{4}$ miles northwest from Carbon, and about three-fourths of a mile west from McDaniel's house. It is in very thick woods, but has a cleared space around it. Instrument elevated 32 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 17' 09''$.56. Longitude, $98^{\circ} 49' 47''$.97.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Lost Mountain... | 16 | 41 | 29.05 | 196 | 38 | 46.45 | 4.445589 |
| Cottonwood..... | 77 | 47 | 11.09 | 257 | 36 | 54.30 | 4.490814 |
| Jameson..... | 268 | 11 | 24.21 | 88 | 22 | 16.05 | 4.504351 |

COTTONWOOD.

In Callahan Co., Tex., about $3\frac{1}{2}$ miles from the town of Cottonwood; at the head of Sabana Creek on a flat-topped knoll from which all timber has been cut down except one tree on the northwestern part of the hill.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 13' 41''$.10. Longitude, $99^{\circ} 09' 10''$.76.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Wesly..... | 205 | 02 | 22.75 | 25 | 06 | 31.29 | 4.457345 |
| Derrick..... | 221 | 30 | 03.33 | 41 | 35 | 32.26 | 4.385124 |
| Cisco..... | 231 | 48 | 25.05 | 51 | 55 | 13.14 | 4.404943 |
| McDaniel..... | 257 | 36 | 54.30 | 77 | 47 | 11.09 | 4.490814 |
| Hiltson..... | 151 | 24 | 21.02 | 331 | 19 | 10.65 | 4.500268 |

LOST MOUNTAIN.

In Comanche Co., Tex., in the southwest quarter of section 32, Buffalo, Bayou, Brazos and Colorado Railroad, about 1 mile northwest from Lost Gap.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 02' 41"-87. Longitude, 98° 54' 53"-40.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Thompson..... | 352 08 37.80 | 172 09 15.20 | 4.144092 |
| Santa Anna..... | 48 12 28.03 | 228 00 02.33 | 4.697444 |
| Cisco..... | 176 23 19.31 | 356 22 33.22 | 4.555001 |
| McDaniel..... | 196 38 46.45 | 16 41 29.05 | 4.445589 |

JAMESON.

In Erath Co., Tex., on mountain known as Jameson Peak, about 3½ miles northeast from Desdemona.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 17' 40"-67. Longitude, 98° 29' 27"-79.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mesquite..... | 24 35 52.27 | 204 29 19.38 | 4.668979 |
| McDaniel..... | 88 22 16.05 | 268 11 24.21 | 4.504351 |
| Guthrie..... | 254 09 48.35 | 74 13 26.97 | 4.046149 |
| Price..... | 305 11 47.63 | 125 15 58.94 | 4.178679 |

GUTHRIE.

In Erath Co., Tex., on prairie knoll one-fourth of a mile north of Mr. Guthrie's house and one-fourth of a mile east of the Dublin and Gordon road, at a point about midway between the two towns. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 19' 19"-02. Longitude, 98° 22' 38"-75.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Price..... | 352 08 30.62 | 172 09 03.64 | 4.073545 |
| Jameson..... | 74 13 26.97 | 254 09 48.35 | 4.046149 |
| Murphy..... | 275 32 16.28 | 95 37 15.16 | 4.167162 |

PRICE.

In Erath Co., Tex., on a prairie knoll on land owned by Mr. Price. The knoll is the north one of two, one-eighth of a mile east from the Dublin and Gordon road, at a point about 10 miles from Dublin. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 12' 58''-07. Longitude, 98° 21' 36''-91.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mesquite | 43 20 24.77 | 223 09 42.33 | 4.665832 |
| Jameson | 125 15 58.94 | 305 11 47.63 | 4.178679 |
| Duffau | 279 58 34.23 | 100 10 23.80 | 4.549481 |
| Guthrie | 172 09 03.64 | 352 08 30.62 | 4.073545 |
| Murphy | 231 35 25.12 | 51 39 50.55 | 4.220133 |

MURPHY.

In Erath Co., Tex., on a prairie knoll known as Murphy Peak, about 5 miles north from Stephenville. Instrument elevated 16 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 18' 32''-64. Longitude, 98° 13' 19''-65.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Price | 51 39 50.55 | 231 35 25.12 | 4.220133 |
| Guthrie | 95 37 15.16 | 275 32 16.28 | 4.167162 |
| Duffau | 306 59 49.76 | 127 07 15.02 | 4.437557 |
| McClenny | 190 51 16.50 | 10 52 19.07 | 4.209652 |

MCCLENNY.

In Erath Co., Tex., in Mr. Robert McClenny's pasture, on the highest ground in a small cleared place surrounded by timber; about 6 miles, north of Morgan Mill and 1 mile from McClenny's house. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 27' 09''-30. Longitude, 98° 11' 22''-81.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Duffau | 329 51 40.11 | 149 58 03.81 | 4.573652 |
| Murphy | 10 52 19.07 | 190 51 16.50 | 4.209652 |
| Comanche | 282 43 16.46 | 102 55 48.97 | 4.575417 |

DUFFAU.

In Erath Co., Tex., on ridge of Duffau Mountains, about 1 mile north of Skipper Gap. Lines of sight radiating in five different directions, cut through timber. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 09' 36''-80. Longitude, 97° 59' 24''-87.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Price | 100 10 23.80 | 279 58 34.23 | 4.549481 |
| Murphy | 127 07 15.02 | 306 59 49.76 | 4.437557 |
| Comanche | 216 39 53.75 | 36 45 59.93 | 4.477485 |
| McIver | 273 27 44.85 | 93 32 11.83 | 4.119548 |
| McClenny | 149 58 03.81 | 329 51 40.11 | 4.573652 |

COMANCHE.

In Hood Co., Tex., on Comanche Peak, about 5 miles south of Granbury. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 22' 38"-19. Longitude, 97° 47' 59"-00.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Duffau..... | 36 45 59·93 | 218 39 53·75 | 4·477485 |
| McClenny..... | 102 55 48·97 | 282 43 16·46 | 4·575417 |
| Hart..... | 285 27 11·65 | 105 35 21·26 | 4·395014 |
| Myers..... | 284 39 48·05 | 104 45 50·75 | 4·262942 |
| McIver..... | 10 59 11·04 | 190 57 32·68 | 4·403730 |
| Bosque..... | 355 58 45·55 | 175 59 25·47 | 4·440622 |

MYERS.

In Johnson Co., Tex., on land belonging to David Myers. In pasture on ridge east of Barnard Knob and about 2 miles from same. About one-half mile from Myers' house.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 20' 07"-12. Longitude, 97° 36' 41"-29.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| McIver..... | 48 12 09·77 | 228 04 29·89 | 4·481422 |
| Comanche..... | 104 45 50·75 | 284 39 48·05 | 4·262942 |
| Bosque..... | 34 13 36·79 | 214 08 15·24 | 4·448663 |
| Gatewood..... | 13 50 09·91 | 193 47 59·95 | 4·426920 |

HART.

In Johnson Co., Tex., about 11 miles from Cleburne, on the highest point on Kennard and Hart's ranch, about three-fourths of a mile west from the Cleburne and Glenrose road.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 19' 09"-35. Longitude, 97° 32' 52"-02.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Comanche..... | 105 35 21·26 | 285 27 11·65 | 4·395014 |
| Caddo Peak..... | 215 53 57·06 | 35 58 27·64 | 4·351907 |

CADDO PEAK.

In Johnson Co., Tex., on point known as Caddo Peak, 1½ miles north-west from Joshua, on land owned by Dr. D. B. McWilliam.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 29' 00"-39. Longitude, 97° 24' 27"-05.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Boyles..... | 123 | 35 | 27.87 | 303 | 25 | 05.36 | 4.558347 |
| Rattlesnake..... | 148 | 04 | 02.60 | 327 | 56 | 26.38 | 4.619141 |
| Centipede..... | 234 | 08 | 04.97 | 54 | 14 | 42.97 | 4.376649 |
| Hart..... | 35 | 58 | 27.64 | 215 | 53 | 57.06 | 4.351907 |
| Post Oak..... | 207 | 46 | 39.85 | 27 | 50 | 56.64 | 4.425651 |
| Widow..... | 277 | 48 | 54.06 | 98 | 01 | 15.84 | 4.561603 |

WIDOW.

In Ellis Co., Tex., about 4 miles southwest of Midlothian, on land owned by Mrs. Taylor, and about one-half mile east of her residence. On the highest point in the pasture.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 26' 17"-43. Longitude, 97° 01' 24"-99.]

| To station. | Azimuth. | | | Back azimuth. | | | Log dist. |
|-----------------|----------|----|-------|---------------|----|-------|-----------|
| | ° | ' | " | ° | ' | " | Meters. |
| Box..... | 50 | 01 | 58.11 | 229 | 53 | 39.00 | 4.503266 |
| Caddo Peak..... | 98 | 01 | 15.84 | 277 | 48 | 54.06 | 4.561603 |
| Turner..... | 13 | 22 | 53.37 | 193 | 20 | 27.15 | 4.491044 |

BOX.

In Johnson Co., Tex., on Cleburne and Hillsboro road about 9 miles from Cleburne, on land owned by Mr. Doc Box, about 200 yards south-east of Harrell's cotton gin. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 33° 15' 11"-92. Longitude, 97° 16' 57"-74.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Widow..... | 229 | 53 | 08.52 | 50 | 01 | 27.57 | 4.503266 |
| Gathings..... | 336 | 42 | 50.15 | 156 | 44 | 09.84 | 3.995976 |
| Turner..... | 299 | 07 | 53.13 | 119 | 13 | 44.46 | 4.296028 |

TURNER.

In Hill Co., Tex., about 3 miles east of Itasca, on the mountain road between Itasca and Hillsboro; on land owned by the Turner heirs, in a cotton field, about 50 yards from where the Hillsboro road turns south. Instrument elevated 15 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 09' 58"-97. Longitude, 97° 05' 58"-61.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Box..... | 119 | 13 | 44.46 | 299 | 07 | 53.13 | 4.296028 |
| Widow..... | 193 | 20 | 27.15 | 13 | 22 | 53.37 | 4.491044 |
| Hix..... | 62 | 26 | 32.62 | 242 | 19 | 04.63 | 4.396790 |
| Gathings..... | 92 | 20 | 42.36 | 272 | 16 | 11.02 | 4.125922 |
| Frazier..... | 354 | 16 | 23.44 | 174 | 17 | 02.67 | 4.288521 |

GATHINGS.

In Hill Co., Tex.; about $1\frac{1}{2}$ miles southeast of Covington and about one-half mile east of the Cleburne and Hillsboro road; on land owned by Mr. Philip Gathings.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $32^{\circ} 10' 16''$.44. Longitude, $97^{\circ} 14' 28''$.25.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Box | 156 44 09.84 | 336 42 50.15 | 3.995976 |
| Turner | 272 16 11.02 | 92 20 42.36 | 4.125922 |
| Frazier | 322 21 37.93 | 142 26 47.85 | 4.399367 |

HIX.

In Hill Co., Tex., about 4 miles south from Blanton, on road between Blanton and Fort Graham, one-fourth mile southeast from the road, on land owned by Mr. C. C. Hicks, of Whitney, on a timbered ridge 1 mile south of Mr. Joe Hardin's house. Instrument elevated 35 feet.

Permanent mark: Stone marked with cross and U. S. G. S.

[Latitude, $32^{\circ} 03' 43''$.68. Longitude, $97^{\circ} 20' 01''$.32.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Turner | 242 19 04.63 | 62 26 32.62 | 4.396790 |
| Frazier | 287 50 54.20 | 107 59 00.34 | 4.402734 |
| Kellum | 22 28 41.79 | 202 24 51.52 | 4.476345 |

FRAZIER.

In Hill Co., Tex., about $3\frac{1}{2}$ miles southeast of Hillsboro, on a prairie knoll about 200 yards north of the Hillsboro and Hubbard road, on land owned by Mr. Frazier, and about three-quarters of a mile north-east from his residence.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 59' 31''$.22. Longitude, $97^{\circ} 04' 44''$.75.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gathings | 142 26 47.85 | 322 21 37.93 | 4.399367 |
| Turner | 174 17 02.67 | 354 16 23.44 | 4.288521 |
| Hix | 107 59 00.34 | 287 50 54.20 | 4.402734 |
| West | 4 34 59.77 | 184 34 26.58 | 4.315469 |
| Kellum | 60 50 19.76 | 240 38 25.34 | 4.609780 |

WEST.

In McLennan Co., Tex., in the town of West, on the Missouri, Kansas and Texas Railroad, on a lot owned by Mr. Zack Davis. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 48' 22''$.07. Longitude, $97^{\circ} 05' 47''$.56.]

| To stations. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Kellum | 91 | 17 | 27.69 | 271 | 06 | 08.24 | 4.530366 |
| Frazier | 184 | 34 | 26.58 | 4 | 34 | 59.77 | 4.315469 |
| Kendrick | 21 | 16 | 45.73 | 201 | 12 | 17.62 | 4.570035 |
| Nick | 75 | 45 | 00.34 | 255 | 32 | 50.75 | 4.575727 |

KELLUM.

In Bosque Co., Tex., about 50 yards east from the Fort Graham and Valley Mills road, and about 10 miles from Valley Mills, on a narrow strip of land owned by northern people whose names could not be ascertained. Just north of Kellum's sheep ranch, and about a mile northwest of Mr. Jones' residence. Instrument elevated 15 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 48' 45''$.07. Longitude, $97^{\circ} 27' 16''$.61.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Hix | 202 | 24 | 51.52 | 22 | 28 | 41.79 | 4.476345 |
| Frazier | 240 | 38 | 25.34 | 60 | 50 | 19.76 | 4.609780 |
| West | 271 | 06 | 08.24 | 91 | 17 | 27.69 | 4.530366 |
| Nick | 14 | 15 | 24.47 | 194 | 14 | 33.46 | 4.015289 |

NICK.

In Bosque Co., Tex., in a pasture owned by Mr. Nicholas Eglehart and about one-half mile east of his residence; about $3\frac{1}{2}$ miles north of Valley Mills, and about 1 mile west from the Fort Graham and Valley Mills road. A group of live oak trees about 200 yards southeast of the station.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 43' 19''$.10. Longitude, $97^{\circ} 28' 53''$.50.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Kellum | 194 | 14 | 33.46 | 14 | 15 | 24.47 | 4.015289 |
| West | 255 | 32 | 50.75 | 75 | 45 | 00.34 | 4.575727 |
| Kendrick | 317 | 34 | 59.20 | 137 | 42 | 37.79 | 4.534484 |
| Simpson | 3 | 46 | 40.55 | 183 | 46 | 23.13 | 4.123111 |

SIMPSON.

In McLennan Co., Tex., on the highest point in Mr. Simpson's pasture, about a mile southwest from Patton, on the Gulf, Colorado and Santa Fe Railroad.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 36' 08"-95. Longitude, 97° 29' 26"-69.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Nick..... | 183 46 23.13 | 3 46 40.55 | 4.123111 |
| Kendrick..... | 296 38 31.62 | 116 46 26.80 | 4.428396 |
| Ghent..... | 322 16 53.59 | 152 22 16.39 | 4.546010 |

KENDRICK.

In McLennan Co., Tex., on a bluff about 9 miles southwest of Waco, about one-half mile south of the McGregor and Waco road, on land owned by William Payne, about 1 mile south of William Kendrick's residence. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 29' 37"-62. Longitude, 97° 14' 18"-50.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Nick..... | 137 42 37.79 | 317 34 59.20 | 4.534484 |
| West..... | 201 12 17.62 | 21 16 45.73 | 4.570035 |
| Ghent..... | 21 52 29.31 | 201 49 58.33 | 4.313031 |
| Windmill..... | 75 08 19.87 | 255 00 07.30 | 4.411356 |
| Simpson..... | 116 46 26.80 | 296 38 31.62 | 4.426396 |

WINDMILL.

In Coryell Co., Tex., a wind mill in Mr. Arthur Smith's barnyard, about 5 miles west of McGregor and 1 mile north of Oglesby.

Permanent mark: The well.

[Latitude, 31° 26' 01"-94. Longitude, 97° 30' 02"-20.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Kendrick..... | 255 00 07.30 | 75 08 19.87 | 4.411356 |
| Ghent..... | 305 42 05.76 | 125 47 46.27 | 4.328232 |
| Lynch..... | 328 18 43.21 | 148 23 46.33 | 4.468136 |

GHENT.

In McLennan Co., Tex., about 2½ miles northeast of Moody on the Moody and Waco road, on land owned by Mr. James Ghent and about one-fourth of a mile south of his residence.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 19' 18"-01. Longitude, 97° 19' 08"-22.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Simpson..... | 152 22 16.39 | 332 16 53.59 | 4.546010 |
| Kendrick..... | 201 49 58.33 | 21 52 29.31 | 4.313031 |
| Windmill..... | 125 47 46.27 | 305 42 05.76 | 4.328232 |

LYNCH.

In Bell Co., Tex., about a mile northeast of Pendleton, on land owned by Dr. J. A. Lynch, on a high point one-fourth of a mile south-east from his residence.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 12' 29''$.66. Longitude, $97^{\circ} 20' 19''$.08.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cox | 115 26 06.33 | 295 18 36.69 | 4.404397 |
| Windmill | 148 23 46.33 | 328 18 43.21 | 4.468136 |

TEMPLE.

In Bell Co., Tex., center of town tank at Temple Junction.

Permanent mark: The tank.

[Latitude, $31^{\circ} 05' 48''$.48. Longitude, $97^{\circ} 20' 18''$.63.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ivy Gap | 87 12 45.24 | 266 56 19.66 | 4.704689 |
| Haley Ratlif | 59 15 24.11 | 239 03 16.05 | 4.4640355 |
| Cox | 135 18 46.73 | 315 11 20.25 | 4.510682 |
| Hulsey | 97 46 14.13 | 277 36 46.24 | 4.468119 |

HULSEY.

In Bell Co., Tex., on summit of ridge about 4 miles east of Killeen, near the northeast corner of Hulsey's pasture, built close to a post oak tree.

Permanent mark: Stone marked U. S. G. S., 86 and a cross. Distance to station, 6 feet, bearing S. 24° E.

[Latitude, $31^{\circ} 07' 56''$.19. Longitude, $97^{\circ} 38' 37''$.60.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Temple | 277 36 46.24 | 97 46 14.13 | 4.468119 |
| Haley Ratlif | 17 37 02.71 | 197 34 20.51 | 4.441289 |
| Ivy Gap | 73 10 00.84 | 253 03 02.45 | 4.350858 |
| Cox | 198 11 09.58 | 18 13 12.47 | 4.302982 |
| Mistletoe | 151 43 14.63 | 331 38 59.12 | 4.439109 |
| Rock Spring | 99 19 51.71 | 297 10 14.21 | 4.676494 |

IVY GAP.

Near corner of Coryell, Lampasas, and Bell counties, Tex., 3 miles south of Copperas Cave, about 300 yards south of an old road crossing ridge.

Permanent mark: Stone marked U. S. G. S., 86 and cross placed N. 4° W. 7.33 feet from live oak tree.

[Latitude, 31° 04' 24'' .56. Longitude, 97° 52' 07'' .52.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Haley Ratlif..... | 326 25 08.21 | 146 29 23.10 | 4.376100 |
| Taylor..... | 95 54 38.75 | 275 51 44.47 | 3.954102 |
| Temple..... | 266 56 19.66 | 87 12 45.24 | 4.704689 |
| Hulsey..... | 253 03 02.45 | 73 10 00.34 | 4.350858 |
| Rock Spring..... | 144 24 37.23 | 324 21 58.87 | 4.144277 |

TAYLOR.

In Lampasas Co., Tex., about 2 miles east of Kempner; a flat-topped butte.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 04' 54'' .52. Longitude, 97° 57' 45'' .14.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bachelers Peak... | 52 31 31.90 | 232 27 26.03 | 4.202526 |
| Waters Mountain... | 91 53 21.78 | 271 41 38.29 | 4.557870 |
| Haley Ratlif..... | 313 07 28.36 | 133 14 37.11 | 4.481470 |
| Prairie (1)..... | 359 18 39.69 | 179 18 45.57 | 4.402518 |
| Ivy Gap..... | 275 51 44.47 | 95 54 38.75 | 3.954102 |
| Rock Spring..... | 184 32 39.25 | 4 32 55.40 | 4.018845 |

ROCK SPRING.

Near line between Coryell and Lampasas counties, Tex., on highest part of mound, about 5 miles northwest from Copperas Cave, on Gulf, Colorado and Santa Fe Railroad, and about 2 miles southeast of Rock Spring, on south end of mound.

Permanent mark: Stone marked with cross and letters U. S. G. S.

[Latitude, 31° 10' 32'' .57. Longitude, 97° 57' 13'' .89.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hulsey..... | 279 10 14.21 | 99 19 51.71 | 4.676494 |
| Ivy Gap..... | 324 21 58.87 | 144 24 37.23 | 4.144277 |
| Taylor..... | 4 32 55.40 | 184 32 39.25 | 4.018845 |

COX.

In Coryell Co., Tex., on a hill in field belonging to Mr. Cox, about 2½ miles west of The Grove P. O. Station is about 100 yards west of one and 100 yards south of another of two large oak trees in the field.

Permanent mark: Stone marked with cross and letters U. S. G. S.

[Latitude, $31^{\circ} 18' 15''$.89. Longitude, $97^{\circ} 34' 40''$.50.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Hulsey | 18 | 13 | 12.47 | 198 | 11 | 09.58 | 4.302982 |
| Temple | 315 | 11 | 20.25 | 135 | 18 | 46.73 | 4.510681 |
| Graves | 174 | 58 | 29.45 | 354 | 57 | 53.83 | 4.313900 |
| Ridge | 151 | 16 | 09.32 | 331 | 13 | 15.43 | 4.263523 |
| Mistletoe | 104 | 53 | 39.21 | 284 | 47 | 19.79 | 4.300152 |
| Lynch | 295 | 18 | 36.69 | 115 | 26 | 06.33 | 4.404397 |

MISTLETOE.

In Coryell Co., Tex., on a small knob near its northwestern edge. The knob is the smaller of two knobs near together, about 7 miles by road southwest of Gatesville and about one-half mile southwest of T. W. Walker's house.

Permanent mark: Stone marked U. S. G. S., '86, and cross is buried 2 inches under center of station.

[Latitude, $31^{\circ} 21' 01''$.89. Longitude, $97^{\circ} 46' 50''$.26.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Cox | 284 | 47 | 19.79 | 104 | 53 | 39.21 | 4.300152 |
| Hulsey | 331 | 38 | 59.12 | 151 | 43 | 14.63 | 4.439109 |
| Bateman | 200 | 18 | 57.40 | 20 | 21 | 44.29 | 4.385524 |
| Ridge | 223 | 35 | 44.58 | 43 | 39 | 10.79 | 4.180557 |

RIDGE.

In Coryell Co., Tex., near large oak tree, and about 20 feet east of road from Gatesville to Waco, and about 5 miles from Gatesville.

Permanent mark: Stone marked with cross and letters U. S. G. S.

[Latitude, $31^{\circ} 26' 58''$.10. Longitude, $97^{\circ} 40' 14''$.48.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Mistletoe | 43 | 39 | 10.79 | 223 | 35 | 44.58 | 4.180557 |
| Cox | 331 | 13 | 15.43 | 151 | 16 | 09.32 | 4.263523 |
| Graves | 237 | 38 | 30.56 | 57 | 40 | 49.22 | 3.919014 |
| Bateman | 170 | 22 | 23.26 | 350 | 21 | 43.55 | 4.078424 |

GRAVES.

In Coryell Co., Tex., on high ground about 100 yards southwest from Mr. Graves's house, about 4 miles southeast of Coryell City and 2 miles east of Riddle's wells.

Permanent mark: Stone marked with cross and letters U. S. G. S.
Distance from stone to station, 3.75 feet, bearing S. 45° 54' E..

[Latitude, 31° 29' 22"-24. Longitude, 97° 35' 48"-87].

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ridge..... | 57 40 49.22 | 237 38 30.56 | 3.919014 |
| Cox..... | 354 57 53.83 | 174 58 29.45 | 4.313900 |
| Bateman..... | 129 18 21.25 | 309 15 22.67 | 4.066035 |
| Weatherow..... | 162 34 17.09 | 342 32 42.73 | 4.200398 |

BATEMAN.

In Coryell Co., Tex., on prairie ridge, in pasture belonging to Parson Bateman, and about one-fourth mile west from his house and about 10 miles north from Gatesville.

Permanent mark: Stone marked with cross and letters U. S. G. S.

[Latitude, 31° 33' 21"-57. Longitude, 97° 41' 30"-43.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Graves..... | 309 15 22.67 | 129 18 21.25 | 4.066035 |
| Ridge..... | 350 21 43.55 | 170 22 23.24 | 4.078424 |
| Mistletoe..... | 20 21 44.29 | 200 18 57.40 | 4.385524 |
| Weatherow..... | 208 41 53.16 | 388 43 17.64 | 3.947006 |
| Sheep Ranch..... | 152 05 23.06 | 332 03 03.85 | 4.174466 |

WEATHEROW.

In Coryell Co., Tex., on high ground about 40 yards southwest of C. C. Weatherow's house, about 5 miles east of Turnersville.

Permanent mark: Stone with letters U. S. G. S. and cross cut upon it, marking center of station.

[Latitude, 31° 37' 33"-63. Longitude, 97° 38' 49"-16.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bateman..... | 388 43 17.64 | 208 41 53.16 | 3.947006 |
| Graves..... | 342 32 42.73 | 162 34 17.09 | 4.200398 |
| Sheep Ranch..... | 115 50 45.73 | 295 47 01.75 | 4.096662 |
| Lone Tree (2)..... | 151 19 01.72 | 331 16 16.95 | 4.235413 |

SHEEP RANCH.

In Bosque Co., Tex., on prairie ridge about 4 miles west of Hurst Springs, 0.27 miles N. 54° E. from corners of Hamilton, Bosque, and Coryell counties.

Permanent mark: Stone with the letters U. S. G. S. and a cross cut upon it showing center of station.

[Latitude, $31^{\circ} 40' 30''$.16. Longitude, $97^{\circ} 45' 56''$.14.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|-----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Weatherow | 295 | 47 | 01.75 | 115 | 50 | 45.73 | 4.098662 |
| Bateman | 332 | 03 | 03.85 | 152 | 405 | 23.06 | 4.174466 |
| Youree | 114 | 50 | 31.53 | 294 | 46 | 23.05 | 4.170851 |
| Lone tree (2) | 197 | 10 | 18.30 | 17 | 11 | 17.82 | 4.003984 |

YOUREE.

In Hamilton Co., Tex., on ridge about 5 miles south of Cranfill Gap, near Bosque county line, on land belonging to Youree, about 40 yards west of his field and opposite the fiftieth fence post from northwest corner of field.

Permanent mark: Stone with the letters U. S. G. S. cut on it; distance 1.1 feet, bearing north.

[Latitude, $31^{\circ} 43' 52''$.56. Longitude, $97^{\circ} 54' 27''$.00.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Lone tree (2) | 258 | 10 | 43.18 | 78 | 16 | 11.56 | 4.224786 |
| Sheep ranch | 294 | 46 | 03.05 | 114 | 50 | 31.53 | 4.170851 |
| Evans | 168 | 22 | 29.43 | 348 | 21 | 24.95 | 4.208178 |
| Mound | 65 | 53 | 42.52 | 245 | 47 | 07.35 | 4.338705 |
| Prairie (2) | 123 | 31 | 48.90 | 303 | 23 | 51.25 | 4.456061 |
| Cowhouse | | | | | | | 4.702366 |

LONE TREE (2).

In Bosque Co., Tex., on ridge north of Neil creek, about 4 miles west of Norway Mills and one-half mile north of Hagen's house.

Permanent mark: Stone with the letters U. S. G. S. and a cross cut upon it. Distance to station, 13.1 feet, bearing S. 48° E.

[Latitude, $31^{\circ} 45' 43''$.23. Longitude, $97^{\circ} 44' 02''$.92.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Sheep ranch | 17 | 11 | 17.82 | 197 | 10 | 18.30 | 4.003984 |
| Weatherow | 331 | 16 | 16.95 | 151 | 19 | 01.72 | 4.235413 |
| Evans | 121 | 56 | 18.48 | 301 | 49 | 44.96 | 4.364021 |
| Youree | 78 | 16 | 11.56 | 258 | 10 | 43.18 | 4.224786 |

ADAMS.

In Bosque Co., Tex., one-fourth mile north of the Meridian and Hamilton road, at the fifth mile board from Meridian. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 53' 31''-39. Longitude, 97° 43' 23''-58.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Doty..... | 112 06 03-23 | 292 01 39-92 | 4-149814 |
| Knisely..... | 183 35 41-73 | 3 35 59-87 | 4-156671 |

EVANS.

In Bosque Co., Tex., on ridge at head of middle fork of Meridian Creek, about 1½ miles west of Evans's house and 150 yards west of where the Hico road crosses ridge.

Permanent mark: Stone with letters U. S. G. S. cut on it. Distance to station 2-7 feet, bearing N. 43° E.

[Latitude, 31° 52' 19''-76. Longitude, 97° 56' 29''-40.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Yuree..... | 348 21 24-95 | 168 22 29-43 | 4-203178 |
| Lone tree (2)..... | 301 49 44-96 | 121 56 18-48 | 4-364021 |
| Prairie (2)..... | 90 23 46-54 | 270 16 52-57 | 4-314008 |

DOTY.

In Bosque Co., Tex., 4 miles south, from Iredell, on a flat, bushy topped knoll, one-eighth mile east of point where the Iredell and Cranfill Gap road gets on top of ridge. Instrument elevated 16 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 31° 56' 23''-59. Longitude, 97° 51' 41''-64.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bosque..... | 200 43 26-70 | 20 46 04-46 | 4-343054 |
| Knisely..... | 237 08 46-87 | 57 13 28-82 | 4-220879 |
| Adams..... | 292 01 39-92 | 112 06 03-23 | 4-149814 |

KNISELY.

In Bosque Co., Tex., in Twin Mountain pasture, 1 mile southeast from Walnut, three-fourths mile southeast from a big barn in a pasture, and on the highest point in the pasture. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 01' 16''-18. Longitude, 97° 42' 49''-30.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bosque..... | 152 01 35-25 | 331 59 30-51 | 4-118170 |
| Gatewood..... | 200 08 17-79 | 20 09 23-74 | 3-976004 |
| Adams..... | 3 35 59-87 | 183 35 41-73 | 4-156671 |
| Doty..... | 57 13 28-82 | 237 08 46-87 | 4-220879 |

GATEWOOD.

In Bosque Co., Tex., on ridge between Steele and Mustang creeks, about 5 miles northeast from Walnut, about 150 yards from Mr. Gatewood's house, and near the Glenrose and Morgan road.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 06' 04"-59. Longitude, 97° 40' 45"-05.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bosque | 106 04 21.72 | 286 01 10.80 | 3.991109 |
| Myers | 193 47 59.95 | 13 50 09.91 | 4.426920 |
| Knisely | 20 09 23.74 | 200 08 17.79 | 3.976004 |

BOSQUE.

In Bosque Co., Tex., on ridge between Steele Creek and Hill Creek, 5 miles northwest from Walnut, 100 yards west from where road crosses the ridge. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 07' 32"-51. Longitude, 97° 46' 44"-20.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Comanche | 175 59 25.47 | 355 58 45.55 | 4.446622 |
| Myers | 214 08 15.24 | 34 13 36.79 | 4.448663 |
| Gatewood | 286 01 10.80 | 106 04 21.72 | 3.991109 |
| Knisely | 331 59 30.51 | 152 01 35.25 | 4.118170 |
| Doty | 20 46 04.46 | 200 43 26.70 | 4.343054 |

McIVER.

In Somerville Co., Tex., on Lavaca Co. school land, about 9 miles northwest from Walnut and 12 miles north from Iredell, 8 miles southwest from Glenrose, about 200 yards northwest from Mrs. Nannie McIver's house, and one-quarter mile north from Panther Cave signal. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 32° 09' 10"-70. Longitude, 97° 51' 03"-25.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Duffau | 93 32 11.83 | 273 27 44.85 | 4.119548 |
| Comanche | 190 57 32.68 | 10 59 11.04 | 4.403730 |
| Myers | 228 04 29.89 | 48 12 09.77 | 4.481422 |

PRAIRIE (2).

In Hamilton Co., Tex., on prairie ridge, west of Mesquite creek, about 2 miles west of Hamilton and Hico road, at point about 12 miles

north of Hamilton. It is about one mile northwest of Dr. Myers's house and about one-half mile northwest of smaller house.

Permanent mark: Stone marked U. S. G. S., and cross. Distance to station, 2.25 feet, bearing N. 20° W.

[Latitude, 31° 52' 24''-64. Longitude, 98° 09' 33''-51.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Evans | 270 16 52.57 | 90 23 46.54 | 4.314008 |
| Youree | 303 23 51.25 | 123 31 48.90 | 4.456061 |
| Mound | 350 38 22.55 | 170 39 43.71 | 4.397543 |
| Mesquite | 94 55 18.26 | 274 38 16.71 | 4.707480 |
| Cowhouse | 62 32 45.85 | 242 23 55.25 | 4.475028 |
| Limekiln | | | 4.707516 |

MOUND.

In Hamilton Co., Tex., on a mound about 3½ miles south of Hamilton, on Hamilton and Lampasas road, and 100 yards west of road.

Permanent mark: Stone marked U. S. G. S., and cross. Distance to station, 4.75 feet, bearing S. 79° W.

[Latitude, 31° 39' 04''-46. Longitude, 98° 06' 59''-33.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Youree | 245 47 07.35 | 65 53 42.52 | 4.336705 |
| Prairie (2) | 170 39 43.71 | 350 38 22.55 | 4.397543 |
| Cowhouse | 109 37 18.53 | 289 27 08.57 | 4.511013 |

COWHOUSE.

In Comanche Co., Tex., on north end of Cowhouse Mountain, which is about 3 miles south from point where Hamilton and Comanche road crosses south fork of Leon River.

Permanent mark: Stone marked with cross and letters U. S. G. S. Distance to station, 2 feet, bearing S. 40° E.

[Latitude, 31° 44' 56''-63. Longitude, 98° 26' 20''-10.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Prairie (2) | 242 23 55.25 | 62 32 45.85 | 4.475026 |
| Youree | | | 4.702366 |
| Mound | 289 27 08.57 | 109 37 18.53 | 4.511013 |
| Mesquite | 126 34 59.21 | 306 26 50.33 | 4.481871 |
| Limekiln | 89 04 49.14 | 268 57 18.94 | 4.352634 |

LIMEKILN.

In Comanche Co., Tex., near an old limekiln on main ridge, about 2½ miles south of Mercers Gap, on the highest part of the ridge.

Permanent mark: Stone marked with a cross and letters U. S. G. S.

[Latitude, $31^{\circ} 44' 44''$.11. Longitude, $98^{\circ} 40' 35''$.71.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mesquite | 174 11 36.76 | 354 10 59.13 | 4.267847 |
| Prairie (2) | | | 4.707516 |
| Cowhouse | 268 57 18.94 | 89 04 49.14 | 4.352634 |
| Onion Gap | | | 4.869130 |
| Santa Anna | | | 4.776138 |
| Doubletree | 132 19 27.20 | 312 14 06.44 | 4.335110 |
| Cabaniss | 73 44 01.14 | 253 32 41.39 | 4.550253 |

MESQUITE

In Comanche Co., Tex., on north end of high ridge south of what is known as Round Mountain. Station is about $3\frac{1}{4}$ miles northeast of Logan Gap and about 6 miles west of Comanche.

Permanent mark: Stone marked with cross and letters U. S. G. S. Distance to center of station, 5.25 feet, bearing N. 35° E.

[Latitude, $31^{\circ} 54' 42''$.59. Longitude, $98^{\circ} 41' 47''$.06.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cowhouse | 306 26 50.33 | 126 34 59.21 | 4.481871 |
| Prairie (2) | 274 38 16.71 | 94 55 18.26 | 4.707480 |
| Doubletree | 74 40 11.67 | 254 35 27.86 | 4.165532 |
| Limekiln | 354 10 59.13 | 174 11 36.76 | 4.267847 |
| Jameson | 204 29 19.38 | 24 35 52.27 | 4.668979 |
| Price | 223 09 42.33 | 43 20 24.77 | 4.665832 |

THOMPSON.

In Brown Co., Tex., at the head of Gap Creek, on most westerly ridge of hills that run north from Salt Mountain, and about 5 miles northwest from Salt Mountain.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 55' 13''$.70. Longitude, $98^{\circ} 53' 40''$.90.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Doubletree | 316 10 12.29 | 136 11 45.64 | 3.826419 |
| Santa Anna | 03 35 32.87 | 243 22 30.24 | 4.639546 |
| Lost Mountain ... | 172 09 15.20 | 352 08 37.80 | 4.144092 |

DOUBLETREE.

In Brown Co., Tex., on hill about three-quarters of a mile west of where Coleman and Comanche road crosses Salt Creek.

Permanent mark: Stone marked with cross and letters U. S. G. S.
Distance to station, 8.75 feet, bearing N. 37° E.

[Latitude, 31° 52' 36''-61. Longitude, 98° 50' 44''-23.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Limekiln | 312 | 14 | 06.44 | 132 | 19 | 27.20 | 4.335110 |
| Mesquite | 254 | 35 | 27.86 | 74 | 40 | 11.67 | 4.165532 |
| Cabaniss | 36 | 20 | 10.12 | 216 | 14 | 09.47 | 4.489744 |
| Santa Anna | 71 | 36 | 08.62 | 251 | 21 | 33.35 | 4.663325 |
| Thompson | 136 | 11 | 45.64 | 316 | 10 | 12.29 | 3.826419 |

CABANISS.

In Brown Co., Tex., in pasture belonging to Cabaniss, about 6 miles southwest of Brownwood and about one-half mile west of the Upper Brownwood and Brady road.

Permanent mark: Stone marked with a cross and letters U. S. G. S. cut on it. Distance to station, 6.25 feet; bearing to station S. 48° E.

[Latitude, 31° 39' 19''-41. Longitude, 99° 02' 09''-28.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Doubletree | 216 | 14 | 09.47 | 36 | 20 | 10.12 | 4.483744 |
| Limekiln | 253 | 32 | 41.39 | 73 | 44 | 01.14 | 4.550253 |
| Onion Gap | 23 | 24 | 12.92 | 203 | 18 | 12.17 | 4.663016 |
| Santa Anna | 111 | 11 | 41.75 | 291 | 03 | 09.18 | 4.439921 |

SANTA ANNA.

In Coleman Co., Tex., on southern high point of smaller of two peaks overlooking Santa Anna, a station on the Gulf, Colorado and Santa Fe Railroad.

Permanent mark: Stone marked with cross and letters U. S. G. S. cut on it.

[Latitude, 31° 44' 41''-62. Longitude, 99° 18' 24''-72.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Doubletree | 251 | 21 | 33.35 | 71 | 36 | 08.62 | 4.663325 |
| Limekiln | | | | | | | 4.776138 |
| Cabaniss | 291 | 03 | 09.18 | 111 | 11 | 41.75 | 4.439921 |
| Antelope | | | | | | | 4.796952 |
| Onion Gap | 351 | 47 | 50.47 | 171 | 50 | 19.07 | 4.721953 |
| Cow Gap | 10 | 33 | 35.14 | 190 | 30 | 11.86 | 4.749595 |
| Lost Mountain | 228 | 00 | 02.33 | 48 | 12 | 28.03 | 4.697444 |
| Thompson | 243 | 22 | 30.24 | 63 | 35 | 32.87 | 4.639546 |

ONION GAP.

In McCulloch Co., Tex., on hill in pasture, the southwest corner of which is 10½ miles from Brady, on Brownwood and Brady road. Hill

is about $1\frac{1}{2}$ miles from west line of fence and one-fourth mile from south line of fence. Station is on highest point of hill and near the center of top of hill.

Permanent mark: Stone marked with cross and letters U. S. G. S.

[Latitude, $31^{\circ} 16' 27''$.35. Longitude, $99^{\circ} 13' 40''$.39.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Santa Anna | 171 50 19.07 | 351 47 50.47 | 4.721953 |
| Antelope | 292 09 32.02 | 112 14 30.64 | 4.216253 |
| Three-Notch | | | 4.650833 |
| G | 343 15 29.05 | 163 20 00.91 | 4.686601 |
| Brady | 36 33 01.02 | 216 26 29.03 | 4.528220 |
| Cow Gap | 80 19 12.33 | 260 13 22.87 | 4.257128 |
| Cabaniss | 203 18 12.17 | 23 24 12.92 | 4.663016 |
| Limekiln | | | 4.869130 |

COW GAP.

On ridge between Colorado River and Brady Creek, and about $1\frac{1}{2}$ miles west of Cow Gap. Road from Brady to Coleman goes through Cow Gap.

Permanent mark: Stone with letters U. S. G. S. cut on it and cross marking center of station.

[Latitude, $31^{\circ} 14' 48''$.17. Longitude, $99^{\circ} 24' 53''$.81.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Brady | 5 18 28.42 | 185 17 44.81 | 4.383405 |
| Mason Mountain | | | 4.678370 |
| G | | | 4.731524 |
| Santa Anna | 190 30 11.66 | 10 33 35.14 | 4.749595 |
| Union Gap | 260 13 22.87 | 80 19 12.33 | 4.257128 |

ANTELOPE.

On west edge of hill, about 17 miles east of Brady; about one-fourth mile east of northeast corner of large pasture and about 200 yards from fence.

Permanent mark: Stone marked U. S. G. S., '86, center of station.

[Latitude, $31^{\circ} 13' 05''$.49. Longitude, $99^{\circ} 04' 04''$.69.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Three-Notch | 336 57 33.99 | 157 01 39.00 | 4.507636 |
| G | 1 50 34.37 | 181 50 09.19 | 4.605837 |
| Mason Mountain | | | 4.632739 |
| Santa Anna | | | 4.796952 |
| Union Gap | 112 14 30.64 | 292 09 32.02 | 4.216253 |

BALLINGER.

The cupola of the court-house in Ballinger, the county seat of Runnels Co., Tex. Not occupied.

Permanent mark: Cupola.

[Latitude, $31^{\circ} 44' 24''$. Longitude, $99^{\circ} 56' 40''$.24]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Table Gap | 206 05 26.44 | 26 10 35.80 | 4.543438 |
| Bradley | 251 36 26.97 | 71 44 28.49 | 4.403896 |

BRADY.

In McCulloch Co., Tex., on ridge about 10 miles southwest of Brady; about 4 miles south of Brady and Menardville road, at point about 8 miles from Brady.

Permanent mark: Stone marked with cross and letters U. S. G. S. in center of station.

[Latitude, $31^{\circ} 01' 46''$. Longitude, $99^{\circ} 26' 18''$.14.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| G | 299 33 56.26 | 119 44 56.77 | 4.593743 |
| Mason Mountain .. | | | 4.462056 |
| Onion Gap | 216 26 29.03 | 36 33 01.02 | 4.528220 |
| Cow Gap | 185 17 44.81 | 5 18 28.42 | 4.383405 |

MASON MOUNTAIN.

In Mason Co., Tex., on southeastern part of highest ridge of Mason Mountain, about 1 mile east of Mason and Camp San Saba road, and 5 miles south of Katemcy.

Permanent mark: Stone marked U. S. G. S. '86 and a cross. Distance to station 21 feet, bearing S. 20° W.

[Latitude, $30^{\circ} 51' 08''$. Longitude, $99^{\circ} 12' 55''$.59.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| G | 268 57 35.23 | 89 01 42.45 | 4.107561 |
| Blue Mountain ... | 34 14 49.22 | 214 07 56.84 | 4.582486 |
| Brady | | | 4.462056 |
| Antelope | | | 4.632739 |
| Cow Gap | | | 4.678370 |

G.

In Mason Co., Tex., on a hill 3 miles west of the fourteenth mile post, Mason and Pontotoc road. The mile post is in the Fly Gap.

Permanent mark: A large stone marked with a cross and the letters U. S. G. S., '86 G. Distance to station 5 feet; bearing to station S. 70° W.

[Latitude, 30° 51' 15''-96. Longitude, 99° 04' 53''-53.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Three Notch..... | 232 | 21 | 37.76 | 52 | 26 | 06.56 | 4.2441230 |
| Blue Mountain... | 47 | 13 | 14.22 | 227 | 02 | 15.64 | 4.6704320 |
| House Mountain... | 331 | 43 | 49.69 | 151 | 48 | 48.79 | 4.5176159 |
| B..... | 252 | 05 | 48.25 | 72 | 12 | 02.82 | 4.3088710 |
| Brady..... | 119 | 44 | 56.77 | 299 | 33 | 56.26 | 4.5937430 |
| Antelope..... | 181 | 50 | 09.19 | 1 | 50 | 34.37 | 4.6058370 |
| Onion Gap..... | 163 | 20 | 00.91 | 343 | 15 | 29.05 | 4.6866010 |
| Cow Gap..... | | | | | | | 4.7315240 |
| Mason Mountain.. | 89 | 01 | 42.45 | 268 | 57 | 35.23 | 4.1075610 |

THREE NOTCH.

In Llano Co., Tex., about a mile west of the head of Cold Creek on a round-topped hill.

Permanent mark: U. S. G. S. cut on southernmost of 2 connected stumps. Distance to station 12.6 feet, bearing S. 27° W.

[Latitude, 30° 57' 03''-57. Longitude, 98° 56' 10''-14.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| B..... | 309 | 08 | 42.88 | 129 | 10 | 28.96 | 3.849179 |
| Antelope..... | 157 | 01 | 39.00 | 336 | 57 | 33.99 | 4.507636 |
| Onion Gap..... | | | | | | | 4.656833 |
| G..... | 52 | 26 | 06.56 | 232 | 21 | 37.76 | 4.244123 |

B.

In northwest corner of Llano Co., Tex., on a light-colored gravelly hill, 16½ miles northwest of Llano, and 4 miles northeast of Smoothing-iron Mountain. "The lone oak" is one-fourth of a mile west. There are a few live oak and mesquite trees on the hill. Station is on the highest part of the hill. No trees near the station.

Permanent mark: Stone marked with a cross and U. S. G. S. 1885.

[Latitude, 30° 54' 38''-67. Longitude, 98° 52' 43''-77.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Riley Mountain... | 315 | 37 | 11.34 | 135 | 45 | 35.78 | 4.574120 |
| Long Mountain... | 271 | 24 | 49.85 | 91 | 41 | 33.62 | 4.715322 |
| Three Notch..... | 129 | 10 | 28.96 | 309 | 08 | 42.88 | 3.849179 |
| G..... | 72 | 12 | 02.82 | 252 | 05 | 48.25 | 4.308871 |

D.

In San Saba Co., Tex. A light-colored gravelly hill, about 3 miles west from the twelfth-mile post from San Saba court-house, on the San Saba and Bluffton road north of Cherokee Creek.

Permanent mark: Cross and U. S. G. S. cut in rock, 20 feet N. 44° 14' E. from center of station.

[Latitude, $31^{\circ} 04' 09''$.8. Longitude, $98^{\circ} 39' 45''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Waters Mountain. | 265 14 30.3 | 85 24 27.9 | 4.488397 |

WATERS MOUNTAIN.

In Lampasas Co., Tex., the southernmost of the knobs northwest of Lampasas; about one-half a mile from the tenth mile post from Lampasas. Local name, Waters or Green Mountain.

Permanent mark: Cross and U. S. G. S. cut in the rock 9.4 feet N. $22^{\circ} 43'$ E. from the signal tree.

[Latitude, $31^{\circ} 05' 31''$.20. Longitude, $98^{\circ} 20' 27''$.60.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bunker Hill | 344 42 40.22 | 164 44 09.88 | 4.243485 |
| Long Mountain... | 358 42 56.30 | 178 43 05.65 | 4.332659 |
| Bachelor Peak ... | 294 42 22.21 | 114 49 58.90 | 4.412687 |
| Taylor Mountain. | 271 41 38.29 | 91 53 21.78 | 4.557870 |
| D | 85 24 27.90 | 265 14 30.30 | 4.488397 |

BUNKER HILL.

In Burnet Co., Tex., about 200 yards west of the Burnet and San Saba road on the divide near the fourteenth mile post from Burnet. Instrument elevated 16 feet.

Permanent mark: Stone marked with a cross and U. S. G. S., N. 48° 46' E., and distant 7.75 feet from station.

[Latitude, $30^{\circ} 56' 22''$.45. Longitude, $98^{\circ} 17' 33''$.60.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Long Mountain... | 41 56 43.81 | 221 55 23.73 | 3.791851 |
| Waters Mountain | 164 44 09.88 | 344 42 40.22 | 4.243485 |
| Bachelor Peak.... | 252 08 57.18 | 72 15 03.33 | 4.297415 |

LONG MOUNTAIN.

In Llano Co., Tex., a cedar-covered hill 4 miles west of the thirteenth mile post from Burnet, on the Burnet and San Saba road. Station is near the northeast side of the hill. Local name is Long or Biñon Mountain. Instrument elevated 20 feet.

Permanent mark: Stone buried even with surface of ground, marked with a cross and U. S. G. S., S. $51^{\circ} 36'$ E., and distant 5.8 feet from the station.

[Latitude, $30^{\circ} 53' 52''$. Longitude, $98^{\circ} 20' 09''$. 43.]

| To station. | Azimuth. | | | Back azimuth. | | | Log dist. |
|-------------------|----------|----|-------|---------------|----|-------|-----------|
| | ° | ' | " | ° | ' | " | Meters. |
| B..... | 91 | 41 | 33.62 | 271 | 24 | 49.85 | 4.715322 |
| Bunker Hill..... | 221 | 55 | 23.73 | 41 | 56 | 43.81 | 3.791851 |
| Roper Hill..... | 335 | 44 | 31.90 | 155 | 46 | 33.71 | 4.187025 |
| Riley Mountain .. | 45 | 26 | 18.69 | 225 | 18 | 02.81 | 4.558716 |
| Waters Mountain | 178 | 43 | 05.65 | 358 | 42 | 56.30 | 4.332659 |

BACHELOR PEAK.

In Lampasas Co., Tex.; a small butte about 8 miles south of Lampasas. The Georgetown and Lampasas road runs within one-half mile of the station on the west side. Station is S. $42^{\circ} 56'$ W. and distant 4.7 feet from the stone.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $30^{\circ} 59' 39''$. Longitude, $98^{\circ} 05' 42''$. 00.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Waters Mountain. | 114 | 49 | 58.90 | 294 | 42 | 22.21 | 4.412687 |
| Bunker Hill..... | 72 | 15 | 03.33 | 252 | 08 | 57.18 | 4.297415 |
| Prairie (1)..... | 320 | 09 | 31.40 | 140 | 13 | 42.33 | 4.306436 |
| Taylor Mountain. | 232 | 27 | 26.03 | 52 | 31 | 31.90 | 4.202526 |

HALEY RATLIF.

In Bell Co., Tex.; sometimes called Post Oak Mountain; a large knob, about 5 miles northeast of Florence post-office, covered with large post-oak trees. Land owned by Haley and Ratlif. Station is N. $75^{\circ} 21'$ E. and distant 5 feet from the station. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $30^{\circ} 53' 41''$. Longitude, $97^{\circ} 43' 52''$. 40]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Taylor..... | 133 | 14 | 37.11 | 313 | 07 | 28.36 | 4.481470 |
| Prairie (1)..... | 78 | 20 | 18.60 | 258 | 13 | 17.14 | 4.347953 |
| Morrison Ridge.... | 35 | 14 | 18.03 | 215 | 10 | 47.95 | 4.276423 |
| Haystack..... | 352 | 25 | 49.56 | 172 | 27 | 17.37 | 4.540935 |
| Ivy Gap..... | 146 | 29 | 23.10 | 326 | 25 | 08.21 | 4.376100 |
| Temple..... | 239 | 03 | 16.05 | 59 | 15 | 24.11 | 4.640355 |
| Hulsey..... | 197 | 34 | 20.51 | 17 | 37 | 02.71 | 4.441289 |

PRAIRIE (1).

In Burnet Co., Tex., on a high part of the prairie about 6 miles north from where the Bertram and Florence road crosses the San Gabriel River.

Permanent mark: Stone, marked with a cross and U. S. G. S. '85, buried a few inches under ground.

[Latitude, 30° 51' 14''·17. Longitude, 97° 57' 33''·71.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Taylor..... | 179 18 45·57 | 359 18 39·69 | 4·402518 |
| Bachelor Peak.... | 140 13 42·33 | 320 09 31·40 | 4·306436 |
| Haley Ratlif..... | 258 13 17·14 | 78 20 18·60 | 4·347953 |
| Morrison Ridge... | 314 55 06·15 | 134 58 36·80 | 4·188928 |

CORN HILL.

In Williamson Co., Tex., on the open prairie, 800 feet west of Corn Hill post-office, 335 feet south of a barbed wire fence.

Permanent mark: Stone, marked with a cross and U. S. G. S., buried about 2 inches under ground.

[Latitude, 30° 47' 16''·37. Longitude, 97° 37' 15''·18.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Haystack..... | 14 53 09·21 | 194 51 14·17 | 4·368848 |
| Beaver Hill..... | 328 54 38·69 | 148 56 22·30 | 4·018871 |

MORRISON RIDGE.

In Williamson Co., Tex., about 8 miles northeast of Liberty Hill post-office—sometimes called Long Knob Station—on the west side, near the north end, and on about the highest part of the ridge; about 500 yards south from a well on the west side of the ridge. Land owned by J. C. Morrison. Signal stands near a post-oak tree, which has some limbs cut off on the east side.

Permanent mark: Stone marked with a cross and U. S. G. S. The station is S. 56° 40' W. of stone and distant 5·05 feet.

[Latitude, 30° 45' 19''·74. Longitude, 97° 50' 42''·37.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Haley Ratlif..... | 215 10 47·95 | 35 14 18·03 | 4·276423 |
| Prairie (1)..... | 134 58 36·80 | 314 55 06·15 | 4·188928 |
| Beaver Hill..... | 281 11 53·88 | 101 20 29·93 | 4·437658 |
| Haystack..... | 320 47 00·77 | 140 51 57·52 | 4·389458 |

BEAVER HILL.

In Williamson Co., Tex., is a low, wooded hill about 8 miles northeast of Georgetown. Land owned by Henry Beach. About 400 yards east of "the tree in the gap;" west side of the hill.

Permanent mark: Stone marked with a cross and U. S. G. S., buried S. $71^{\circ} 35'$ E. 3.9 feet from center of station.

[Latitude, $30^{\circ} 42' 25''$.88. Longitude, $97^{\circ} 33' 52''$.51.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Morrison Ridge..... | 101 | 20 | 29.93 | 281 | 11 | 53.88 | 4.437658 |
| Corn Hill..... | 148 | 56 | 22.30 | 328 | 54 | 38.69 | 4.018871 |
| Haystack..... | 39 | 53 | 27.95 | 219 | 49 | 49.74 | 4.250056 |
| Yegua..... | 318 | 12 | 10.83 | 138 | 23 | 37.64 | 4.733921 |

HAYSTACK.

In Williamson Co., Tex., on a bare hill about 3 miles south of Georgetown, about one-half mile east of the Georgetown and Round Rock road.

Permanent mark: Stone marked with a cross and U. S. G. S., buried under center of station.

[Latitude, $30^{\circ} 35' 02''$.56. Longitude, $97^{\circ} 41' 00''$.60.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Beaver Hill..... | 219 | 49 | 49.74 | 39 | 53 | 27.95 | 4.250056 |
| Morrison Ridge..... | 140 | 51 | 57.52 | 320 | 47 | 00.77 | 4.389458 |
| Corn Hill..... | 194 | 51 | 14.17 | 14 | 53 | 09.21 | 4.368848 |
| Haley Ratliff..... | 172 | 27 | 17.37 | 352 | 25 | 49.56 | 4.540935 |
| Yegua..... | 299 | 19 | 02.35 | 119 | 34 | 04.94 | 4.736638 |
| P. K. N..... | 7 | 05 | 23.23 | 187 | 04 | 49.19 | 4.161075 |

P. K. N.

In Travis Co., Tex.; on south end of hill known as Pilot Knob, about one mile northwest of Merrittown; about three-fourths of a mile east of junction of the International and Great Northern and Austin and Northwestern railroads, which cross on land owned by W. G. McIntyre.

Permanent mark: Stone marked P. K. N., cross, and U. S. G. S.

[Latitude, $30^{\circ} 27' 15''$.59. Longitude, $97^{\circ} 42' 07''$.64.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Haystack..... | 187 | 04 | 49.19 | 7 | 05 | 23.23 | 4.161075 |
| Yegua..... | 284 | 00 | 55.12 | 104 | 16 | 29.89 | 4.706342 |
| Texas Hill..... | 335 | 06 | 04.26 | 155 | 11 | 05.98 | 4.579975 |
| Lone Tree..... | 34 | 45 | 45.97 | 214 | 42 | 32.58 | 4.253165 |

YEGUA.

In Lee Co., Tex.; is the most northerly of the Yegua knobs, $4\frac{1}{4}$ miles northeast of McDade, about 17 feet from the highest part of the hill.

Permanent mark: U. S. G. S. '84 and \triangle cut in the rock 17 feet N. $1^{\circ} 15'$ E. from station.

[Latitude, $30^{\circ} 20' 31''$.99. Longitude, $97^{\circ} 11' 20''$.30.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Haystack..... | 119 34 04.94 | 290 19 02.35 | 4.736688 |
| Beaver Hill..... | 138 23 37.64 | 318 12 10.83 | 4.733921 |
| Bastrop Hill..... | 26 03 16.94 | 205 59 37.89 | 4.423428 |
| Texas Hill..... | 56 38 14.43 | 236 27 45.20 | 4.602419 |
| P. K. N. | 104 16 29.89 | 284 00 55.12 | 4.706342 |

BASTROP HILL.

In Bastrop Co., Tex., about 1 mile northeast of Bastrop court-house, on the westernmost of the Copperas Mountains.

Permanent mark: None.

[Latitude, $30^{\circ} 07' 38''$.3. Longitude, $97^{\circ} 18' 35''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Yegua..... | 205 59 37.89 | 26 03 16.94 | 4.423428 |
| Lone Tree..... | 114 17 16.68 | 294 02 13.28 | 4.720986 |

TEXAS HILL.

A bare, round-topped, gravelly hill, in Travis Co., Tex., about 1 mile south of Garfield post-office, about 15 miles from Austin and one-half mile north of the Upper Bastrop road; station on highest part of hill.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $30^{\circ} 08' 35''$.36. Longitude, $97^{\circ} 32' 09''$.60.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lone Tree..... | 127 05 50.40 | 306 57 36.79 | 4.516350 |
| Yegua..... | 236 27 45.20 | 56 38 14.43 | 4.602419 |
| P. K. N. | 155 11 05.98 | 335 06 04.26 | 4.579975 |
| Pilot Knob..... | 95 53 52.16 | 275 48 45.17 | 4.215966 |
| Bald Knob..... | 166 18 28.08 | 346 16 50.41 | 4.340159 |
| Cedar Hill..... | 97 23 15.39 | 277 10 42.36 | 4.606632 |

EAST BASE HILL.

In Travis Co., Tex., on the east side of Onion Creek; a round-topped hill, about 130 feet above low water in the creek, about 1,380 feet east of East Base. The base line was extended by triangulation to this station. The line East Base Hill—West Base, is the line used as a base in the work around Austin. Instrument elevated 20 feet.

Permanent mark: Large stone, buried even with the surface of the ground and marked with the letters U. S. G. S. and copper bolt.

[Latitude, 30° 11' 48''-34. Longitude, 97° 36' 32''-72.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| East Base..... | 94 37 26.11 | ..... | 2.625607 |
| West Base..... | 94 37 26.11 | 274 34 12.90 | 4.013135 |
| Pilot Knob..... | 65 24 59.85 | 245 22 04.88 | 4.010423 |
| Bald Knob..... | 186 52 39.94 | 6 53 14.81 | 4.188397 |
| Land Office..... | 124 13 40.65 | 304 09 49.00 | 4.172615 |

BALD KNOB.

A round, bare, grassy knob in Travis Co., Tex., near the 11-mile board from Austin, on the Austin and Manor road, between the wagon road and the railroad, about 3 miles from Manor station and on the highest part of the hill.

Permanent mark: Stone marked with a cross.

[Latitude, 30° 20' 05''-87. Longitude, 97° 35' 23''-54.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Texas Hill..... | 346 16 50.41 | 166 18 28.08 | 4.340159 |
| Pilot..... | 29 41 42.49 | 209 38 12.31 | 4.352942 |
| East Base Hill.... | 6 53 14.81 | 186 52 39.94 | 4.188397 |

LAND OFFICE.

In Travis Co., Tex., on the peak of the roof of the land office at Austin, on the south end and just north of the north chimney.

Permanent mark: None.

[Latitude, 30° 16' 19''-93. Longitude, 97° 44' 13''-02.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| East Base Hill... | 304 09 49.0 | 124 13 40.65 | 4.172615 |

LONE TREE (1).

A flat-topped hill on the south side of the Colorado River, in Travis Co., Tex., about 5 miles northwest from Austin and about 2½ miles west from Mount Bonnell. All the large trees except one have been cut from the hill. Wood road leading to Austin passes the hill on the south side.

Permanent mark: A 2 by 4 joist spiked to the roots of a tree which

bears S. 15° W. from the center of the station, 8.7 feet distant; has a Δ cut on it.

[Latitude, 30° 19' 17''-54. Longitude, 97° 48' 29''-95.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| P. K. N..... | 214 | 42 | 32.58 | 34 | 45 | 45.97 | 4.253165 |
| Cedar Hill..... | 43 | 26 | 06.50 | 223 | 21 | 45.40 | 4.304545 |
| Bastrop Hill..... | 294 | 02 | 13.28 | 114 | 17 | 16.68 | 4.720986 |
| Shingle..... | 85 | 55 | 23.58 | 265 | 46 | 44.41 | 4.440203 |
| Boultinghouse..... | 134 | 33 | 55.67 | 314 | 25 | 23.96 | 4.577263 |
| Pilot Knob..... | 331 | 21 | 57.91 | 151 | 25 | 03.82 | 4.314154 |
| Texas Hill..... | 306 | 57 | 36.79 | 127 | 05 | 50.40 | 4.516350 |

WEST BASE.

In Travis Co., Tex., about 5 miles southeast of Austin, in the north corner of a field belonging to T. P. Givens, and about 100 feet south of his house. Instrument elevated 20 feet.

Permanent mark: Large stone buried 6 inches under the surface, 5 feet from fence, marked U. S. G. S., W. B.; center is a copper bolt marked with a cross.

[Latitude, 30° 12' 15''-17. Longitude, 97° 42' 56''-82.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pilot Knob..... | 349 | 16 | 42.70 | 169 | 17 | 00.81 | 3.714471 |
| East Base Hill.... | 274 | 34 | 12.90 | 94 | 37 | 26.11 | 4.013135 |

PILOT KNOB.

In Travis Co., Tex.; it is the south one of two bare hills known as the Pilot Knobs, about 8 miles south of Austin, on land owned by William (or "Wildcat") Jones.

Permanent mark: Stone monument, about 4 feet high and 5 feet in diameter at the base.

[Latitude, 30° 09' 29''-83. Longitude, 97° 42' 20''-80.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Bald Knob..... | 200 | 38 | 12.31 | 29 | 41 | 42.49 | 4.352942 |
| Texas Hill..... | 275 | 48 | 45.17 | 95 | 53 | 52.16 | 4.215966 |
| Lone Tree..... | 151 | 25 | 03.82 | 331 | 21 | 57.91 | 4.314154 |
| East Base Hill.... | 245 | 22 | 04.88 | 65 | 24 | 59.85 | 4.010423 |
| West Base..... | 169 | 17 | 00.81 | 349 | 16 | 42.70 | 3.714471 |

CEDAR HILL.

In Travis Co., Tex., about 14 miles west of Austin and 2 miles south of Cedar Valley post-office on a wooded hill. Station is on the part of the hill owned by Mr. Fred Willis, and is about the center of the hill. Instrument elevated 31 feet.

Permanent mark: Stone marked Cedar Hill with a cross and U. S. G. S.

[Latitude, $30^{\circ} 11' 21''$.78. Longitude, $97^{\circ} 57' 08''$.14.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shingle..... | 132 52 43.30 | 312 48 26.18 | 4.269803 |
| Lone Man | 46 00 13.41 | 225 56 10.94 | 4.254805 |
| Texas Hill..... | 277 10 42.36 | 97 23 15.39 | 4.606632 |
| Lone Tree (1) | 223 21 45.40 | 43 26 06.50 | 4.304545 |

LONE MAN.

In Hays Co., Tex. A small peak 8 miles south of Dripping Springs near the intersection of the Dripping Springs and San Marcos, and the Blanco and Kyle roads. Local name, Lone Man. Station is N. $23^{\circ} 49'$ E., and distant 4.9 feet from stone.

Permanent mark: Stone marked with a cross and U. S. G. S., 1884.

[Latitude, $30^{\circ} 04' 35''$.92. Longitude, $98^{\circ} 05' 11''$.12.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Twin Sisters..... | 72 53 46.00 | 287 6 53.99 | 4.254805 |
| Cedar Hill..... | 225 56 10.94 | 46 00 13.41 | 4.254805 |
| Shingle..... | 178 19 44.98 | 358 19 31.17 | 4.400782 |

TWIN SISTERS.

In Blanco Co., Tex., the westernmost of two buttes, near Twin Sisters post-office, $6\frac{1}{2}$ miles south of Blanco.

Permanent mark: Stone marked with a cross.

[Latitude, $29^{\circ} 58' 48''$.7. Longitude, $98^{\circ} 26' 40''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shovel Mountain | 20 31 35 | 159 28 25 | 4.737288 |
| Lone Man | 72 53 46 | 287 6 53 | |

SHINGLE.

In Hays Co., Tex. A butte at the west end of Shingle Mountain. The station is near the northwest side of the butte. The Cedar Valley and Round Mountain post-office road runs one-fourth mile east of the station.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $30^{\circ} 18' 12''$.80. Longitude, $98^{\circ} 05' 38''$.58.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Boultinghouse.... | 181 00 01.81 | 1 00 11.26 | 4.454476 |
| Shovel | 136 22 15.20 | 316 17 38.36 | 4.325789 |
| Round Mountain .. | 122 27 42.08 | 302 19 26.84 | 4.490882 |
| E..... | 70 01 39.76 | 255 51 07.67 | 4.538560 |
| Lone Man | 358 19 31.17 | 178 19 44.98 | 4.400782 |
| Lone Tree | 265 46 44.41 | 85 55 23.58 | 4.440203 |
| Cedar Hill..... | 312 48 26.18 | 132 52 43.30 | 4.269803 |

E.

In Blanco Co., Tex., on a high, round-topped bare hill, about 4 miles south of Johnson City, south side of the Austin and Fredericksburg road.

Permanent mark: Stone marked with a cross and U. S. G. S. '85.

[Latitude, 30° 13' 40''-14. Longitude, 98° 26' 32''-70.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Shingle..... | 255 | 51 | 07.67 | 76 | 01 | 39.76 | 4.538560 |
| Round Mountain.. | 196 | 21 | 14.29 | 16 | 23 | 33.12 | 4.415656 |

SHOVEL.

In Blanco Co., Tex., a high flat-topped butte 6 miles east of Round Mountain post-office, in a pasture owned by Abling Brothers. Local name is Shovel Mountain. Station is S. 58° 33' E., and distant 9 feet from the mark.

Permanent mark: Stone marked with a cross and U. S. G. S. 1885.

[Latitude, 30° 26' 30''-19. Longitude, 98° 14' 46''-10.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|-------|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Boultinghouse.... | 228 | 53 | 35.34 | 48 | 58 | 22.71 | 4.301581 |
| Shingle..... | 316 | 17 | 38.36 | 136 | 22 | 15.20 | 4.325789 |
| Twin Sisters..... | 20 | 31 | 35.00 | ..... | ..... | ..... | 4.737288 |

BOULTINGHOUSE.

In Burnet Co., Tex., on point of ridge facing west about 3 miles from the Colorado river, 37 miles from Austin on the old Austin and Burnet road, on land owned by Mr. Boultinghouse.

Permanent mark: U. S. G. S. cut in rock near station. Center marked by a duplicate + cut in rock about 4 feet from letters.

[Latitude, 30° 33' 37''-40. Longitude, 98° 05' 19''-93.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Round Mountain.. | 66 | 00 | 29.96 | 245 | 52 | 03.36 | 4.464533 |
| Roper Hill..... | 143 | 29 | 41.31 | 323 | 24 | 08.85 | 4.464468 |
| Shovel..... | 48 | 58 | 22.71 | 228 | 53 | 35.34 | 4.301581 |
| Lone Tree..... | 314 | 25 | 23.96 | 134 | 33 | 55.67 | 4.377263 |
| Shingle..... | 1 | 00 | 11.26 | 181 | 00 | 01.81 | 4.454476 |

ROUND MOUNTAIN.

In Blanco Co., Tex., a small, round knob 3 miles northwest of Round Mountain post-office. Local name Round Mountain. Station is N. 84° 36' E., distant 6.3 feet from the mark.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $30^{\circ} 27' 11''$.52. Longitude, $98^{\circ} 21' 57''$.88.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Roper Hill..... | 194 36 57.44 | 14 39 53.69 | 4.561987 |
| E | 16 23 33.12 | 196 21 14.29 | 4.415656 |
| Bell Mountain.... | 88 49 41.39 | 268 39 01.71 | 4.527442 |
| Riley Mountain.... | 136 13 37.04 | 316 06 19.54 | 4.519961 |
| Shingle..... | 302 19 26.84 | 122 27 42.08 | 4.490882 |
| Boultinghouse.... | 245 52 03.36 | 66 00 29.96 | 4.464533 |

ROPER HILL.

In Burnet Co., Tex., on a ridge about 3 miles west of Burnet. The Burnet and Llano road passes near foot of the ridge, distant about one-half mile from the station. Station is near a live oak tree which has had most of the limbs cut off. On highest part of the ridge. There is an old stone quarry about one-half mile from station toward Burnet. Instrument elevated 16 feet. Station is S. $76^{\circ} 41'$ W. from stone, distant 5.15 feet.

Permanent mark: Stone marked with a cross and U. S. G. S., 1885.

[Latitude, $30^{\circ} 46' 17''$.52. Longitude, $98^{\circ} 16' 11''$.78.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Riley Mountain .. | 70 31 31.88 | 250 21 15.52 | 4.532351 |
| Long Mountain.... | 155 46 33.71 | 335 44 31.90 | 4.487025 |
| Boultinghouse.... | 323 24 08.85 | 143 29 41.31 | 4.464468 |
| Round Mountain .. | 14 39 53.69 | 194 36 57.44 | 4.561987 |

RILEY MOUNTAIN.

In Llano Co., Tex., on the highest knob near the northeastern end of Riley Mountain, sometimes called Dancer Peak.

Permanent mark: A cross and U. S. G. S. '85 is cut in the rock, N. $7^{\circ} 52'$ E., and distant 13 feet from station.

[Latitude, $30^{\circ} 40' 07''$.12. Longitude, $98^{\circ} 36' 18''$.32.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Long Mountain.... | 225 18 02.81 | 45 26 18.69 | 4.558716 |
| E | 135 45 35.78 | 315 37 11.34 | 4.574120 |
| Bell Mountain.... | 23 31 49.39 | 203 28 25.11 | 4.428989 |
| House | 74 26 52.76 | 254 17 17.14 | 4.494748 |
| Roper Hill..... | 250 21 15.52 | 70 31 31.88 | 4.532351 |
| Round Mountain .. | 316 06 19.54 | 136 13 37.04 | 4.519961 |

BELL MOUNTAIN.

A high, bare hill, in Gillespie Co., Tex., about 5 miles northwest of Hudson mound. The station is about fifty feet from eastern edge of the hill. Sometimes called Not Mountain.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 30° 26' 47''-45. Longitude, 98° 43' 00''-12.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| House Mountain.. | 129 | 54 | 48·84 | 309 | 48 | 40·15 | 4·402872 |
| Round..... | 268 | 39 | 01·71 | 88 | 49 | 41·39 | 4·527442 |
| Riley Mountain .. | 203 | 28 | 25·11 | 23 | 31 | 49·39 | 4·428989 |

HOUSE MOUNTAIN.

A flat-topped granite butte in Llano Co., Tex., about 20 miles southwest of Llano court-house. Station is near the north edge of the butte and on the highest part.

Permanent mark: Cross and U. S. G. S. cut in the highest rock on the mountain S. 0° 32' W. and 20 feet from center.

[Latitude, 30° 35' 33''-74. Longitude, 98° 55' 08''-09.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Bell Mountain.... | 309 | 48 | 40·15 | 129 | 54 | 48·84 | 4·4028720 |
| Riley Mountain .. | 254 | 17 | 17·14 | 74 | 26 | 52·76 | 4·4947480 |
| Blue Mountain ... | 86 | 52 | 49·54 | 266 | 36 | 55·66 | 4·6993160 |
| G..... | 151 | 48 | 48·79 | 331 | 43 | 49·69 | 4·5176159 |

BLUE MOUNTAIN.

In Kimble Co., Tex., on highest knob of Blue Mountain, 5 miles south of Llano River and about 20 miles west of Mason.

Permanent mark: Stone marked U. S. G. S. 86 and cross. Distance to center, 8·5 feet, bearing N. 29° W.

[Latitude, 30° 34' 01''-56. Longitude, 99° 26' 23''-08.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| House Mountain.. | 266 | 36 | 55·66 | 86 | 52 | 49·54 | 4·699316 |
| G..... | 227 | 02 | 15·64 | 47 | 13 | 14·22 | 4·670432 |
| Mason Mountain.. | 214 | 07 | 56·84 | 34 | 14 | 49·22 | 4·582486 |

PEAK.

In Menard Co., Tex. (not occupied), on the eastern of two peaks in the southeast part of the Los Meras ranch, about one-half mile from the eastern fence, in a large cattle pasture.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 30° 45' 21''-64. Longitude, 99° 41' 42''-07.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Cactus..... | 106 | 30 | 10·20 | 286 | 23 | 01·26 | 4·366105 |
| Maddox | 168 | 27 | 17·84 | 348 | 24 | 59·09 | 4·553546 |

RUNGE.

In Menard Co., Tex. (not occupied), in the Los Meras ranch and about 4 miles south of Menardville, about 3 miles a little north of east from Mr. Runge's residence, on the highest point of, and near the northern edge of the ridge. A large live-oak tree was cut down about 100 yards southeast of signal.

Permanent mark: None.

[Latitude, $30^{\circ} 51' 35''$.49. Longitude, $99^{\circ} 46' 26''$.47.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cactus..... | 71 29 36.59 | 251 24 52.78 | 4.190867 |
| Mustang..... | 143 09 04.19 | 323 04 09.03 | 4.404422 |
| Sumac..... | 14 15 17.35 | 194 14 01.99 | 4.201578 |

MUSTANG.

In Menard Co., Tex., about 1 mile southeast from Mr. Sim's wind-mill on the Eden and McKavett road and about 12 miles from Eden. About three-fourths of a mile east of Niggers Gap. All timber cleared away except one mesquite tree.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 02' 34''$.52. Longitude, $99^{\circ} 56' 00''$.35.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Molloy..... | 195 07 13.69 | 15 09 37.94 | 4.451199 |
| Maddox..... | 258 13 42.43 | 78 18 45.89 | 4.202166 |
| Runge..... | 323 04 09.03 | 143 09 04.19 | 4.404422 |
| Cactus..... | 358 46 46.34 | 178 46 56.74 | 4.402042 |
| Burbank..... | 26 27 14.28 | 206 22 40.11 | 4.503129 |
| First..... | 45 32 32.77 | 225 27 24.49 | 4.348071 |
| Flower..... | 111 01 21.08 | 290 56 37.72 | 4.192866 |

BONES.

In Menard Co., Tex., near the McCullough line, about 3 miles north of the Menardville and Brady road, at a point about 8 miles from Menardville, in the southeast corner of Maddox's pasture, on the highest and most northern of three high points.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 00' 31''$.31. Longitude, $99^{\circ} 39' 17''$.61.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Maddox..... | 122 38 16.96 | 302 34 43.21 | 4.115598 |
| Live Oak..... | 179 28 59.53 | 359 28 54.07 | 4.490477 |

MADDOX.

In Menard Co., Tex., in a pasture owned by Mr. Maddox, of Austin, 2 or 3 miles south of the Concho line, about $2\frac{1}{2}$ miles east of Eden and Menardville road, and 1 mile a little south of east of the ranch house, about one-fourth of a mile south of the road between Mr. Maddox's two ranches; 9 miles from Eden to Maddox's gate. Instrument elevated 24 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $31^{\circ} 04' 19''$.66. Longitude, $99^{\circ} 46' 12''$.14.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Molloy | 161 | 12 | 01.55 | 341 | 09 | 21.32 | 4.404850 |
| Live Oak | 204 | 04 | 49.90 | 24 | 08 | 19.05 | 4.418098 |
| Bones | 302 | 34 | 43.21 | 122 | 38 | 16.96 | 4.4115598 |
| Peak | 348 | 24 | 59.09 | 168 | 27 | 17.84 | 4.553546 |
| Mustang | 78 | 18 | 45.89 | 258 | 13 | 42.43 | 4.202166 |
| Cactus | 27 | 56 | 45.59 | 207 | 51 | 53.53 | 4.508065 |

FIRST.

In Menard Co., Tex., on western side of the county and about 4 miles a little east of north from Fort McKavett, on the most western of three prominent knolls.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $30^{\circ} 54' 07''$.25. Longitude, $100^{\circ} 05' 59''$.39.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Burbank | 352 | 19 | 34.91 | 172 | 20 | 08.43 | 4.41146200 |
| Black | 64 | 34 | 04.58 | 244 | 27 | 42.14 | 4.43413280 |
| Cactus | 300 | 14 | 47.14 | 120 | 20 | 04.77 | 4.2799660 |
| Mustang | 225 | 27 | 24.49 | 45 | 32 | 32.77 | 4.43480710 |
| Fort McKavett .. | 5 | 51 | 34.93 | 185 | 51 | 18.87 | 3.9110093 |

BLACK.

In Schleicher Co., Tex., in Mr. Black's pasture, about 12 miles west from Fort McKavett, on high knoll on divide between the north valley and middle valley of the San Saba River. The ranch road running west from Fort McKavett passes about 2 miles north of station.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $30^{\circ} 49' 00''$.64. Longitude, $100^{\circ} 18' 24''$.99.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| First | 244 | 27 | 42.14 | 64 | 34 | 04.58 | 4.4341328 |
| Burbank | 279 | 03 | 49.03 | 99 | 10 | 44.30 | 4.4339168 |
| Decker | 314 | 51 | 25.18 | 134 | 56 | 57.96 | 4.4388314 |
| Riley | 343 | 58 | 50.26 | 164 | 00 | 35.38 | 4.4297740 |

FORT MCKAVETT.

In Menard Co., Tex. Not occupied. Located in 1891. Tower on old building.

[Latitude, 30° 49' 44"-07. Longitude, 100° 06' 30"-69.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| First | 185 | 51 | 18.87 | 5 | 51 | 34.93 | 3.9110093 |
| Burbank | 331 | 49 | 18.89 | 151 | 50 | 08.41 | 3.7359203 |

CACTUS.

In Menard Co., Tex., on the Los Meras ranch, owned by Mr. Runge, about 6 miles a little south of west from Mr. Runge's residence. No other house near. The highest point within 4 or 5 miles, about one-half mile south of a fence. Timber all cleared from summit.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 30° 48' 55"-20. Longitude, 99° 55' 40"-13.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Mustang | 178 | 46 | 56.74 | 358 | 46 | 46.34 | 4.402042 |
| Maddox | 207 | 51 | 53.53 | 27 | 56 | 45.59 | 4.508065 |
| Burbank | 77 | 25 | 55.64 | 257 | 21 | 12.03 | 4.178635 |
| First | 120 | 20 | 04.77 | 300 | 14 | 47.14 | 4.279986 |
| Runge | 251 | 24 | 52.78 | 71 | 29 | 36.59 | 4.190867 |
| Peak | 286 | 23 | 01.26 | 106 | 30 | 10.20 | 4.366105 |
| Deer | 23 | 01 | 11.10 | 202 | 59 | 47.96 | 4.043674 |
| Sumac | 314 | 05 | 23.90 | 134 | 08 | 51.82 | 4.177721 |

DEER.

In Menard Co., Tex. Not occupied. About 4 miles west of the Menardville and Junction City road, where road goes off the divide between Los Meras and Bear creeks, on the highest and most southern of several hills at the head of Los Meras Creek.

Permanent mark: None.

[Latitude, 30° 43' 24"-69. Longitude, 99° 58' 22"-66.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Cactus | 202 | 59 | 47.96 | 23 | 01 | 11.10 | 4.043674 |
| Sumac | 271 | 06 | 26.02 | 91 | 11 | 16.69 | 4.180165 |

SUMAC.

In Menard Co., Tex. Not occupied. In the Los Meras pasture about 3 miles east of Menardville and Junction City road, where it goes off the divide between Los Meras and Bear creeks, about 10 miles from

Mr. Runge's house; south, a little east, about 50 yards from the fence on the west side of the pasture. Platform 15 feet high.

[Latitude, 30° 43' 14"-84. Longitude, 99° 48' 53"-68.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Cactus..... | 134 | 08 | 51.82 | 314 | 05 | 23.90 | 4.177721 |
| Runge..... | 194 | 14 | 01.99 | 14 | 15 | 17.35 | 4.201578 |
| Deer..... | 91 | 11 | 16.69 | 271 | 06 | 26.02 | 4.180165 |

BURBANK.

In Mr. Burbank's north pasture on high knoll in the western side of Menard Co., Tex., about 2 miles southwest of Mr. Burbank's residence and 1 mile east from the McKavett and Pecan Spring road, about 3 miles a little east of south from Fort McKavett.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 30° 47' 08"-23. Longitude, 100° 04' 54"-00.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| First..... | 172 | 20 | 08.43 | 352 | 19 | 34.91 | 4.114620 |
| Cactus..... | 257 | 21 | 12.03 | 77 | 25 | 55.64 | 4.178635 |
| Mustang..... | 206 | 22 | 40.11 | 26 | 27 | 14.28 | 4.503129 |
| Black..... | 99 | 10 | 44.30 | 279 | 03 | 49.03 | 4.339168 |
| Decker..... | 17 | 08 | 51.52 | 197 | 07 | 29.82 | 4.159582 |
| Fort McKavett... | 151 | 50 | 08.41 | 331 | 49 | 18.89 | 3.735920 |

DECKER.

In Sutton Co., Tex., in northeast corner of the county, in a cedar grove about 50 yards south of the McKavett and Pecan Spring road and about 6 miles north from Pecan Spring. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 30° 39' 40"-12. Longitude, 100° 07' 33"-92.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Black..... | 134 | 56 | 57.96 | 314 | 51 | 25.18 | 4.388314 |
| Burbank..... | 197 | 07 | 29.82 | 17 | 08 | 51.52 | 4.159582 |
| Riley..... | 81 | 18 | 41.36 | 261 | 14 | 54.30 | 4.079046 |
| Patterson..... | 342 | 20 | 42.07 | 162 | 23 | 19.67 | 4.435987 |
| Piper..... | 32 | 01 | 19.12 | 211 | 58 | 49.26 | 4.170156 |

RILEY.

In Sutton Co., Tex. Cupola on Mr. John Riley's residence, about 12 miles south of Fort McKavett.

Permanent mark: Cupola.

[Latitude, $30^{\circ} 38' 41''$.06. Longitude, $100^{\circ} 14' 59''$.28.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Black..... | 164 | 00 | 35.38 | 343 | 58 | 50.26 | 4.297740 |
| Decker | 261 | 14 | 54.30 | 81 | 18 | 41.36 | 4.079046 |
| Piper | 339 | 26 | 12.27 | 159 | 27 | 29.13 | 4.059128 |
| Wentworth..... | 22 | 02 | 04.68 | 201 | 59 | 12.26 | 4.382546 |

PIPER.

In Sutton Co., Tex., on highest point on mountain about half a mile west from west side of Mr. John Riley's pasture. Old Fort Terrett road is about one-quarter of a mile east of station; about 2 miles a little east of north from Mr. Adams' windmill. Instrument elevated 16 feet.

[Latitude, $30^{\circ} 32' 52''$.64. Longitude, $100^{\circ} 12' 28''$.28.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Riley | 159 | 27 | 29.13 | 339 | 26 | 12.27 | 4.059128 |
| Decker | 211 | 58 | 49.26 | 32 | 01 | 19.12 | 4.170156 |
| Patterson | 309 | 48 | 45.88 | 129 | 53 | 52.56 | 4.322236 |
| Marshall | 358 | 21 | 16.47 | 178 | 21 | 27.72 | 4.314714 |
| Wentworth..... | 48 | 21 | 10.11 | 228 | 17 | 01.32 | 4.243193 |

WENTWORTH.

Situated in Sutton Co., Tex., on a ridge about 12 miles west from Mr. Wentworth's residence, which is at the head of the running water of the north fork of Llano River, about 2 miles northwest from the 10-mile water hole on North Llano. Several large live-oak trees are near the station. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $30^{\circ} 26' 34''$.59. Longitude, $100^{\circ} 20' 38''$.55.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Piper | 228 | 17 | 01.32 | 48 | 21 | 10.11 | 4.243193 |
| Marshall..... | 303 | 16 | 37.70 | 123 | 20 | 57.04 | 4.214026 |
| Fawn | 341 | 25 | 39.89 | 161 | 27 | 15.90 | 4.202208 |
| Wallace | 28 | 41 | 44.99 | 203 | 38 | 22.92 | 4.347510 |
| Riley | 201 | 59 | 12.26 | 22 | 02 | 04.68 | 4.382546 |

PATTERSON.

Situated in Kimble Co., Tex., on a high prairie knoll near a fence on the eastern side of Mr. Patterson's pasture, and about 3 miles east of his residence, which is near the head of Maynard Creek, about three-quarters of a mile east of old government road between Fort McKavett and Fort Clark.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 30° 25' 35" .59. Longitude, 100° 02' 23" .80.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Piper..... | 129 | 53 | 52.56 | 309 | 48 | 45.88 | 4.322236 |
| Decker..... | 162 | 23 | 19.67 | 342 | 20 | 42.07 | 4.435978 |
| Marshall..... | 65 | 16 | 08.26 | 245 | 11 | 13.66 | 4.233497 |

MARSHALL.

Situated in Sutton Co., Tex., on Messrs. Marsh & Taylor's pasture, about one-quarter of a mile east from the west side of the pasture and about 1 mile south from the north side. It is on a very flat ridge which is the divide between the north and south branches of the Llano River, about 3 miles northwest from Marsh & Taylor's ranch. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 30° 21' 42" .64. Longitude, 100° 12' 06" .09.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Piper..... | 178 | 21 | 27.72 | 358 | 21 | 16.47 | 4.314714 |
| Patterson..... | 245 | 11 | 13.66 | 65 | 16 | 08.26 | 4.233497 |
| Wentworth..... | 123 | 20 | 57.04 | 303 | 16 | 37.70 | 4.214026 |
| Fawn..... | 54 | 40 | 38.91 | 234 | 37 | 55.99 | 4.023819 |
| Harris..... | 354 | 22 | 41.15 | 174 | 23 | 20.95 | 4.333607 |

FAWN.

Situated in Edwards Co., Tex., on ridge about 2 miles west from the west side of Mr. Wentworth's small pasture, which joins Marsh & Taylor's pasture on the east side; about 1 mile northwest of Mr. Runnels' wind-mill; 1 mile south from the Sutton County line. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 30° 18' 24" .18. Longitude, 100° 17' 28" .67.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Wentworth..... | 161 | 27 | 15.90 | 341 | 25 | 39.89 | 4.202208 |
| Marshall..... | 234 | 37 | 55.99 | 54 | 40 | 38.91 | 4.023819 |
| Harris..... | 324 | 59 | 30.77 | 145 | 02 | 52.96 | 4.272445 |
| Fire..... | 353 | 54 | 16.74 | 173 | 55 | 05.88 | 4.391543 |
| Wallace..... | 74 | 20 | 35.25 | 254 | 15 | 37.83 | 4.214082 |

WALLACE.

Situated in Edwards Co., Tex., on a prairie ridge about 4 miles southwest from Mr. Thomas Rand's residence. Road between Mr.

Rand's and Mr. Hagerman's ranches passes about one-half mile north from the station. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $30^{\circ} 16' 00'' \cdot 33$. Longitude, $100^{\circ} 27' 18'' \cdot 40$.]

| To stations. | Azimuth. | | | Back azimuth. | | | Log dist. |
|----------------|----------|----|-------|---------------|----|-------|-----------|
| | ° | ' | " | ° | ' | " | Meters. |
| Wentworth..... | 208 | 38 | 22.92 | 28 | 41 | 44.99 | 4.347516 |
| Fawn..... | 254 | 15 | 37.83 | 70 | 20 | 35.25 | 4.214082 |
| Harris..... | 292 | 18 | 26.48 | 112 | 26 | 45.35 | 4.457398 |
| Fire..... | 317 | 26 | 41.62 | 137 | 32 | 27.16 | 4.434878 |
| Wolf..... | 339 | 10 | 20.77 | 159 | 13 | 03.00 | 4.385990 |

HARRIS.

Situated in Edwards Co., Tex., on a ridge about $1\frac{1}{2}$ miles south of Harris post-office. A grove of live oak trees about 100 yards northwest of station. A thicket of small trees on east and west sides of station. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $30^{\circ} 10' 05'' \cdot 90$. Longitude, $100^{\circ} 10' 47'' \cdot 16$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Wallace..... | 112 | 26 | 45.35 | 292 | 18 | 26.48 | 4.457398 |
| Fawn..... | 145 | 02 | 52.96 | 324 | 59 | 30.77 | 4.272449 |
| Fire..... | 41 | 38 | 46.35 | 221 | 36 | 13.89 | 4.087909 |
| Marshall..... | 174 | 23 | 20.95 | 354 | 22 | 41.18 | 4.333607 |
| Jasper..... | 17 | 26 | 49.69 | 197 | 25 | 04.84 | 4.271688 |

FIRE.

Situated in Edwards Co., Tex., on a live-oak ridge about 4 miles west from McKenzie Lake and Rock Springs road where the road crosses the divide south of McKenzie Lake. Road from McKenzie Lake to Black Water Hole, at a point 5 miles from McKenzie Lake, passes within 200 yards of the station. Instrument elevated 20 feet.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $30^{\circ} 05' 08'' \cdot 67$. Longitude, $100^{\circ} 15' 50'' \cdot 98$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Wallace..... | 137 | 32 | 27.16 | 317 | 26 | 41.62 | 4.434878 |
| Harris..... | 221 | 36 | 13.85 | 41 | 38 | 46.35 | 4.087909 |
| Wolf..... | 74 | 44 | 01.14 | 254 | 40 | 58.45 | 4.005284 |
| Jasper..... | 343 | 42 | 21.79 | 163 | 43 | 09.20 | 3.956438 |
| Fawn..... | 173 | 55 | 05.88 | 353 | 54 | 16.74 | 4.391543 |

WOLF.

Situated in Edwards Co., Tex., on ridge about 2 miles northeast from Mr. Ridley's windmill. Road running west from Rock Spring passes

about 200 yards south of station at a point about 12 miles from Rock Springs. Instrument elevated 20 feet.

Permanent mark: None.

[Latitude, 30° 03' 41"-97. Longitude, 100° 21' 55"-55.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Wallace..... | 159 | 13 | 03.00 | 339 | 10 | 20.77 | 4.385590 |
| Fire..... | 254 | 40 | 58.45 | 74 | 44 | 01.14 | 4.005284 |
| Ellis..... | 17 | 30 | 16.27 | 197 | 27 | 08.69 | 4.526210 |
| Jasper..... | 296 | 00 | 39.14 | 116 | 04 | 29.01 | 4.136582 |
| Holliday..... | 344 | 59 | 04.03 | 165 | 00 | 31.22 | 4.256860 |

JASPER.

Situated in Edwards Co., Tex., on a live-oak ridge about 1 $\frac{3}{4}$ miles west of the town of Rock Springs. Road from Rock Springs to Ford & Holliday's ranch passes one-half mile north of station. Instrument elevated 20 feet.

Permanent mark: None.

[Latitude, 30° 00' 26"-69. Longitude, 100° 14' 16"-28.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Wolf..... | 116 | 04 | 29.01 | 296 | 00 | 39.14 | 4.136582 |
| Fire..... | 163 | 43 | 09.20 | 343 | 42 | 21.79 | 3.956438 |
| Harris..... | 197 | 25 | 04.84 | 17 | 26 | 49.69 | 4.271688 |
| Goode..... | 10 | 00 | 20.52 | 189 | 58 | 46.87 | 4.463488 |
| Holliday..... | 33 | 45 | 04.62 | 213 | 42 | 42.41 | 4.138375 |

HOLLIDAY.

Situated in Edwards Co., Tex., on the highest point on a ridge about 4 miles southwest from Ford & Holliday's ranch. Road from Rock Springs to Blackwater Hole passes about 1 $\frac{1}{2}$ miles north of station, at a point about 10 miles from Rock Springs.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 29° 54' 15"-25. Longitude, 100° 19' 01"-08.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Wolf..... | 165 | 00 | 31.22 | 344 | 59 | 04.03 | 4.256860 |
| Jasper..... | 213 | 42 | 42.41 | 33 | 45 | 04.62 | 4.138375 |
| Reagan..... | 324 | 40 | 48.88 | 144 | 44 | 34.46 | 4.323848 |
| Goode..... | 351 | 23 | 51.59 | 171 | 24 | 39.74 | 4.240302 |
| Ellis..... | 45 | 24 | 39.03 | 225 | 20 | 05.09 | 4.317387 |

ELLIS.

Situated in Edwards Co., Tex., on high point on mountain, about 2 miles a little south of west of Ellis post-office, which is at the residence of Mr. Jerry Ellis.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 29° 46' 21''-43. Longitude, 100° 28' 11''-65.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Wolf..... | 197 | 27 | 08.69 | 17 | 30 | 16.27 | 4.526210 |
| Holliday..... | 225 | 20 | 05.09 | 45 | 24 | 39.03 | 4.317387 |
| Goode..... | 278 | 28 | 33.21 | 98 | 33 | 54.55 | 4.245180 |
| Nueces..... | 320 | 20 | 14.75 | 140 | 24 | 22.67 | 4.324095 |

GOODE.

Situated in Edwards Co., Tex., on a high point on a divide about 7 miles east of Kickapoo Spring, which is on road between Rock Springs and Fort Clark, and about 35 miles from Fort Clark; about 6 miles west of the head of Cedar Creek.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 29° 44' 56''-80. Longitude, 100° 17' 24''-28.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Ellis..... | 98 | 33 | 54.55 | 278 | 28 | 33.21 | 4.245180 |
| Holliday..... | 171 | 24 | 39.74 | 351 | 23 | 51.59 | 4.240302 |
| Jasper..... | 189 | 58 | 46.87 | 10 | 00 | 20.52 | 4.463488 |
| Reagan..... | 270 | 02 | 27.34 | 90 | 05 | 24.35 | 3.981609 |
| Monte..... | 337 | 14 | 57.08 | 157 | 17 | 36.13 | 4.349757 |
| Nueces..... | 16 | 10 | 07.36 | 196 | 08 | 54.57 | 4.152272 |

REAGAN.

Situated in Edwards Co., Tex., on the most eastern of two high cedar-covered knolls; on the south side and near the head of Cedar Creek.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 29° 44' 56''-45. Longitude, 100° 11' 27''-54.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Goode..... | 90 | 05 | 24.35 | 270 | 02 | 27.34 | 3.981609 |
| Holliday..... | 144 | 44 | 34.46 | 324 | 40 | 48.88 | 4.323848 |
| Monte..... | 2 | 38 | 15.53 | 182 | 27 | 58.06 | 4.314879 |
| Nueces..... | 44 | 51 | 22.03 | 224 | 47 | 12.55 | 4.283584 |

NUECES.

Situated in Edwards Co., Tex., on a large lone mountain, about 3 miles north from Mr. Hillcote's ranch (post-office) and about 3 miles south-east from a spring known as Dobbs Run, on the West Nueces River.

[Latitude, 29° 37' 33''-84. Longitude, 100° 9' 51''-26.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Ellis..... | 140 | 24 | 22.67 | 320 | 20 | 14.75 | 4.324095 |
| Goode..... | 196 | 08 | 54.57 | 16 | 10 | 07.36 | 4.152272 |
| Reagan..... | 224 | 47 | 12.55 | 44 | 51 | 22.03 | 4.283584 |
| Monte..... | 299 | 00 | 26.41 | 119 | 04 | 17.74 | 4.158905 |
| Turkey..... | 335 | 14 | 51.52 | 155 | 18 | 51.52 | 4.486057 |
| Anacacho..... | 354 | 54 | 35.34 | 174 | 55 | 54.13 | 4.689033 |
| Las Moras..... | 10 | 25 | 48.29 | 190 | 24 | 08.76 | 4.478883 |

MONTE.

Situated in Edwards Co., Tex., on a sharp peak in the southern part of Edwards County, near the Kinney County line, about $3\frac{1}{2}$ miles north-east of Whistler post-office. The Whistler and Barksdale road passes about 1 mile west of the station.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $29^{\circ} 33' 46''$. Longitude, $100^{\circ} 12' 02''$.84.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Nueces | 119 04 17.74 | 299 00 26.41 | 4.158905 |
| Goode | 157 17 36.13 | 337 14 57.08 | 4.349757 |
| Turkey | 359 28 43.62 | 179 28 47.08 | 4.318473 |
| Reagan | 182 37 53.06 | 2 38 15.53 | 4.314879 |
| Anacacho | 11 17 24.35 | 191 14 53.30 | 4.628365 |
| Las Moras | 38 39 23.45 | 218 33 53.64 | 4.461748 |

TURKEY.

Situated in Kinney Co., Tex., on a lone mountain, about 16 miles a little north of east from Fort Clark. Point is well known.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, $29^{\circ} 22' 30''$. Longitude, $100^{\circ} 11' 55''$.82.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Las Moras | 84 23 45.81 | 264 18 13.51 | 4.263989 |
| Monte | 179 28 47.08 | 359 28 43.62 | 4.318473 |
| Anacacho | 22 11 46.58 | 202 09 12.53 | 4.352677 |
| Nueces | 155 18 45.64 | 335 14 51.52 | 4.486057 |
| Fort Clark | 70 47 06.90 | 250 40 38.65 | 4.354939 |

LAS MORAS.

Situated in Kinney Co., Tex., on a large, lone mountain, known as Las Moras Peak, about 4 miles northeast of Fort Clark.

Permanent mark: Rock cairn.

[Latitude, $29^{\circ} 21' 31''$. Longitude, $100^{\circ} 23' 13''$.43.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Nueces | 190 24 08.76 | 10 25 48.29 | 4.478883 |
| Monte | 218 33 53.64 | 38 39 23.45 | 4.461748 |
| Turkey | 264 18 13.51 | 84 23 45.81 | 4.263989 |
| Anacacho | 332 46 42.24 | 152 49 39.56 | 4.330812 |
| Cline | 305 57 05.70 | 126 04 18.75 | 4.470519 |
| Spoilford | 6 01 17.44 | 136 00 38.68 | 4.310132 |

FORT CLARK.

Situated in Kinney Co., Tex.; not occupied.

Permanent mark: Flagstaff.

[Latitude, 29° 18' 27"-65. Longitude, 100° 25' 38"-14.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Turkey | 250 40 38·65 | 70 47 06·90 | 4·354939 |
| Anacacho | 316 03 08·97 | 136 07 02·20 | 4·269139 |

CLINE.

In Kinney Co., Tex., on the southeast side of the Anacacho Mountains, about 4 miles southwest of Cline post-office; very near the eastern side of the mountains.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 29° 12' 07"-36. Longitude, 100° 08' 28"-00.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Anacacho | 83 15 20·51 | 263 11 05·51 | 4·152988 |
| Las Moras | 126 04 18·75 | 305 57 05·70 | 4·470519 |

ANACACHO.

Situated in Kinney Co., Tex., on a high knoll on the west side of the Anacacho Mountains, about 1 mile south from a station on the Southern Pacific Railroad known as Anacacho, very near the northern side of the mountain.

Permanent mark: Stone marked with a cross and U. S. G. S.

[Latitude, 29° 11' 12"-82. Longitude, 100° 17' 10"-78.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Las Moras | 152 49 39·56 | 332 46 42·24 | 4·330812 |
| Turkey | 202 09 12·53 | 22 11 46·58 | 4·352677 |
| Nueces | 174 55 54·13 | 354 54 35·34 | 4·689033 |
| Monte | 191 14 53·30 | 11 17 24·35 | 4·628365 |
| Cline | 263 11 05·51 | 83 15 20·51 | 4·152988 |
| Spoifford | 84 00 29·35 | 263 56 53·88 | 4·079441 |
| Fort Clark | 136 07 02·20 | 316 03 08·97 | 4·269139 |

SPOFFORD (WATER TANK).

In Kinney Co., Tex. Not occupied. Water tank. Located in 1891.

[Latitude, 29° 10' 31"-91. Longitude, 100° 24' 32"-72.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Las Moras | 186 00 38·68 | 6 01 17·44 | 4·3101324 |
| Anacacho | 263 56 53·88 | 84 00 29·35 | 4·0794410 |

CORNUDA.

In Lincoln Co., N. Mex., just north of Texas State line and about 2 miles south from the Cornuda Mountain and Spring, on what is locally known as Wind Mountain.

Permanent mark: Conical pile of rocks 5 or 6 feet in height on highest point of mountain.

[Latitude, $32^{\circ} 01' 28''$.44. Longitude, $105^{\circ} 30' 57''$.65.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Salt..... | 324 | 44 | 31.51 | 144 | 56 | 10.27 | 4.7822428 |
| Quitman..... | 358 | 54 | 54.94 | 178 | 55 | 31.28 | 4.9871645 |
| North Franklin.... | 81 | 53 | 27.32 | 261 | 22 | 24.88 | 4.9702455 |
| El Capitan..... | 283 | 18 | 38.13 | 503 | 39 | 26.18 | 4.8039810 |
| Cerro Alto..... | 78 | 26 | 22.02 | 258 | 11 | 54.71 | 4.6424226 |

NORTH FRANKLIN.

On highest point of Franklin range of mountains in El Paso Co., Tex., about 10 or 12 miles north from town of El Paso.

Permanent mark: Conical pile of stones 7 or 8 feet in height.

[Latitude, $31^{\circ} 54' 07''$.24. Longitude, $106^{\circ} 29' 35''$.83.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Cornuda..... | 261 | 22 | 24.88 | 81 | 53 | 27.32 | 4.9702455 |
| Quitman..... | 311 | 09 | 02.18 | 131 | 40 | 18.08 | 5.1010737 |

The Wheeler survey determined location of this point from astronomical station at El Paso and a short base line near El Paso. The coordinates given are: Latitude, $31^{\circ} 54' 06''$.81; longitude, $106^{\circ} 29' 23''$.40.

CERRO ALTO.

On highest point of Cerro Alto Mountain in El Paso Co., Tex., about 40 miles east of town of El Paso.

Permanent mark: Conical pile of rocks.

[Latitude, $31^{\circ} 56' 39''$.90. Longitude, $105^{\circ} 58' 15''$.05.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Cornuda..... | 258 | 11 | 54.71 | 78 | 26 | 22.02 | 4.6424226 |
| Quitman..... | 332 | 49 | 48.76 | 153 | 04 | 41.76 | 4.9956792 |

EL CAPITAN.

In El Paso Co., Tex., on highest point of Guadalupe Mountains and probably highest point in Texas.

Bull. 122—18

Permanent mark: Conical pile of rocks.

[Latitude, $31^{\circ} 53' 26''$.38. Longitude, $104^{\circ} 51' 39''$.69.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Salt..... | 38 09 27.15 | 218 00 24.34 | 4.6438946 |
| Cornuda..... | 103 39 26.18 | 283 18 38.13 | 4.8039810 |

SALT.

In El Paso Co., Tex., on highest point of small isolated range of mountains, known as Sierra Prietta, about 35 miles northeast from Sierra Blanca.

Permanent mark: Top of culminating rock.

[Latitude, $31^{\circ} 34' 40''$.74. Longitude, $105^{\circ} 08' 51''$.69.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Eagle..... | 355 20 35.69 | 175 22 31.67 | 4.8640142 |
| Quitman..... | 35 01 10.05 | 214 50 16.04 | 4.7634401 |
| Cornuda..... | 144 56 10.27 | 324 44 31.51 | 4.7822428 |
| El Capitan..... | 218 00 24.34 | 38 09 27.15 | 4.6438946 |

SIERRA BLANCA.

In El Paso Co., Tex., on northern of two points of Sierra Blanca Peak.

Permanent mark: Conical pile of rocks about 6 or 8 feet high.

[Latitude, $31^{\circ} 15' 05''$.34. Longitude, $105^{\circ} 26' 09''$.64.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mesa..... | 298 07 27.64 | 118 16 14.40 | 4.4851764 |
| Quitman..... | 27 01 38.84 | 206 59 45.58 | 4.1053004 |
| Diablo..... | 276 44 59.51 | 97 01 12.65 | 4.6993709 |
| Chispa..... | 305 39 59.56 | 125 53 26.69 | 4.9312553 |
| Eagle..... | 317 33 17.14 | 137 44 08.48 | 4.6957501 |

QUITMAN.

In El Paso Co., Tex., on highest point of Quitman Mountains.

Permanent mark: Pile of rocks about 6 feet in height.

[Latitude, $31^{\circ} 08' 56''$.68. Longitude, $105^{\circ} 29' 48''$.26.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mesa..... | 275 17 51.58 | 95 28 30.60 | 4.5170143 |
| Eagle..... | 302 43 14.90 | 122 55 58.00 | 4.6694309 |
| North Franklin..... | 131 40 18.08 | 311 09 02.18 | 5.1010737 |
| Cornuda..... | 178 55 31.28 | 358 54 54.94 | 4.9871645 |
| Salt..... | 214 50 16.04 | 35 01 10.05 | 4.7634401 |
| Cerro Alto..... | 153 04 41.76 | 332 49 48.76 | 4.9956792 |
| Sierra Blanca..... | 206 59 45.58 | 27 01 38.84 | 4.1053004 |

DIABLO.

On eastern of two high points in Diablo Mountains, in El Paso Co., Tex., about 3 miles northwest from Hazel silver mines and about 30 miles southeast from Sierra Blanca.

Permanent mark: Conical pile of rocks with cedar tree in center.

[Latitude, $31^{\circ} 11' 50''$.54. Longitude, $104^{\circ} 54' 52''$.40.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Sierra Blanca..... | 97 | 01 | 12.65 | 276 | 44 | 59.51 | 4.6993709 |
| Eagle..... | 28 | 03 | 51.05 | 207 | 58 | 33.38 | 4.5409601 |
| Chispa..... | 335 | 55 | 12.13 | 156 | 01 | 31.35 | 4.6810032 |
| Vieja..... | 344 | 39 | 12.43 | 164 | 46 | 27.83 | 4.9327801 |
| Newman..... | 285 | 10 | 16.73 | 105 | 36 | 09.93 | 4.9172799 |

EAGLE.

On highest peak in Eagle Mountains, sometimes called Livermore Peak, in El Paso Co., Tex., about 25 miles southeast from Sierra Blanca.

Permanent mark: Conical pile of rocks.

[Latitude, $30^{\circ} 55' 14''$.41. Longitude, $105^{\circ} 05' 08''$.13.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Sierra Blanca..... | 137 | 44 | 08.48 | 317 | 33 | 17.14 | 4.6957501 |
| Diablo..... | 207 | 58 | 33.38 | 28 | 03 | 51.05 | 4.5409601 |
| Newman..... | 264 | 32 | 41.07 | 85 | 03 | 44.82 | 4.9847437 |
| Chispa..... | 289 | 59 | 46.68 | 110 | 11 | 20.22 | 4.5826138 |
| Baldy..... | 289 | 42 | 54.77 | 110 | 10 | 54.16 | 4.9677230 |
| Vieja..... | 322 | 59 | 54.09 | 143 | 12 | 21.96 | 4.8126761 |
| Salt..... | 175 | 22 | 31.67 | 355 | 20 | 35.69 | 4.8640142 |

CHISPA.

On highest point in mountains, about 4 miles north from Chispa, a station on the Galveston, Harrisburg and San Antonio Railroad, in Jeff Davis Co., Tex.

Permanent mark: Conical pile of rocks.

[Latitude, $30^{\circ} 48' 07''$.73. Longitude, $104^{\circ} 42' 36''$.10.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Eagle..... | 110 | 11 | 20.22 | 999 | 59 | 46.68 | 4.5826108 |
| Diablo..... | 156 | 01 | 31.35 | 335 | 55 | 12.13 | 4.6810032 |
| Sierra Blanca..... | 125 | 53 | 26.69 | 305 | 30 | 59.89 | 4.9312553 |
| Newman..... | 249 | 53 | 33.71 | 70 | 12 | 59.89 | 4.8072184 |
| Baldy..... | 289 | 42 | 39.43 | 109 | 59 | 05.23 | 4.7371129 |
| Vieja..... | 355 | 32 | 32.57 | 175 | 33 | 30.34 | 4.5902392 |

NEWMAN.

On high point near northwest extremity of Davis Mountains, in Jeff Davis Co., Tex., about 3 or 4 miles northeast from Mr. Newman's

ranch and about three-fourths of a mile north from Antelope Spring.

Permanent mark: Conical pile of rocks with tree in center.

[Latitude, $30^{\circ} 59' 58'' \cdot 36$. Longitude, $104^{\circ} 04' 45'' \cdot 31$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------|----------|----|-------|---------------|----|-------|------------|
| | o | ' | " | o | ' | " | Meters. |
| Diablo..... | 105 | 36 | 09.93 | 285 | 10 | 16.73 | 4.9172799 |
| Eagle..... | 85 | 03 | 44.82 | 264 | 32 | 41.07 | 4.9847437 |
| Chispa..... | 70 | 12 | 59.89 | 249 | 53 | 33.71 | 4.8072184 |
| Vieja..... | 43 | 33 | 10.13 | 223 | 14 | 47.84 | 4.9218841 |
| Baldy..... | 12 | 39 | 43.39 | 192 | 36 | 48.71 | 4.6172386 |
| Star..... | 312 | 08 | 25.43 | 132 | 17 | 11.67 | 4.5659822 |

STAR.

A high detached mountain near northeast corner of Davis Mountains, in Jeff Davis Co., Tex. Mountain is in pasture known as Star Ranch, about 15 miles north from Fort Davis, and about 1 mile west from Lympia Creek, at point on road from Fort Davis to Victoria, 15 miles from former.

Permanent mark: Stone marked $\begin{array}{c} \text{U.} \mid \text{S.} \\ \text{G.} \mid \text{S.} \end{array}$

[Latitude, $30^{\circ} 46' 36'' \cdot 32$. Longitude, $103^{\circ} 47' 40'' \cdot 23$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|-------|---------------|----|-------|------------|
| | o | ' | " | o | ' | " | Meters. |
| Newman..... | 132 | 17 | 11.67 | 312 | 08 | 25.43 | 4.5653822 |
| Baldy..... | 66 | 42 | 40.09 | 246 | 31 | 02.55 | 4.5977449 |
| Chinati..... | 35 | 53 | 56.59 | 215 | 33 | 12.62 | 5.0513069 |
| Mount Ord..... | 335 | 42 | 44.44 | 155 | 51 | 14.20 | 4.8147622 |

BALDY.

The highest point of Davis Mountains, a little south of center of range, in Jeff Davis, Co., Tex.; sometimes called Livermore Peak; about 25 miles northwest from Marfa, and about 20 miles a little north of east from Valentine.

Permanent mark: Conical pile of rocks.

[Latitude, $30^{\circ} 38' 05'' \cdot 85$. Longitude, $104^{\circ} 10' 26'' \cdot 27$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | o | ' | " | o | ' | " | Meters. |
| Newman..... | 192 | 36 | 48.71 | 12 | 39 | 43.39 | 4.6172386 |
| Chispa..... | 109 | 59 | 05.23 | 289 | 42 | 39.43 | 4.7371129 |
| Eagle..... | 110 | 10 | 54.16 | 289 | 42 | 54.77 | 4.9677230 |
| Vieja..... | 67 | 24 | 10.97 | 247 | 08 | 47.88 | 4.7200918 |
| Chinati..... | 21 | 13 | 17.03 | 201 | 04 | 04.78 | 4.9090391 |
| San Jacinto..... | 347 | 47 | 01.94 | 167 | 53 | 37.83 | 4.9998026 |
| Santiago..... | 320 | 23 | 31.31 | 140 | 46 | 24.49 | 5.0600854 |
| Mount Ord..... | 304 | 32 | 39.98 | 124 | 52 | 40.70 | 4.8861505 |
| Star..... | 246 | 31 | 02.55 | 66 | 42 | 40.09 | 4.5977449 |

VIEJA.

The highest point of Vieja range of mountains, in Presidio Co., Tex., about 15 miles southwest from Valentine and about 3 or 4 miles from Rio Grande River.

[Latitude, 30° 27' 07"-33. Longitude, 104° 40' 42"-70.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|-------|---------------|----|-------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Eagle..... | 143 | 12 | 21.96 | 322 | 59 | 54.09 | 4.8126761 |
| Diablo..... | 104 | 46 | 27.83 | 344 | 39 | 12.43 | 4.9327801 |
| Chispa..... | 175 | 33 | 30.34 | 355 | 32 | 32.57 | 4.5902892 |
| Newman..... | 223 | 14 | 47.84 | 43 | 33 | 10.13 | 4.9218841 |
| Baldy..... | 247 | 08 | 47.88 | 67 | 24 | 10.97 | 4.7200918 |
| Mount Ord. | 281 | 35 | 28.89 | 102 | 10 | 44.07 | 5.0579310 |
| Chinati..... | 340 | 43 | 44.31 | 160 | 49 | 47.34 | 4.7081425 |

MARFA.

Cupola Court-House, county seat of Presidio Co., Tex.

[Latitude, 30° 18' 46"-12. Longitude, 104° 01' 20"-03.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|-------|---------------|----|-------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Chinati..... | 47 | 50 | 25.38 | 227 | 36 | 41.60 | 4.7734994 |
| Baldy..... | 157 | 50 | 42.21 | 337 | 46 | 05.21 | 4.5862461 |

MOUNT ORD.

On highest point on Mount Ord, in Brewster Co., Tex., a large mountain about 12 miles a little south of east from Alpine, a station on the Galveston, Harrisburg and San Antonio Railroad.

Permanent mark: Conical pile of rocks.

[Latitude, 30° 14' 23"-04. Longitude, 103° 30' 56"-05.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Baldy..... | 124 | 52 | 40.70 | 304 | 32 | 39.98 | 4.8861505 |
| Vieja..... | 102 | 10 | 44.07 | 281 | 35 | 28.89 | 5.0379310 |
| Chinati..... | 71 | 18 | 22.53 | 250 | 49 | 25.00 | 4.9916155 |
| San Jacinto..... | 38 | 19 | 17.11 | 218 | 06 | 05.66 | 4.8362994 |
| Santiago..... | 347 | 57 | 28.02 | 168 | 00 | 26.62 | 4.6619233 |
| Star..... | 155 | 51 | 14.20 | 335 | 42 | 44.44 | 4.8147622 |
| Chisos..... | 349 | 30 | 09.00 | 169 | 36 | 24.00 | 5.0495105 |

CHINATI.

On highest point in the Chinati Mountains, in Presidio Co., Tex., about 45 miles southwest from Marfa, and at the head of Cibolo Creek, about 18 miles west from Shafter silver mines and about 4 miles from Mr. Poole's ranch.

Permanent mark: Conical pile of rocks.

[Latitude, $29^{\circ} 57' 09''$.32. Longitude, $104^{\circ} 28' 41''$.05.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Vieja | 160 49 47.34 | 340 43 44.31 | 4.7681425 |
| Baldy | 201 04 04.78 | 21 13 17.03 | 4.9090391 |
| Star | 215 33 12.62 | 35 53 56.59 | 5.0513072 |
| Mount Ord | 250 49 25.00 | 71 18 22.53 | 4.9916155 |
| Santiago | 277 00 07.31 | 97 31 52.08 | 5.0144016 |
| San Jacinto | 293 28 08.54 | 113 43 45.32 | 4.7413449 |
| Marfa | 227 36 41.60 | 47 50 25.38 | 4.7734994 |
| Chisos | 304 19 09.00 | 124 53 55.00 | 5.1399097 |

SAN JACINTO.

On highest point of San Jacinto Mountain, in Presidio Co., Tex., about 6 miles a little east of south from Alamita, an abandoned post-office, about 50 miles south from Marfa, very near the line between Presidio and Brewster counties.

Permanent mark: Conical pile of rocks.

[Latitude, $29^{\circ} 45' 12''$.59. Longitude, $103^{\circ} 57' 19''$.11.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Chinati | 113 43 45.32 | 293 28 08.54 | 4.7413449 |
| Baldy | 167 53 37.83 | 347 47 01.94 | 4.9998026 |
| Mount Ord | 218 06 05.66 | 38 19 17.11 | 4.8362994 |
| Santiago | 260 04 22.01 | 80 20 25.89 | 4.7232080 |

SANTIAGO.

On highest part of Santiago Mountain, in Brewster Co., Tex., a well known mountain about 18 miles a little north of east from Mr. Collinson's ranch.

Permanent mark: Conical pile of rocks.

[Latitude, $29^{\circ} 50' 04''$.66. Longitude, $103^{\circ} 24' 59''$.26]

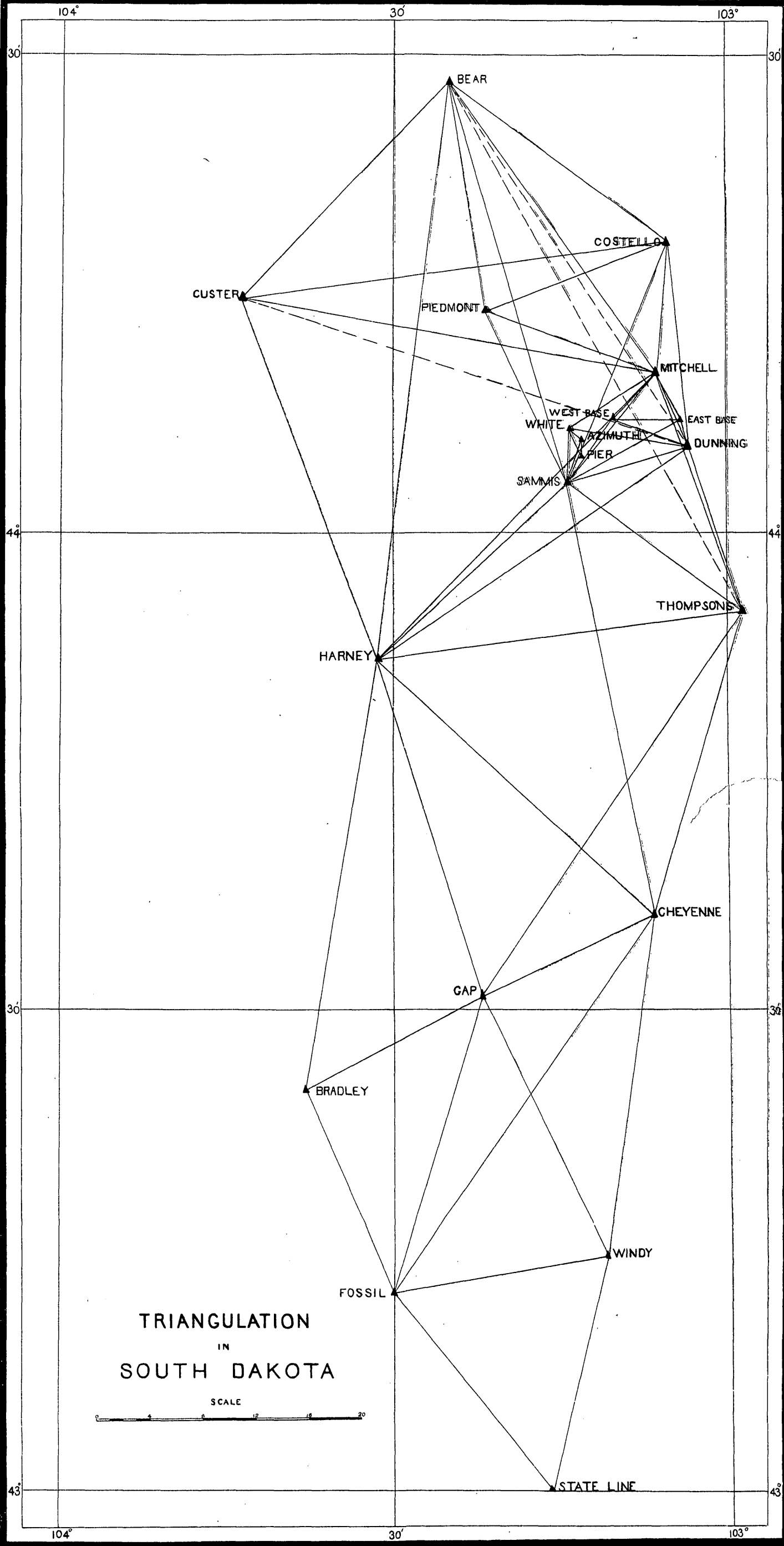
| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mount Ord | 168 00 26.62 | 347 57 28.02 | 4.6619233 |
| Baldy | 140 46 24.40 | 320 23 31.31 | 5.0600854 |
| Chinati | 97 31 52.08 | 277 00 07.31 | 5.0144016 |
| San Jacinto | 80 20 25.89 | 260 04 22.01 | 4.7232080 |

CHISOS.

In southern portion of Foley Co., Tex., near Rio Grande. Highest point in Chisos Mountains. Not occupied.

[Latitude, $29^{\circ} 14' 43''$.36. Longitude, $103^{\circ} 18' 19''$.90.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mount Ord | 169 36 24.00 | 349 30 09.00 | 5.0495105 |
| Chinati | 124 53 55.00 | 304 19 09.00 | 5.1399097 |



SOUTH DAKOTA.

METHODS OF WORK.

The area actually covered by the work in the Black Hills is about 2,500 square miles, extending from the Nebraska state line, latitude $43^{\circ} 00'$, to latitude $44^{\circ} 30'$.

The work was commenced in 1891 by Mr. C. H. Fitch, who selected a site for a base line of which he made a preliminary measurement. The line is in the valley of Box Elder Creek about 4 miles northeast of Rapid City. Mr. W. S. Post, in the same year, built signals at a few stations of the expansion, but was prevented by bad weather from measuring the final angles.

In the fall of 1893 Mr. E. M. Douglas remeasured the base line and located eighteen stations in its development and in the main system of triangulation, including the connection with the astronomical pier at Rapid City. The base line was measured three times with a 300-foot steel tape; temperature was taken at each tape length; the line was supported at each 50 feet and was under a uniform tension of 20 pounds. The adopted length of the line after making corrections for slope, temperature, reduction to sea level, etc., is 25,796.115 feet (nearly 5 miles), and the probable error of the three measurements is 0.84 inch.

The initial astronomical point on which the triangulation depends is a pier in the county court-house yard in Rapid City, the position of which was determined by Mr. S. S. Gannett, in 1890, by latitudes from zenith distances and longitudes from telegraphic exchange of time with St. Louis observatory. Mr. Gannett at the same time fixed a point on the meridian about 1 mile north. From this meridian the azimuths were computed.

Observations were taken by single and combined directions and the whole scheme of triangulation was divided into blocks of about 5 stations each and adjusted by least squares. The stations and signals consisted of low tripods of lumber with a signal pole in the center, under which the instrument was placed.

DESCRIPTIONS AND POSITIONS OF STATIONS.

BEAR BUTTE.

Very prominent butte about 5 miles northeast of Sturgis, in Meade Co., S. Dak., known to every one within 25 miles.

Permanent mark:

U. S.
+
G. S.

cut on large boulder. Stone projects about 6 inches above surface of ground.

[Latitude, $44^{\circ} 28' 34''$.4. Longitude, $103^{\circ} 25' 08''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Custer..... | 43 52 42 | 223 39 44 | 4.5515290 |
| Costello | 306 08 11 | 126 21 58 | 4.5111050 |

CUSTER PEAK.

Local name for highest peak in Lawrence Co., S. Dak., about 3 miles southwest of Brownsville station, on narrow-gauge railroad from Piedmont to Lead.

Permanent mark: Rock monument about 6 feet high and 5 feet in diameter at the base; 5-inch pine pole in the center.

[Latitude, $44^{\circ} 14' 41''$.4. Longitude, $103^{\circ} 43' 41''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mitchell..... | 279 53 51 | 100 19 54 | 4.7036670 |
| Bear Butte | 223 39 44 | 43 52 42 | 4.5515290 |

PIEDMONT.

Lone peak, about 2 miles east of Piedmont station, Fremont, Elkhorn and Missouri Valley Railroad, in Meade Co., S. Dak. Local name is Miller's butte.

Permanent mark:

U. S.
+
G. S.

cut on large rock, which projects about 5 inches above the ground.

[Latitude, $44^{\circ} 13' 55''$.8. Longitude, $103^{\circ} 21' 40''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Costello..... | 249 43 58 | 69 55 18 | 4.3618527 |
| Mitchell..... | 289 59 27 | 110 10 08 | 4.3376719 |
| Sammis..... | 333 43 06 | 153 48 16 | 4.3487698 |

COSTELLO.

On high knoll on summit of ridge north of Elk Creek, in Meade Co., S. Dak., in the SE. $\frac{1}{4}$ of sec. 13, T. 4 N., R. 8 E. The hill breaks off rapidly about 50 yards east and west and 100 yards north, the station being on a spur from the main ridge or divide.

Permanent mark is on a large stone projecting about 4 inches above surface of ground, marked

U. S.
+
G. S.

[Latitude, 44° 18' 12''·9. Longitude, 103° 05' 26''·8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bear Butte..... | 126 21 58 | 306 08 11 | 4·5111050 |
| Piedmont..... | 69 55 18 | 249 43 58 | 4·3618527 |

MITCHELL.

On summit of ridge next north of Box Elder Creek, in Meade Co., S. Dak., in sec. 2, R. 8 E., T. 2 N. Section line is about 440 feet east. There is small board cabin 515 feet northeast.

Station marked by large stone, which projects 10 inches above surface of ground. Stone marked

U. S. G. S.
+

[Latitude, 44° 09' 53''·8. Longitude, 103° 06' 20''·1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Piedmont..... | 110 10·08 | 289 59 27 | 4·3376719 |
| Sammis..... | 40 12 33 | 220 07 01 | 4·2155180 |
| Dunning..... | 336 08 42 | 156 10 38 | 3·9652013 |
| Custer Peak..... | 100 19 54 | 279 53 51 | 4·7036670 |

WEST BASE.

At west end of base line as marked out in 1893, in Pennington Co., S. Dak. In flat in SE. $\frac{1}{4}$ of NW. $\frac{1}{4}$ of sec. 20, R. 8 E., T. 2 N. The quarter corner post (center of sec. 20) is 75·5 feet distant, east of south. Station center marked on a large boulder projecting about 4 inches above ground and marked

U. S. G. S.
+
W. B.

the + being the center of the station. Reference points, 25 feet distant, are placed on the base line east of station, and two at 90 degrees from it, each marked R + P, the arrow pointing toward the station and the + being 25 feet distant from it. The one on the base line is about 6 inches east of the fence line.

[Latitude, 44° 07' 09''·2. Longitude, 103° 10' 29''·1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Dunning..... | 289 53 54 | 109 58 44 | 3·9938653 |
| East Base..... | 271 06 43 | 91 11 49 | 3·8955654 |

WHITE.

On highest of the foothills, $2\frac{1}{2}$ miles northwest of the court-house, Rapid City, Pennington Co., S. Dak. Station is on eastern slope of hill, about 50 yards north of the highest point.

Permanent mark is U. S. + cut in bed rock (limestone) level with surface of ground. White's ranch is about three-fourths of a mile east. An old wood road from Rapid City goes nearly to the station. This station was used in connecting latitude and longitude station in court-house yard with the main scheme of triangulation.

[Latitude, $44^{\circ} 06' 53''\cdot7$. Longitude, $103^{\circ} 14' 12''\cdot0$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sammis..... | 000 49 04 | 180 49 01 | 3·8447879 |
| Dunning | 281 23 54 | 101 31 19 | 4·1618680 |

ASTRONOMICAL PIER.

A brick pier in court-house yard, Rapid City, in Pennington Co., S. Dak., about 75 feet west of the southwest corner of the court-house. The pier extends about 3 feet below surface of ground and about 30 inches above; it has a dressed sandstone cap marked U. S. G. S. The position of this point was determined astronomically by S. S. Gannett in 1890.

[Latitude, $44^{\circ} 04' 45''\cdot24$. Longitude, $103^{\circ} 12' 59''\cdot28$.]

| To station. | Azimuth | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Meridian Mark ... | 180 00 00 | 00 00 00 | 3·3108 |

SAMMIS.

About 2 miles southwest of Rapid City, on the first knoll at the top of the hill, about 50 yards west of the Rapid City and Rockerville road and telephone line, in Pennington Co., S. Dak. The road reaches the summit of the hill about 100 yards south.

Station marked by a large stone projecting about 10 inches above the ground, marked

U. S.
+
G. S.

[Latitude, $44^{\circ} 03' 07''\cdot1$. Longitude, $103^{\circ} 14' 16''\cdot5$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Dunning | 253 56 21 | 74 03 49 | 4·1735420 |
| Mitchell..... | 220 07 01 | 40 12 33 | 4·2155180 |
| Piedmont..... | 153 48 16 | 333 43 06 | 4·3487698 |
| Harney Peak | 48 13 32 | 228 01 37 | 4·4894670 |
| White | 180 49 01 | 0 49 04 | 3·8447879 |

EAST BASE.

On a spur from the main ridge, on the north side of Box Elder Creek in Pennington Co., S. Dak. In the NE. $\frac{1}{4}$ of SW. $\frac{1}{4}$ of sec. 19, T. 2 N., R. 9 E.. The station center is a + on a large rock projecting about 4 inches above surface of ground and marked

U. S. G. S.

+

E. B.

Reference stones 25 feet distant, one on the line toward West Base and two at right angles to the line are marked R + P, the arrow pointing toward the station and the + being 25 feet distant therefrom.

[Latitude, 44° 07' 04". Longitude, 103° 04' 35".5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Dunning..... | 336 17 40 | 156 18 24 | 3.5437858 |
| West Base..... | 91 11 49 | 271 06 43 | 3.8955654 |

DUNNING.

On summit of divide between Box Elder and Rapid creeks, in Pennington Co., S. Dak. In sec. 8, T. 1 N., R. 10 E.

Permanent mark: Large round-topped boulder projecting above surface of ground about 8 inches and marked

U. S.

+

G. S.

[Latitude, 44° 05' 20".3. Longitude, 103° 03' 32".3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Thompson Butte | 341 08 15 | 161 11 36 | 4.3010173 |
| Mitchell | 156 10 38 | 336 08 42 | 3.9652013 |
| East Base | 156 18 24 | 336 17 40 | 3.5437858 |
| Sammis | 74 03 49 | 253 56 21 | 4.1735420 |
| West Base | 109 58 44 | 289 53 54 | 3.9938653 |
| White | 101 31 19 | 281 23 51 | 4.1618680 |

HARNEY PEAK.

Well-known local name for the highest peak of Black Hills, in Pennington Co., S. Dak. There are two summits, the station is on the northern one, and about the center of the highest part as seen from east.

Permanent mark: A three-fourths inch iron bolt leaded into a hole drilled into the rock. Bolt is on the west slope of rock and its top

is about level with the rock 3 inches east. This mark is center of station.

[Latitude, $43^{\circ} 51' 59'' \cdot 6$. Longitude, $103^{\circ} 31' 27'' \cdot 3$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gap | 342 04 07 | 162 10 37 | 4·6142306 |
| Cheyenne..... | 311 48 16 | 132 05 21 | 4·6497967 |
| Bradley..... | 8 44 20 | 188 40 25 | 4·7015755 |
| Sammis..... | 228 01 37 | 48 13 32 | 4·4894670 |
| Thompson Butte . | 262 17 52 | 82 40 35 | 4·6457526 |

THOMPSON BUTTE.

A prominent and well-known conical-shaped peak, in Pennington Co., S. Dak., about 15 miles southeast of Rapid City and about 5 miles south of Rapid Creek. The station center is about 5 feet south of the highest point. Stone 10 inches square projecting 3 inches above the ground is marked

U. S.
+
G. S.

[Latitude, $43^{\circ} 55' 07'' \cdot 0$. Longitude, $102^{\circ} 58' 42'' \cdot 5$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Harney Peak | 82 40 35 | 262 17 52 | 4·6457562 |
| Cheyenne | 16 51 03 | 196 45 31 | 4·5707447 |
| Dunning | 161 11 36 | 341 08 15 | 4·3010173 |

CHEYENNE.

At highest point of divide, 13 miles northeast of Buffalo Gap, in Custer Co., S. Dak., about 4 miles south of Smith's ranch on French Creek.

Permanent mark:

U. S.
+
G. S.

cut on a boulder that projects about 3 inches above the ground. There has been an old rock pile about 6 feet south.

[Latitude, $43^{\circ} 35' 52'' \cdot 6$. Longitude, $103^{\circ} 06' 43'' \cdot 5$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gap | 65 49 36 | 245 39 02 | 4·3550398 |
| Windy | 8 21 55 | 188 18 58 | 4·6004321 |
| Harney Peak | 132 05 21 | 311 48 16 | 4·6497967 |
| Thompson Butte..... | 196 45 31 | 16 51 03 | 4·5707447 |

GAP.

On the highest point of the ridge, about 3 miles northwest of Buffalo Gap town, near the edge of the bluff, in Custer Co., S. Dak. An old

rock pile about 6 feet northeast. Center of station marked by one-half inch brass bolt in bed rock, set with plaster of paris. Projects up above rock one-half inch. U. S. G. S. cut on same rock. Bolt is 11½ inches south of center of last S.

[Latitude, 43° 30' 51''-0. Longitude, 103° 22' 03''-4.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|----|---------------|----|----|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Bradley..... | 62 | 35 | 32 | 242 | 25 | 10 | 4-3597806 |
| Fossil..... | 17 | 26 | 46 | 197 | 21 | 19 | 4-5548890 |
| Windy..... | 333 | 34 | 51 | 153 | 42 | 26 | 4-5265574 |
| Cheyenne..... | 245 | 39 | 02 | 65 | 49 | 36 | 4-3550398 |
| Harney Peak..... | 162 | 10 | 37 | 342 | 04 | 07 | 4-6142306 |

BRADLEY.

On a projecting point of the ridge, on south side of Minnekahta Creek, about 8 miles west of Hot Springs, in Fall River Co., S. Dak. The station is on nearly the highest part of the ridge. The ridge slopes gently toward the south, and is called Bradley's Flat. Jones's sheep ranch is about 3 miles north.

Permanent mark:

U. S.
+
G. S.

cut on the bed rock (soft sandstone), about 2 inches below the surface of the ground. There are two large stones piled on each tripod leg. The leg furthest northeast has one large piece of petrified log on it, and U. S. is cut on the side. There is a hay road from the valley to the top of the flat, running up the side of the hill one-fourth of a mile east of the station.

[Latitude, 43° 25' 08''-5. Longitude, 103° 37' 07''-0.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|----|---------------|----|----|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Gap..... | 242 | 25 | 10 | 62 | 35 | 32 | 4-3597806 |
| Harney Peak..... | 188 | 40 | 25 | 8 | 44 | 20 | 4-7015755 |

FOSSIL.

A knob at the head of Tepee Creek, Fall River Co., S. Dak., at the divide between Tepee and Dry creeks, about 14 miles north of west from Oelrichs.

Permanent mark: +U. S. G. S. cut on the cap rock (brittle limestone); the + is 6 inches northwest of the center of the U.

[Latitude, 43° 12' 21''-52. Longitude, 103° 30' 00''-0.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|----|---------------|----|----|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| State Line..... | 320 | 08 | 41 | 140 | 18 | 13 | 4-4711761 |
| Gap..... | 197 | 21 | 19 | 17 | 26 | 46 | 4-5548890 |

WINDY.

A butte about 5 miles southeast of Smithwick, in Fall River Co., S. Dak., 5 miles northeast of Oelrichs, and 3 miles south of Codner's Ranch.

Station marked on a piece of limestone about 6 inches thick by 12 inches by 15 inches, buried flush with the ground. Stone is marked U. S. + G. S.

[Latitude, $43^{\circ} 14' 35''$. Longitude, $103^{\circ} 11' 00''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| State Line..... | 14 18 00 | 194 14 33 | 4.4427422 |
| Cheyenne..... | 188 18 58 | 8 21 55 | 4.6004321 |
| Gap..... | 153 42 26 | 333 34 51 | 4.5265574 |

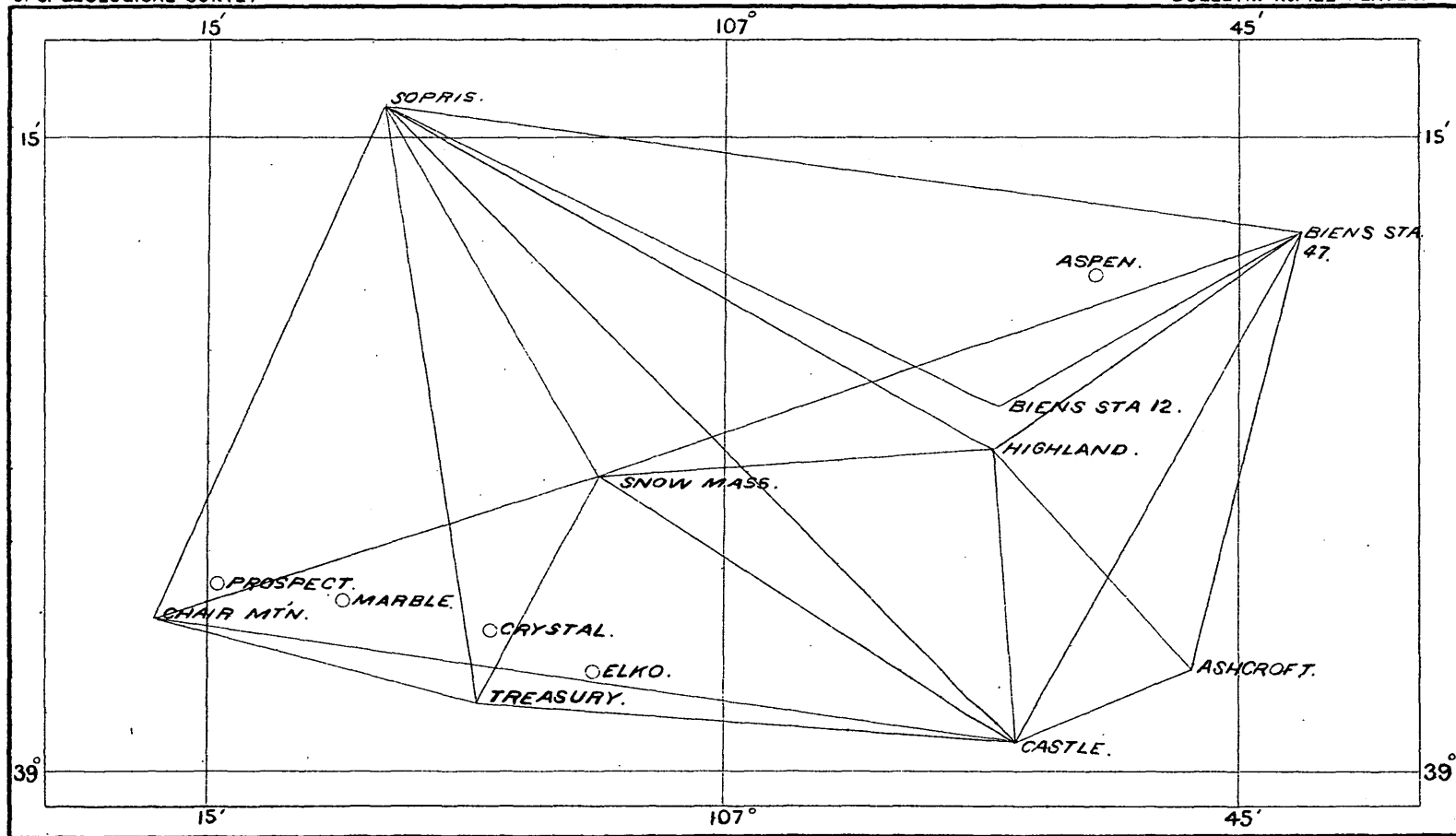
STATE LINE.

About $1\frac{1}{2}$ miles west of the Fremont, Elkhorn and Missouri Valley Railroad track, in Dawes Co., Nebr. On the highest part of a knoll 186.2 feet from the $184\frac{1}{2}$ milepost of the Nebraska-South Dakota State line, as located in 1892-'93 and marked by large stone posts set every half mile. The station is due south of the State line $89\frac{1}{2}$ feet.

Center point of station is a nail in a 2 by 4 stake which projects above ground about 6 inches.

[Latitude, $43^{\circ} 00' 04''$. Longitude, $103^{\circ} 16' 02''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Windy..... | 194 14 33 | 14 18 00 | 4.4427422 |
| Fossil..... | 140 18 13 | 320 08 41 | 4.4711761 |



TRIANGULATION OF ASPEN, COLORADO.

SCALE.



THE NORRIS PETERS CO. PHOTO-LITHO., WASHINGTON, D. C.

ASPEN, COLO.

METHODS OF WORK.

This work was commenced in 1891 by Morris Bien, who measured a base line 1 mile in length along one of the streets of Aspen. This line was expanded and a number of stations located for immediate use in making a large scale map of the mining district. In 1893 the triangulation was extended over an area of about 400 square miles by E. M. Douglas.

An attempt was made to compute a base line for the work from two unclosed triangles of the Hayden survey, but as the two values for the line thus computed differed materially they were both rejected and the line between Bien's station 12 and 47 as computed by him was adopted for a base. It so happened that this distance is nearly the mean of the two determinations from the Hayden angles. The initial latitude and longitude for the work are from the U. S. C. & G. S. position of Treasury Mountain, a station in the transcontinental scheme. The azimuth is from the U. S. C. & G. S. determination at the same point. The positions thus derived differ from the Hayden location about 9 seconds in latitude and 18 seconds in longitude. Angles were measured by the method of repetition in sets of five, using an 8-inch vernier theodolite reading, to 10 seconds. The stations and figures were arbitrarily adjusted, the limited extent of the work not justifying the adjustment by least squares.

DESCRIPTIONS AND POSITIONS OF STATIONS.

SOPRIS.

A well-known peak, about 20 miles west of Aspen, in Pitkin Co., Colo. Station is on the southeast summit.

Permanent mark: A large rock pile, same place as the Hayden Station. A good trail leads from an old sawmill to top of divide, 1 mile south of the peak.

[Latitude, $39^{\circ} 15' 36'' \cdot 2$. Longitude, $107^{\circ} 09' 57'' \cdot 4$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------------|----------|----|----|---------------|----|----|------------|
| | o | ' | " | o | ' | " | Meters. |
| Highland | 300 | 25 | 43 | 120 | 36 | 38 | 4 460953 |
| Snow Mass | 331 | 43 | 59 | 151 | 47 | 43 | 4 254617 |
| Treasury | 348 | 16 | 24 | 168 | 18 | 53 | 4 447570 |
| Chair Mountain | 24 | 15 | 54 | 204 | 11 | 27 | 4 398718 |
| Bien's Station (47) | 276 | 26 | 47 | 96 | 43 | 06 | 4 572241 |
| Bien's Station (12) | 296 | 58 | 48 | 117 | 09 | 54 | 4 453768 |
| Castle Peak | 316 | 41 | 18 | 136 | 52 | 48 | 4 583794 |

BIEN'S STATION (47).

A small blazed pine tree, on a grassy slope, on east or north side of Hunter Creek, in Pitkin Co., Colo., about 5 miles from Aspen. There is an abandoned sawmill about 1 mile west.

[Latitude, $39^{\circ} 13' 17''\cdot 4$. Longitude, $106^{\circ} 44' 10''\cdot 5$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bien's Station (12)..... | 53 47 46 | 233 42 35 | 4·165618 |
| Sopris | 96 43 06 | 276 26 47 | 4·572241 |
| Ashcroft | 10 25 08 | 190 23 32 | 4·308365 |

BIEN'S STATION (12).

On ridge, about 1 mile north of Highland, in Pitkin Co., Colo.

Permanent mark: A small pine tree, blazed and marked U. S. G. S.

[Latitude, $39^{\circ} 08' 36''\cdot 7$. Longitude, $106^{\circ} 52' 22''\cdot 4$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sopris | 117 09 54·7 | 296 58 48 | 4·453768 |
| Bien's Station (47)..... | 233 42 35·5 | 53 47 46·3 | 4·165618 |

HIGHLAND.

The highest point of the ridge on west side of Castle Creek, at the mouth of Conundrum (or West Castle) Creek and opposite the settlement of Highland, in Pitkin Co., Colo.

Permanent mark: Large rock monument.

[Latitude, $39^{\circ} 07' 40''\cdot 2$. Longitude, $106^{\circ} 52' 39''\cdot 9$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sopris | 120 36 38 | 300 25 43 | 4·460953 |
| Snow Mass | 86 01 54 | 265 54 43 | 4·216278 |
| Ashcroft | 318 14 44 | 138 18 28 | 4·109715 |

SNOW MASS.

A well-known peak, about 11 miles southwest of Aspen, in Pitkin Co., Colo., about 3 miles east of Crystal post-office and about same distance south of Capitol Peak. Hayden triangulation point.

Permanent mark: A large upright rock on highest part of peak.

[Latitude, $39^{\circ} 07' 02''\cdot 7$. Longitude, $107^{\circ} 04' 03''\cdot 2$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sopris | 151 47 43 | 331 43 59 | 4·254617 |
| Highland | 265 54 43 | 86 01 54 | 4·216278 |
| Treasury | 13 41 26 | 193 40 12 | 4·077312 |

ASHCROFT.

On the summit of the ridge southeast of Ashcroft town, in Pitkin Co., Colo. Large stone monument with central pole marks the station.

[Latitude, $39^{\circ} 02' 28''$.6. Longitude, $106^{\circ} 46' 43''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Highland | 138 18 28 | 318 14 44 | 4.109715 |
| Bien's Station (47). | 190 23 32 | 10 25 08 | 4.308365 |

CASTLE PEAK.

A well-known peak, about 12 miles south of Aspen, in Pitkin Co., Colo., highest peak within 25 miles. Round top summit about 100 by 30 feet in extent.

Permanent mark: Large rock monument with pole in center.

[Latitude, $39^{\circ} 00' 29''$.8. Longitude, $106^{\circ} 51' 44''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sopris | 136 52 48 | 316 41 18 | 4.583794 |

TREASURY.

A round topped peak, about 3 miles south of Crystal Post-Office, in Gunnison Co., Colo., U. S. C. & G. S. Station (primary point for trans-continental triangulation). A mining trail which starts at Elko runs over the summit and within 50 feet of the station.

[Latitude, $39^{\circ} 00' 46''$.2. Longitude, $107^{\circ} 06' 00''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sopris | 168 18 53 | 348 16 24.0 | 4.447570 |
| Snow Mass. | 193 40 12 | 13 41 26.0 | 4.077312 |
| Chair Mountain .. | 107 06 26 | 286 59 30.5 | 4.220116 |

CHAIR MOUNTAIN.

Well-known point on west side of Rock Creek about 3 miles southwest of Prospect, in Gunnison Co., Colo. Large rock monument on highest point.

[Latitude, $39^{\circ} 03' 24''$.0. Longitude, $107^{\circ} 17' 00''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Treasury | 286 59 30.5 | 107 06 26 | 4.220116 |
| Sopris | 204 11 27.5 | 24 15 54 | 4.393718 |

WYOMING.

METHODS OF WORK.

The scheme of triangulation at Laramie, Wyo., depends upon an astronomical station at Laramie determined in 1872 by the U. S. Geographical Surveys west of the one hundredth meridian. The instrument used was a Wurdemann zenith telescope, J. H. Clark being the observer. Telegraphic communication for longitude was made with Salt Lake City, Utah. During September, 1892, Mr. Frank Tweedy, of the U. S. Geological Survey, made a small development from a short base measured along the ties of the Union Pacific Railroad just north of the town of Laramie. Two measurements were made with a 300-foot steel tape during a cloudy day, giving the following results:

| | Feet. |
|---|--------------|
| First measurement corrected for temperature and inclination | 13, 040. 115 |
| Second measurement corrected for temperature and inclination..... | 13, 040. 389 |
| Difference | 0. 274 |
| Mean base reduced to sea level..... | 13, 035. 813 |

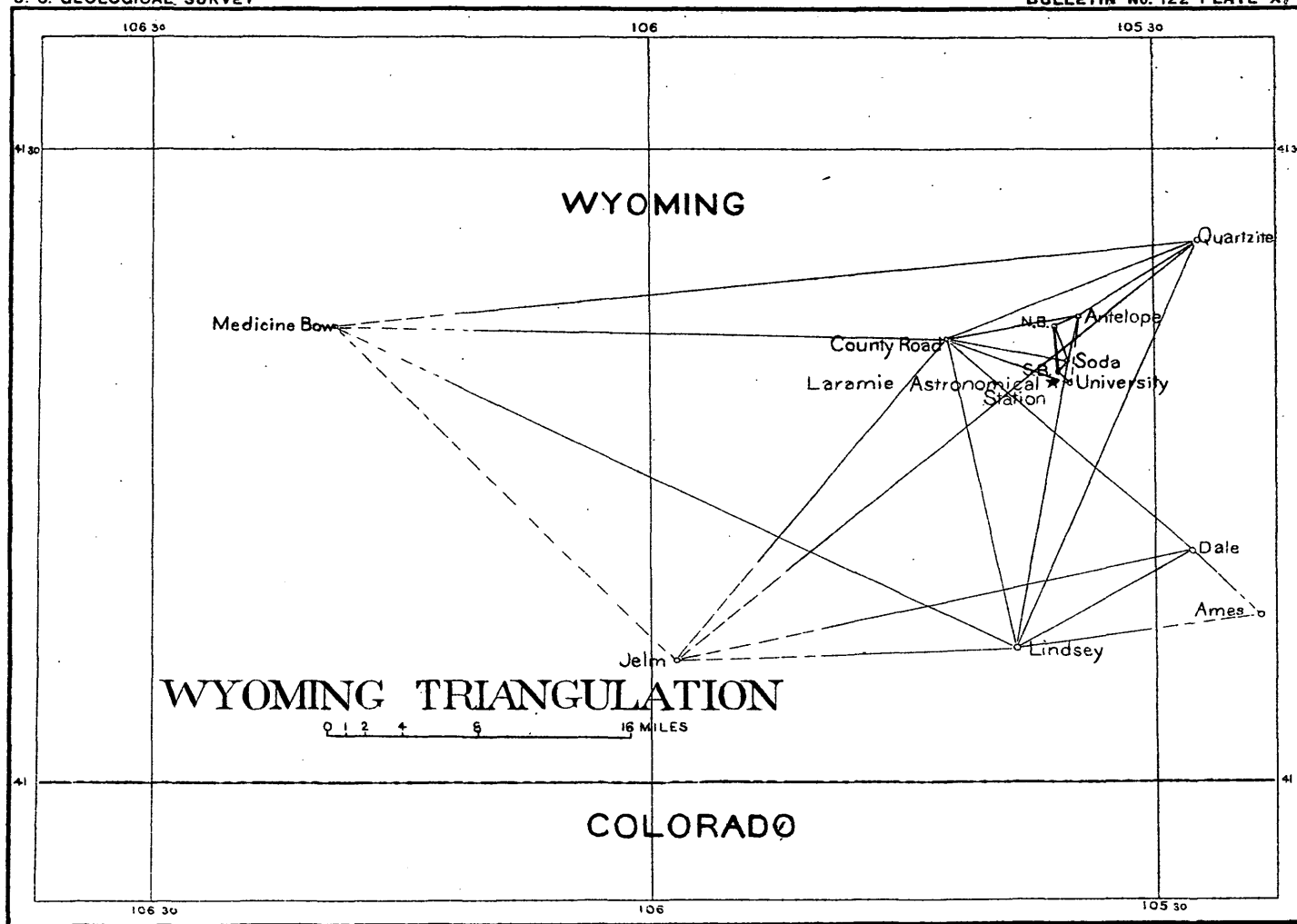
This base was selected and measured hurriedly in order to give the topographic parties immediate control for their work, it being the intention to remeasure it later in the season or to select a new base which would afford a better development, but this plan was not carried out. The ends of the base were not marked permanently but were transferred to two points, Soda and Antelope. The astronomical station was connected with Soda through University and not with the temporary base.

Since the astronomical station was established the city of Laramie has grown up around it, and it is now surrounded by trees and dwellings. The dome of the State University was connected with the station by a series of measurements along the streets of the town with a solar transit and a 300-foot steel tape. The instrument used in this triangulation was an 8-inch Fauth micrometer microscope theodolite. Tripod signals were built on all stations occupied in advance of the angle work. No least square adjustment has been applied to the triangulation.

DESCRIPTIONS AND POSITIONS OF STATIONS.

SODA.

On south edge of Red Mesa, one-half a mile north of Laramie, in Albany Co., Wyo., and two-thirds of a mile east of Soda Mill.



Permanent mark: A piece of 3-inch iron pipe 4 feet long set 3 feet in the ground with cross cut on top.

[Latitude, $41^{\circ} 20' 10''$. 28. Longitude, $105^{\circ} 35' 02''$. 97.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Antelope | 194 03 50 | 14 04 17 | 3.5808681 |
| County road | 99 11 38 | 279 06 52 | 4.0089511 |
| Quartzite | 226 32 15 | 46 37 16 | 4.1634587 |
| University | 355 13 33 | 175 13 39 | 3.4108516 |

UNIVERSITY.

Dome of the State University at Laramie, in Albany Co., Wyo.

[Latitude $41^{\circ} 18' 47''$. 09. Longitude, $105^{\circ} 34' 53''$. 75.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Soda..... | 175 13 39 | 355 13 33 | 3.4108516 |

ASTRONOMICAL PIER.

In block 166 Laramie, in Albany Co., Wyo., between Union Pacific Railroad and Second street and North A street and University avenue. It is in the west end of house lot No. 8 (Hayward). The wooden pier has been removed, but a small depression in the ground is pointed out as the original position of the observing block. Determined by the U. S. Geographical Surveys west of the one hundredth meridian, in 1872.

[Latitude, $41^{\circ} 18' 51''$. 80. Longitude, $105^{\circ} 35' 33''$. 60.]

ANTELOPE.

On low grassy butte $2\frac{1}{2}$ miles northeast of Soda Mill, at Laramie, in Albany Co., Wyo.

Permanent mark: A piece of 3-inch iron pipe 4 feet long set 3 feet in the ground with cross cut on top.

[Latitude, $41^{\circ} 22' 10''$. 06. Longitude, $105^{\circ} 34' 23''$. 14.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Soda | 14 04 17 | 194 03 50 | 3.5808681 |
| County Road | 79 22 51 | 259 17 38 | 4.0490181 |
| Quartzite | 236 45 17 | 56 49 51 | 4.0621799 |

COUNTY ROAD.

On highest part of grassy prairie, in Albany Co., Wyo., 8 miles northwest of Laramie, on county road. A bluff on north descends to a lake basin.

Permanent mark: A large stone set 2 feet in the ground with cross on lead bolt in center.

[Latitude, $41^{\circ} 21' 02''$.92. Longitude, $105^{\circ} 42' 16''$.45.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lindsey | 348 18 12 | 168 20 52 | 4.4455596 |
| Dale | 312 32 22 | 132 42 00 | 4.4429087 |
| Antelope | 259 17 38 | 79 22 51 | 4.0490181 |
| Soda | 279 06 52 | 99 11 38 | 4.0089511 |

QUARTZITE.

On high ridge, 10 miles northeast of Laramie, in Albany Co., Wyo., about $1\frac{1}{2}$ miles south of main wagon-road crossing.

[Latitude, $41^{\circ} 25' 34''$.91. Longitude, $105^{\circ} 27' 27''$.53.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Soda | 46 37 16 | 226 32 15 | 4.1634587 |
| Lindsey | 22 54 35 | 202 47 29 | 4.5882876 |
| Medicine Bow | 84 29 56 | 263 55 55 | 4.8577944 |
| Antelope | 56 49 51 | 236 45 17 | 4.0621799 |

DALE.

On timbered ridge 10 miles southeast of Laramie, Albany Co., Wyo. A cross-country road from Laramie to Sherman runs along the side of the ridge about one-eighth of a mile east of station.

[Latitude, $41^{\circ} 10' 54''$.33. Longitude, $105^{\circ} 27' 39''$.88.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| County Road | 132 42 00 | 312 32 22 | 4.4429087 |
| Ames | 315 15 29 | 135 18 04 | 3.8923764 |
| Lindsey | 60 02 23 | 239 55 26 | 4.2325042 |

AMES.

The Ames monument on the Union Pacific Railroad, at Sherman, in Albany Co., Wyo. Not occupied.

[Latitude, $41^{\circ} 07' 54''$.55. Longitude, $105^{\circ} 23' 44''$.32.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lindsey | 81 40 17 | 261 30 45 | 4.3119835 |
| Dale | 135 18 04 | 315 15 29 | 3.8923764 |

LINDSEY.

On butt of long, bare ridge, running north from high-timbered mesa, 20 miles south of Laramie, in Albany Co., Wyo. One mile north of station are two springs, at a deserted sheep ranch on edge of dry lake.

[Latitude, 41° 06' 17"-33. Longitude, 105° 38' 14"-08.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| County Road | 168 20 52 | 348 18 12 | 4.4455596 |
| Dale | 239 55 26 | 60 02 23 | 4.2325042 |
| Ames | 261 30 45 | 81 40 17 | 4.3119835 |
| Medicine Bow | 116 48 46 | 296 21 58 | 4.8031279 |
| Jelm | 88 32 10 | 268 18 51 | 4.4526265 |
| Quartzite | 202 47 29 | 22 54 35 | 4.5882876 |

JELM.

Timbered peak, known as Jelm Mountain, in Albany Co., Wyo., 25 miles southwest of Laramie, and 2 miles southeast of Woods Post-Office, on the Big Laramie River. Elevation, 9,676 feet.

Has not been occupied.

[Latitude, 41° 05' 52"-06. Longitude, 105° 58' 28"-70.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Lindsey | 268 18 51 | 88 32 10 | 4.4526265 |

MEDICINE BOW.

Known as Medicine Bow Peak, the highest point of the Medicine Bow Range, at heads of Little Laramie River and Medicine Bow Creek, about 38 miles west of Laramie, in Albany Co., Wyo. Elevation, 12,085 feet. Location, approximate.

Signal: None. Has not been occupied.

[Latitude, 41° 21' 39"-4. Longitude, 106° 18' 54"-2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Quartzite | 263 55 55 | 84 29 56 | 4.8577944 |
| Lindsey | 296 21 58 | 116 48 46 | 4.8031279 |

MONTANA.

METHODS OF WORK.

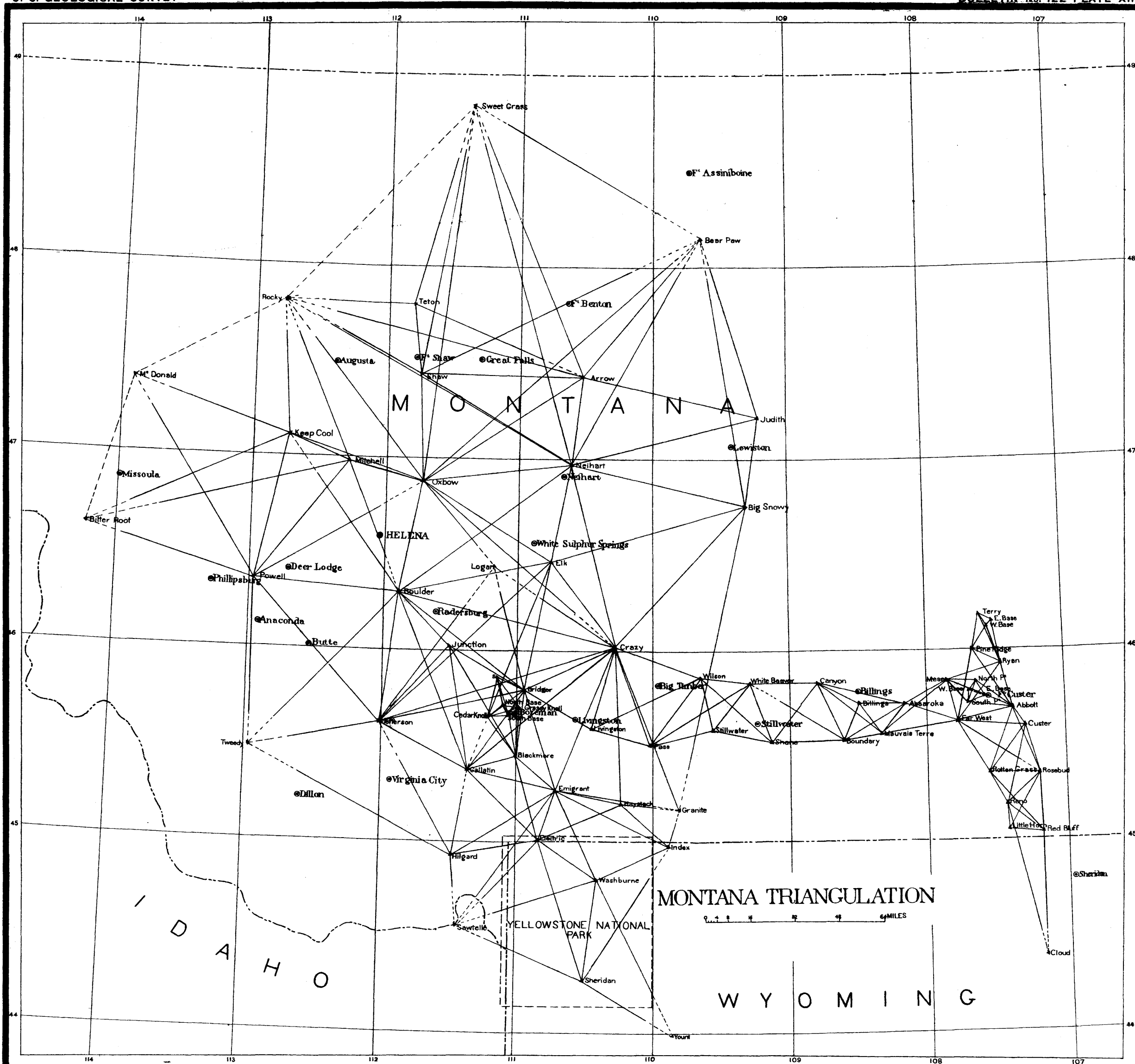
The Montana triangulation covers an area of about 50,000 square miles and is dependent upon a base and astronomical station located near Bozeman, Mont. The astronomical station was established in 1873 by the U. S. geographical surveys west of the one hundredth meridian. The observer at Bozeman was Mr. J. H. Clark and the instrument employed was a Wurdemann zenith telescope of 28 inches focal length. The telegraphic connection with the observatory at Ogden, Utah, was made via Helena, Mont., Dr. F. Kampf being the observer at Ogden. During October, 1877, Lieut. Tillman, of the U. S. Geographical Survey west of the one hundredth meridian, selected the present Bozeman base, which is located just west of the town of Bozeman, and measured it with a steel tape. He also connected it with the astronomical station and determined the azimuth, but carried on no expansion.

In 1883 Mr. J. H. Renshawe, of the U. S. Geological Survey, assisted by Mr. H. S. Chase, remeasured the base with a secondary base apparatus. The whole line was measured once and also computed by triangulation from a second measurement of the middle third with the following result:

| | Meters. |
|--|-----------|
| Length of base by first measurement..... | 7,352.642 |
| Length of base by triangulation from middle third..... | 7,352.572 |
| Weighted mean..... | 7,352.630 |
| Length of base reduced to sea level..... | 7,350.935 |

Mr. J. H. Renshawe, during 1882, and his assistant, Mr. H. S. Chase, in 1883-'84, connected the base with the astronomical station and carried an expansion southward into the Yellowstone National Park. The instrument used in this triangulation was a 10-inch vernier theodolite reading to 10 seconds. The method of observing angles was generally that of circle readings and repeated angles, establishing conditions for station adjustment.

In 1886 Mr. E. M. Douglas was placed in charge of the triangulation in Montana, and during the field season of 1886-'87-'88 reoccupied many of the stations of 1882-'84 and extended the triangulation through central Montana. Assisted by Mr. C. F. Urquhart, he readjusted by least squares the work of Mr. H. S. Chase, including many new points. The remainder of the triangulation in central Montana has been computed



from arbitrary adjustments, as the character of the work did not warrant a more rigid adjustment, the weather conditions having been very unfavorable for the performance of close work.

The instrument employed was an 8-inch vernier theodolite reading to 10 seconds. Natural points were generally sighted in advance of occupation. The method of reading angles was that of the earlier work of Messrs. Renshawe and Chase. A number of distant outlying points on the north and west have been sighted to, but not occupied.

During 1889 Mr. Frank Tweedy carried a short system of triangulation down the Yellowstone River from Bridger-Crazy as a base and in 1889 extended this work eastward to Fort Custer and southward to the Wyoming line, having reoccupied all his stations of 1889. In this work the instrument used was an 8-inch Fauth micrometer microscope theodolite. In all this work either stone cairns on the higher points or simple wooden tripods 10 to 20 feet high on the lower points were erected in advance of the instrumental work for signals.

At Fort Custer a check base about 5 miles long was selected and marked, but not measured. The stations connecting it with the triangulation were occupied, but the base figure has not been adjusted. Mr. W. S. Post, in 1891, extended a narrow belt of triangles from the stations Red Bluff-Little Horn near the Wyoming line eastward across northern Wyoming to a base at Rapid City, S. Dak., but stormy weather prevented his occupying his stations with sufficient completeness to form a connection between the Bozeman and Rapid City bases. The triangulation of 1891 has a somewhat weak connection with the Bozeman base through the line Bridger-Crazy.

DESCRIPTIONS AND POSITIONS OF STATIONS.

ASTRONOMICAL PIER.

On the western edge of the town of Bozeman, Gallatin Co., Mont., just north of the main east and west street, and is marked by a section of a tree 2 feet in diameter set in the ground and sawed off at top with nail in center. Determined by the U. S. Geographical Surveys west of the one hundredth meridian in 1873.

[Latitude, $45^{\circ} 40' 51'' \cdot 92 \pm 0'' \cdot 06$. Longitude, $111^{\circ} 02' 36'' \cdot 64 \pm 0'' \cdot 53$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|----------------------------|----------------------------|----------------------|
| North Base..... | 0 " 125 12 44.00 | 0 " 305 09 59.78 | Meters. 3.7835255 |

NORTH BASE.

On slight grassy rise, 4 miles northwest of Bozeman, Gallatin Co., Mont., marked by a stone pier 1 foot square and 4 feet long, set 3 feet

in the ground. The portion above ground is square, with letters U. S. G. S. cut in on one face and cross cut on top surface.

[Latitude, 45° 42' 45"-29. Longitude, 111° 06' 26"-08.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| South Base | 334 54 16 | 154 55 59 | 3·8663426 |
| Cedar Knoll | 53 44 03 | 233 38 55 | 4·0628859 |
| Grassy Knoll | 281 17 36 | 101 22 55 | 3·9929061 |
| Astronomical Pier..... | 305 10 00 | 125 12 44 | 3·7835255 |

SOUTH BASE.

In field 1 mile southwest of Bozeman, Gallatin Co., Mont., marked by stone pier 1 foot square (cross section) and 4 feet long, set 3 feet in the ground. The portion above ground is squared, with letters U. S. G. S. cut in on one face and cross cut on top surface.

[Latitude, 45° 39' 09"-64. Longitude, 111° 04' 02"-09.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Point 5..... | 163 33 09 | 343 29 26 | 4·3742267 |
| Bridger..... | 212 44 50 | 32 50 24 | 4·2701323 |
| Grassy Knoll..... | 234 06 27 | 54 10 03 | 3·9065048 |
| Cedar Knoll..... | 89 11 58 | 269 05 08 | 4·0947548 |
| North Base..... | 154 55 59 | 334 54 16 | 3·8663426 |

GRASSY KNOLL.

On a grassy knoll $1\frac{1}{2}$ miles north of Fort Ellis and $2\frac{1}{2}$ miles northeast of Bozeman, Gallatin Co., Mont., marked by a cairn of stones 3 feet in height.

[Latitude, 45° 41' 42"-64. Longitude, 110° 59' 00"-18.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Blackmore..... | 3 17 49 | 183 16 56 | 4·4419338 |
| Cedar Knoll..... | 75 34 25 | 256 30 23 | 4·2920765 |
| Point 5..... | 143 41 54 | 323 34 35 | 4·3487350 |
| North Base..... | 101 22 55 | 281 17 36 | 3·9929061 |
| South Base..... | 54 10 03 | 234 06 27 | 3·9065048 |

CEDAR KNOLL.

On knoll 200 feet high, in Gallatin Co., Mont., on west side of Gallatin River, about 2 miles west of Matthew's Hot Springs and just north of road from Bozeman to Virginia City.

Permanent mark: Cedar tree trimmed below.

[Latitude, 45° 39' 03"-61. Longitude, 111° 13' 36"-46.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gallatin | 19 14 57 | 199 09 00 | 4·5188944 |
| Point 5 | 193 57 30 | 14 00 39 | 4·3726260 |
| Bridger | 234 45 20 | 54 57 45 | 4·4397549 |
| Blackmore..... | 322 25 43 | 142 35 17 | 4·4566960 |
| North Base..... | 233 38 55 | 53 44 03 | 4·0628859 |
| Grassy Knoll..... | 256 30 23 | 75 34 25 | 4·2920765 |
| South Base..... | 269 05 08 | 89 11 58 | 4·0947548 |

POINT 5.

On a grassy bench in Gallatin Co., Mont., about 12 miles northwest of Bozeman, Mont., 1 mile north of East Gallatin River and a quarter of a mile northwest of Reese Creek, near Gum's ranch.

Permanent mark: Cairn of stones 3 feet high.

[Latitude, 45° 51' 24"-87. Longitude, 111° 09' 12"-76.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Bridger | 292 41 29 | 112 50 47 | 4.2599257 |
| Cedar Knoll | 14 00 39 | 193 57 30 | 4.3726260 |
| Grassy Knoll | 323 34 35 | 143 14 54 | 4.3487350 |
| South Base | 343 29 26 | 163 33 09 | 4.3742267 |

BRIDGER.

A bare, double peak in Gallatin Co., Mont., 9 miles northeast of Bozeman, Mont., on Bridger Range. The station is on the south point and is marked by a stone cairn 5 feet high. Elevation, 9,100 feet.

[Latitude, 45° 47' 36"-8. Longitude, 110° 56' 15"-58.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Gallatin | 35 32 35 | 215 14 14 | 4.7611481 |
| Junction | 119 32 27 | 299 07 50 | 4.7060882 |
| Boulder | 127 06 27 | 306 24 43 | 4.9701216 |
| Elk | 190 53 58 | 11 01 56 | 4.8743200 |
| Crazy | 243 35 56 | 64 04 25 | 4.7570500 |
| Livingston | 300 51 52 | 121 12 24 | 4.6383223 |
| Emigrant | 342 51 59 | 163 01 52 | 4.7884593 |
| Blackmore | 7 38 07 | 187 35 17 | 4.5899114 |
| South Base | 32 50 24 | 212 44 50 | 4.2701323 |
| Cedar Knoll | 54 57 45 | 234 45 20 | 4.4397549 |
| Point 5 | 112 50 47 | 292 41 29 | 4.2599257 |
| Jefferson | 76 54 05 | 256 08 07 | 4.9331603 |

JUNCTION.

On high, bare hill in Jefferson Co., Mont., 2 miles west of Missouri River and 7 miles north of Three Forks, Mont., and is marked by small cairn of rocks.

[Latitude, 46° 01' 03"-34. Longitude, 111° 30' 31"-21.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Boulder | 135 33 01 | 315 15 55 | 4.6383496 |
| Bridger | 299 07 50 | 119 32 27 | 4.7060882 |
| Gallatin | 351 09 17 | 171 15 25 | 4.8620898 |
| Jefferson | 41 02 13 | 220 40 44 | 4.7734316 |

BOULDER.

A bare double peak, in Jefferson Co., Mont., 12 miles northeast of Boulder Valley and 30 miles south of Helena, 2 miles east of Elkhorn mining camp. Elevation, 9,400 feet.

Permanent mark: Stone monument 8 feet high.

[Latitude, $46^{\circ} 17' 46''$.3. Longitude, $111^{\circ} 54' 14''$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Tweedy | 42 | 43 | 27 | 221 | 57 | 42 | 5.087647 |
| Powell | 94 | 40 | 17 | 273 | 53 | 35 | 4.919695 |
| Keep Cool | 145 | 22 | 20 | 324 | 45 | 51 | 5.047500 |
| Mitchell | 159 | 21 | 54 | 339 | 05 | 25 | 4.911482 |
| Ox Bow | 190 | 23 | 52 | 10 | 31 | 18 | 4.850460 |
| Neilhart | 232 | 29 | 24 | 53 | 26 | 00 | 5.095135 |
| Elk | 258 | 18 | 57 | 79 | 08 | 54 | 4.955483 |
| Bridger | 306 | 24 | 43 | 127 | 06 | 27 | 4.970121 |
| Crazy | 283 | 07 | 19 | 104 | 17 | 41 | 5.111892 |
| Junction | 315 | 15 | 55 | 135 | 33 | 01 | 4.638349 |
| Jefferson | 6 | 07 | 27 | 186 | 02 | 57 | 4.882453 |

JEFFERSON.

(Local name Hollow Top or Baldy.) High bare limestone point in Madison Co., Mont., at head of North Fork of North Willow Creek, about 8 miles southwest of Pony. Elevation, 10,740 feet.

Permanent mark: Stone monument 7 feet high.

[Latitude, $45^{\circ} 36' 49''$.38. Longitude, $112^{\circ} 00' 29''$.62.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Tweedy | 79 | 18 | 33 | 259 | 37 | 42 | 4.881706 |
| Boulder | 186 | 02 | 57 | 6 | 07 | 27 | 4.882453 |
| Junction | 220 | 40 | 44 | 41 | 02 | 13 | 4.773431 |
| Crazy | 250 | 48 | 47 | 72 | 03 | 42 | 5.152230 |
| Elk | 225 | 38 | 32 | 46 | 32 | 54 | 5.129725 |
| Bridger | 256 | 08 | 07 | 76 | 54 | 05 | 4.933160 |
| Gallatin | 298 | 04 | 36 | 118 | 32 | 05 | 4.756180 |
| Hilgard | 330 | 38 | 22 | 151 | 01 | 47 | 4.946576 |
| Logan | 214 | 37 | 19 | 35 | 12 | 49 | 5.046238 |

GALLATIN.

A high, bare, sharp granite peak at head of Hell Roaring Creek (Gallatin drainage), in Madison Co., Mont., about 26 miles southwest of Bozeman, Mont. Elevation, 10,968 feet.

Permanent mark: Small stone monument 4 feet high.

[Latitude, $45^{\circ} 22' 13''$.27. Longitude, $111^{\circ} 21' 56''$.86.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Emigrant | 282 | 31 | 59 | 103 | 00 | 65 | 4.7239772 |
| Crazy | 229 | 11 | 32 | 49 | 58 | 48 | 5.0470316 |
| Electric | 313 | 58 | 38 | 134 | 21 | 07 | 4.7625041 |
| Hilgard | 8 | 21 | 39 | 188 | 17 | 41 | 4.7050281 |
| Jefferson | 118 | 32 | 05 | 298 | 04 | 36 | 4.7561806 |
| Junction | 171 | 15 | 25 | 351 | 09 | 17 | 4.8620898 |
| Point Four | 199 | 09 | 00 | 19 | 14 | 57 | 4.5188944 |
| Blackmore | 253 | 12 | 43 | 73 | 28 | 11 | 4.4711043 |
| Bridger | 215 | 14 | 14 | 35 | 32 | 35 | 4.7611481 |
| Cedar Knoll | 199 | 09 | 00 | 19 | 14 | 57 | 4.5188944 |

BLACKMORE.

A peak about 15 miles south of Bozeman, at head of Cottonwood Creek, in Gallatin Co., Mont. Elevation, 10,196 feet.

Permanent mark: Small stone pile.

[Latitude, 45° 26' 48''-02. Longitude, 111° 00' 13''-40.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Gallatin | 73 28 11 | 253 12 43 | 4-4711043 |
| Cedar Knoll | 142 35 17 | 322 25 43 | 4-4566960 |
| Grassy Knoll..... | 183 16 56 | 3 17 49 | 4-4419338 |
| Bridger | 187 35 17 | 7 38 07 | 4-5899114 |
| Emigrant..... | 310 51 46 | 131 04 26 | 4-4883949 |
| Electric | 344 58 02 | 165 05 07 | 4-7034796 |

EMIGRANT.

A high volcanic peak in Park Co., Mont., on east side of Yellowstone River, between Emigrant Gulch and Six Mile Creek, 6 miles south-east of Fridley's Ranch. Elevation, 10,968 feet.

Permanent mark: Stone monument 5 feet high.

[Latitude, 45° 15' 54''-13. Longitude, 110° 42' 25''-35.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Electric | 19 46 27 | 199 40 54 | 4-4829363 |
| Hilgard | 57 15 30 | 236 43 32 | 4-8488356 |
| Crazy | 201 37 56 | 21 56 57 | 4-9562002 |
| Granite | 278 33 35 | 99 09 57 | 4-8552200 |
| Haystack | 280 44 46 | 101 05 27 | 4-5891581 |
| Index | 295 50 10 | 116 25 16 | 4-8594787 |
| Washburne..... | 337 18 01 | 157 29 37 | 4-7483054 |
| Blackmore..... | 131 04 26 | 310 51 46 | 4-4883949 |
| Gallatin | 103 00 05 | 282 31 59 | 4-7239772 |
| Bridger | 163 01 52 | 342 51 59 | 4-7884593 |
| Sawtole | 37 06 05 | 216 34 50 | 4-9873343 |

HAYSTACK.

A peak in Park Co., Mont., on head of East Fork of Main Boulder River, about 2 miles south of Boulder mining camp. Elevation, 10,972 feet.

Permanent mark: Small rock pile 5 feet high.

[Latitude, 45° 11' 55''-89. Longitude, 110° 13' 17''-58.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Electric | 66 32 06 | 246 05 55 | 4-7237827 |
| Emigrant..... | 101 05 27 | 280 44 46 | 4-5891581 |

GRANITE.

A very high, rugged, granite peak on Granite Range in Park Co., Mont., at the head of Rosebud Creek, southwest of Red Lodge and

northeast of Cooke City. Has never been occupied. It is the highest peak in Montana. Elevation, 12,824 feet.

[Latitude, $45^{\circ} 09' 56''$. Longitude, $109^{\circ} 48' 22''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Emigrant..... | 99 09 57 | 278 33 35 | 4·85522 |

INDEX.

A high, rugged, sharp volcanic peak in Big Horn Co., Wyo., about 10 miles southeast of Cooke City, Mont. It is probably inaccessible. Pilot Peak is a lower point 2 miles north. Elevation, 11,740 feet.

Permanent mark: None.

[Latitude, $44^{\circ} 58' 41''$ -88. Longitude, $109^{\circ} 52' 53''$ -07.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Washburne..... | 65 44 29 | 245 21 05 | 4·6807340 |
| Electric | 92 48 11 | 272 07 37 | 4·8777557 |
| Emigrant..... | 116 25 16 | 295 50 10 | 4·8594787 |

WASHBURNE.

A round, bare, flat-topped point on Washburne Range in Yellowstone National Park, at head of Antelope Creek. Elevation, 10,000 feet.

Permanent mark: Small rock monument 4 feet high.

[Latitude, $44^{\circ} 47' 58''$ -95. Longitude, $110^{\circ} 26' 01''$ -85.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sheridan..... | 7 20 28 | 187 16 27 | 4·7747361 |
| Sawtelle | 72 22 01 | 251 39 23 | 4·9255599 |
| Electric | 126 03 32 | 305 46 26 | 4·5951298 |
| Index | 245 21 05 | 65 44 29 | 4·6807340 |
| Yount | 333 16 43 | 153 40 33 | 5·0055609 |
| Emigrant..... | 157 29 37 | 337 18 01 | 4·7483054 |

ELECTRIC.

A high volcanic peak in northwest portion of Yellowstone National Park, about one-half mile north of the Montana-Wyoming boundary line. It is 7 miles southwest of Cinnabar, Mont., between heads of Cinnabar and Reese creeks. Elevation, 11,100 feet.

Permanent mark: Small stone monument.

[Latitude, $45^{\circ} 00' 27''$ -04. Longitude, $110^{\circ} 50' 15''$ -05.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sawtelle | 44 34 57 | 224 09 18 | 4·8369594 |
| Hilgard | 78 52 19 | 258 25 57 | 4·5790758 |
| Haystack | 246 05 55 | 66 32 06 | 4·7237827 |
| Index | 272 07 37 | 92 48 11 | 4·8777557 |
| Washburne..... | 305 46 26 | 126 03 32 | 4·5951298 |
| Sheridan | 343 18 08 | 163 31 08 | 4·9330144 |
| Emigrant..... | 199 40 54 | 19 46 27 | 4·4829363 |
| Gallatin | 134 21 07 | 313 58 38 | 4·7625041 |
| Blackmore..... | 165 05 07 | 344 58 02 | 4·7034796 |

HILGARD.

A high, rugged, basaltic peak in Madison Co., Mont., about 15 miles north of the second canyon of the Madison River. Has not been occupied.

Permanent mark: None.

[Latitude, $44^{\circ} 55' 08''$. 17. Longitude, $111^{\circ} 27' 32''$. 99.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Jefferson | 151 01 47 | 330 38 22 | 4 9465763 |
| Electric | 258 25 57 | 78 52 19 | 4 5790758 |
| Gallatin | 188 17 41 | 8 21 39 | 4 7050281 |
| Emigrant..... | 236 43 32 | 57 15 30 | 4 8488356 |

SAWTELLE.

A bare, round-topped point on Continental Divide, on boundary between Montana and Idaho, southwest of Henry Lake. Has not been occupied. Elevation, 10,000 feet.

Permanent mark: None.

[Latitude, $44^{\circ} 33' 56''$. 05. Longitude, $111^{\circ} 26' 40''$. 33.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Electric | 224 09 18 | 44 34 57 | 4 8369594 |
| Washburne..... | 251 39 23 | 72 22 01 | 4 9255599 |
| Sheridan..... | 294 03 00 | 114 41 26 | 4 9033070 |
| Emigrant..... | 216 34 50 | 37 06 05 | 4 9873343 |

SHERIDAN.

Highest peak in Red Mountain Range, Yellowstone National Park, between Heart and Lewis lakes. Elevation, 10,400 feet.

Permanent mark: Small stone monument.

[Latitude, $44^{\circ} 16' 06''$. 02. Longitude, $110^{\circ} 31' 44''$. 81.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sawtelle | 114 41 26 | 294 03 00 | 4 9033070 |
| Washburne | 187 16 27 | 7 20 28 | 4 7747361 |
| Yount | 300 31 55 | 120 59 36 | 4 7906195 |
| Electric | 163 31 08 | 343 18 08 | 4 9530144 |

YOUNT.

A high volcanic peak, in Big Horn Co., Wyo., at extreme head of Upper Yellowstone River, between alpine forks of that stream, and $1\frac{1}{2}$ miles north of Continental Divide. Has not been occupied as triangulation station. Elevation, 12,130 feet.

Permanent mark: Stone cairn 5 feet high.

[Latitude, $43^{\circ} 59' 02''$.76. Longitude, $109^{\circ} 51' 58''$.28.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Washburne..... | 153 40 33 | 333 16 43 | 5.0055609 |
| Sheridan..... | 120 59 36 | 300 31 55 | 4.7906195 |

POWELL.

Highest point of volcanic range in Deer Lodge Co., Mont., 12 miles southwest of Deer Lodge, between heads of Dempsey and Tin Cup Joe creeks. Elevation, 10,300 feet.

Permanent mark: Stone monument 5 feet high.

[Latitude, $46^{\circ} 21' 07''$.3. Longitude, $112^{\circ} 58' 48''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bitter Root..... | 106 24 20 | 285 30 35 | 5.007540 |
| McDonald..... | 148 22 40 | 328 01 00 | 5.132300 |
| Keep Cool..... | 192 05 40 | 12 17 49 | 4.940526 |
| Mitchell..... | 217 05 20 | 37 36 06 | 4.945071 |
| Ox Bow..... | 235 30 50 | 56 25 13 | 5.061306 |
| Tweedy..... | 359 19 41 | 179 20 18 | 4.985232 |
| Boulder..... | 273 53 35 | 94 40 17 | 4.919695 |

TWEEDY.

Highest point of granite range in Beaver Head Co., Mont., at head of Willow Creek, west of Apex Station, Utah and Northern Railroad. Has not been occupied as triangulation station. Elevation, 11,179 feet.

[Latitude, $45^{\circ} 28' 57''$.0. Longitude, $112^{\circ} 57' 56''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Powell..... | 179 20 18 | 359 19 41 | 4.985232 |
| Boulder..... | 221 57 42 | 42 43 27 | 5.087647 |
| Jefferson..... | 259 37 42 | 79 18 33 | 4.881706 |

BITTER ROOT.

A high peak on the Bitter Root range, in Missoula Co., Mont., 20 miles southwest of Missoula, Mont. Has not been occupied.

[Latitude, $46^{\circ} 36' 12''$.5. Longitude, $114^{\circ} 15' 14''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mitchell..... | 253 39 51 | 75 06 06 | 5.19415 |
| Powell..... | 285 30 35 | 196 24 20 | 5.00754 |

MCDONALD.

A high, rocky peak in Missoula Co., Mont., probably McDonald Peak, about 15 miles northeast of St. Ignatius Mission, in the Flathead Indian Reservation. Has not been occupied.

[Latitude, 47° 23' 11". Longitude, 113° 55' 18".]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Keep Cool | 287 56 00 | 108 47 50 | 4.97464 |
| Powell..... | 328 01 00 | 148 22 40 | 5.13230 |

KEEP COOL.

On Keep Cool Peak, in Deer Lodge Co., Mont., 10 miles north of Lincoln Gulch (Big Blackfoot drainage.) Elevation, 9,380 feet.

Permanent mark: Stone monument.

[Latitude, 47° 07' 08". Longitude, 112° 44' 21".]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| McDonald | 108 47 50 | 287 56 00 | 4.974640 |
| Recky | 176 35 19 | 356 32 36 | 4.889359 |
| Ox Bow..... | 284 50 49 | 105 34 58 | 4.898867 |
| Mitchell..... | 293 26 41 | 113 45 55 | 4.579482 |
| Boulder..... | 324 45 51 | 145 22 20 | 5.047500 |
| Powell..... | 12 17 49 | 192 05 40 | 4.940526 |

MITCHELL.

High point on continental divide, 5 miles northwest of Mitchell railroad station, Montana Central Railroad. Grassy ridge. Elevation, 7,800 feet.

Permanent mark: None.

[Latitude, 46° 58' 56". Longitude, 112° 16' 54".]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rocky | 157 13 44 | 336 50 54 | 5.002574 |
| Ox Bow..... | 277 26 34 | 97 50 36 | 4.624199 |
| Boulder..... | 339 05 25 | 159 21 54 | 4.911482 |
| Powell..... | 37 36 06 | 217 05 20 | 4.945071 |
| Bitter Root | 75 06 06 | 253 39 51 | 5.194150 |
| Keep Cool | 113 45 55 | 293 26 41 | 4.579482 |

OX BOW (MOORES MOUNTAIN).

At the head of north fork of Beaver Creek, in Meagher Co., Mont., about 10 miles north of York post-office. There are four peaks near the station of nearly the same elevation; the station is one of the highest ones, farthest northwest. Elevation, 8,000 feet.

Permanent mark: Pile of rocks and poles.

[Latitude, $46^{\circ} 55' 54''$.8. Longitude, $111^{\circ} 44' 01''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rocky | 141 00 08 | 320 13 01 | 5.103852 |
| Arrow | 238 28 50 | 59 21 57 | 5.028724 |
| Neihart | 266 42 01 | 87 31 14 | 4.934222 |
| Elk | 304 54 21 | 125 37 09 | 4.963010 |
| Boulder | 10 31 18 | 190 23 52 | 4.856460 |
| Powell | 56 25 13 | 235 30 50 | 5.061306 |
| Mitchell | 97 50 36 | 277 26 34 | 4.624199 |
| Keep Cool | 105 34 58 | 284 50 49 | 4.898867 |
| Crazy | | 132 40 31 | 5.178892 |

LOGAN.

A high peak on the range between the Missouri and Smith rivers, in Meagher Co., Mont., about 17 miles northeast of Townsend, Mont. Has not been occupied. Elevation, 9,400 feet.

Permanent mark: None.

[Latitude, $46^{\circ} 26' 03''$.5. Longitude, $111^{\circ} 11' 10''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Crazy | 302 55 07 | 123 34 32 | 4.923815 |
| Jefferson | 35 12 49 | 214 37 19 | 5.046238 |

ELK.

A large outcrop of rocks at the southwest end of a mountain in Meagher Co., Mont., 10 miles southeast of White Sulphur Springs. There is a small stunted pine near the monument. Elevation, 8,600 feet.

Permanent mark: A small cairn of rocks.

[Latitude, $46^{\circ} 27' 17''$.6. Longitude, $110^{\circ} 45' 12''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bridger | 11 01 56 | 190 53 58 | 4.874320 |
| Neihart | 191 02 58 | 11 09 24 | 4.766779 |
| Big Snowy | 252 41 21 | | 5.061627 |
| Crazy | 322 31 57 | | 4.783230 |
| Jefferson | 46 32 54 | 225 38 32 | 5.129725 |
| Boulder | 79 08 54 | 258 18 57 | 4.955483 |
| Ox Bow | 125 37 09 | 304 54 21 | 4.963010 |

CRAZY.

Highest point of Crazy Mountains, in Park Co., Mont., at head of Big Timber Creek. Elevation, 11,178 feet.

Permanent mark: Large pile of rocks.

[Latitude, 46° 01' 13''-1. Longitude, 110° 16' 36''-2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Livingston | 16 40 42 | 196 32 50 | 4-696314 |
| Boulder | 104 17 41 | 283 07 19 | 5-111892 |
| Ox Bow | 132 40 31 | ..... | 5-178892 |
| Big Snowy | 221 55 45 | 42 37 36 | 5-041950 |
| Wilson | 289 36 22 | 110 03 16 | 4-711123 |
| Pass | 340 24 49 | 160 35 53 | 4-778444 |
| Emigrant | 21 56 57 | 201 27 56 | 4-956200 |
| Bridger | 64 04 25 | 243 35 56 | 4-757050 |
| Logan | 123 34 22 | 302 55 07 | 4-925815 |
| Gallatin | 49 58 48 | 229 11 32 | 5-047031 |
| Jefferson | 72 03 42 | 250 48 47 | 5-152230 |
| Neihart ..... | ..... | 346 23 58 | 5-035800 |
| Elk ..... | ..... | 322 31 57 | 4-783230 |

BIG SNOWY.

On highest part of Big Snowy Mountains, in Fergus Co., Mont., south and east of Half Moon Pass. Elevation, 8,600 feet.

Permanent mark: Stone monument 4 feet high.

[Latitude, 46° 45' 12''-3. Longitude, 109° 18' 48''-8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Judith | 187 42 20 | 7 46 24 | 4-717817 |
| Neihart | 104 13 56 | 283 17 23 | 5-066122 |
| Crazy | 42 37 36 | 221 55 45 | 5-041950 |
| Elk ..... | ..... | 252 41 21 | 5-061627 |

JUDITH.

Highest peak of the Judith Mountains (local name, North Pacific Peak), in Fergus Co., Mont., about 15 miles northeast of Lewiston, Mont. Elevation, 6,400 feet.

Permanent mark: Rock monument 15 feet high.

[Latitude, 47° 13' 07''-9. Longitude, 109° 13' 15''-6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Arrow | 103 40 18 | 282 42 30 | 5-005533 |
| Bear Paw | 162 54 03 | 342 35 03 | 5-035100 |
| Big Snowy | 7 46 24 | 187 42 20 | 4-717817 |
| Neihart | 75 47 10 | 254 46 19 | 5-036097 |

NEIHART.

A large bald mountain in Meagher Co., Mont., about 8 miles west of south from Glendennin Post-Office (Barker Mining Camp). The station is on the highest part of the mountain, west end. Elevation, 9,200 feet.

Permanent mark: Stone monument.

[Latitude, $46^{\circ} 58' 15''$. Longitude, $110^{\circ} 36' 22''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shaw | 121 34 22 | 300 44 01 | 5.005403 |
| Arrow | 186 44 23 | 6 47 53 | 4.709051 |
| Bear Paw | 208 24 22 | ..... | 5.174812 |
| Judith | 254 46 19 | 75 47 10 | 5.036097 |
| Big Snowy | 283 17 23 | 104 13 56 | 5.006122 |
| Crazy | 346 23 58 | ..... | 5.035800 |
| Elk | 11 09 24 | 191 02 58 | 4.766779 |
| Boulder | 53 26 00 | 232 29 24 | 5.095135 |
| Oxbow | 87 31 14 | 266 42 01 | 4.934222 |

ARROW.

On Arrow Peak, in Choteau Co., Mont., the second highest peak of the Highwood Mountains, 5 miles south of east from Highwood Peak, between heads of Highwood and North Arrow creeks. Elevation, 7,420 feet.

Permanent mark: Rock monument.

[Latitude, $47^{\circ} 25' 40''$. Longitude, $110^{\circ} 31' 35''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shaw | 91 28 41 | 270 34 37 | 4.965291 |
| Teton | 114 20 50 | ..... | 5.026110 |
| Sweet Grass | 158 33 50 | 337 56 00 | 5.230678 |
| Bear Paw | 218 53 54 | 39 32 50 | 5.016239 |
| Neihart | 6 47 53 | 186 44 23 | 4.709051 |
| Judith | 282 42 30 | 103 40 18 | 5.005533 |
| Oxbow | 59 21 57 | 238 28 50 | 5.028724 |

SHAW.

A mesa butte in Cascade Co., Mont., 6 miles south of Sun River Post-Office; station on a grassy knoll on the north part of butte. Elevation, 4,700 feet.

Permanent mark: Stone monument 5 feet high.

[Latitude, $47^{\circ} 26' 29''$. Longitude, $111^{\circ} 44' 56''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Teton | 172 56 30 | ..... | 4.619460 |
| Sweet Grass | 190 01 40 | 10 18 30 | 5.201000 |
| Bear Paw | 242 38. 41 | ..... | 5.245893 |
| Neihart | 300 44 01 | 121 34 22 | 5.005403 |
| Arrow | 270 34 37 | 91 28 41 | 4.965291 |

TETON.

On Teton Ridge, in Choteau Co., Mont., 20 miles north of Sun River Post-Office, Mont., at head of Muddy Creek.

[Latitude, 47° 48' 48'' 0. Longitude, 111° 49' 02'' 4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|----------|---------------|------------|
| | | ° ' " | Meters. |
| Arrow | | 114 20 50 | 5.026110 |
| Shaw | | 172 56 30 | 4.619460 |

ROCKY.

A very high rocky peak on the summit of the range in Choteau Co., Mont., about 30 miles west of Choteau Post-Office. Has not been occupied.

[Latitude, 47° 48' 53'' 5. Longitude, 112° 48' 03'' 1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mitchell | 336 50 54 | 157 13 44 | 5.002574 |
| Keep Cool | 356 32 36 | 176 35 19 | 4.889359 |
| Oxbow | 320 13 01 | 141 00 08 | 5.103852 |

SWEET GRASS.

A cone-shaped butte in the Sweet Grass Hills in Choteau Co., Mont., near the British boundary. Has not been occupied.

[Latitude, 48° 50' 52'' 6. Longitude, 111° 22' 21'' 0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Arrow | 337 56 00 | 158 33 50 | 5.230678 |
| Shaw | 10 18 30 | 190 01 40 | 5.201000 |

BEAR PAW.

A prominent cone, highest point in the Bear Paw mountains in Chouteau Co., Mont., about 25 miles southeast of Fort Assinniboine; not occupied.

[Latitude, 48° 09' 00''. Longitude, 109° 38' 58''.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Arrow | 39 32 50 | 218 53 54 | 5.016239 |
| Judith | 342 35 03 | 162 54 03 | 5.035100 |
| Neihart | | 208 24 22 | 5.174812 |
| Shaw | | 242 38 41 | 5.245893 |

LIVINGSTON.

A high point in Park Co., Mont., 7 miles southeast from town of Livingston, at head of Suce Creek. Elevation, 9,400 feet.

Permanent mark: Rock monument 8 feet high.

[Latitude, $45^{\circ} 35' 30''$.6. Longitude, $110^{\circ} 27' 33''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wilson | 244 02 24 | 64 37 03 | 4.8429796 |
| Pass | 284 28 33 | 104 47 25 | 4.5506913 |
| Bridger | 121 12 24 | 300 51 52 | 4.6383223 |
| Crazy | 196 32 50 | 16 40 42 | 4.6963140 |

PASS.

Near eastern end of high rocky limestone ridge between two main east branches of East Boulder River, in Yellowstone Co., Mont. The southern of these two branches is generally dry and has a trail running up it and over pass at head to Nye City. Elevation, 9,200 feet.

Permanent mark: Rock monument 5 feet high.

[Latitude, $45^{\circ} 30' 39''$.8. Longitude, $110^{\circ} 01' 08''$.4.]

| To station. | Azimuth. | Back Azimuth. | Log dist. |
|-------------------|-----------|---------------|-----------|
| | ° " " | ° ' " | Meters. |
| Wilson | 215 56 40 | 36 12 23 | 4.6852485 |
| White Beaver..... | 237 01 06 | 57 31 57 | 4.8231473 |
| Stillwater | 255 34 07 | 75 53 17 | 4.5573305 |
| Crazy | 160 35 53 | 340 24 49 | 4.7784442 |
| Livingston | 104 47 25 | 284 28 33 | 4.5506913 |

WILSON.

A small butte on large mesa, in Park Co., Mont., east of Sweet Grass Creek and south of east fork of Sweet Grass Creek. A road passes a few hundred yards north and descends into the head of a canyon one-half mile northwest, where there is a spring.

Permanent mark: Stone monument 7 feet high.

[Latitude, $45^{\circ} 51' 48''$.1. Longitude, $109^{\circ} 39' 10''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| White Beaver..... | 276 29 50 | 96 45 00 | 4.4401336 |
| Shane..... | 315 55 21 | 134 17 31 | 4.7482890 |
| Stillwater | 348 06 31 | 168 10 01 | 4.4902387 |
| Crazy | 110 03 16 | 289 36 22 | 4.7111238 |
| Pass | 36 12 23 | 215 56 40 | 4.6852485 |
| Livingston | 64 37 03 | 244 02 24 | 4.8429796 |

STILLWATER.

On bare, grassy hill (limestone), in Yellowstone Co., Mont., 7 miles northwest of junction of Stillwater River and Rosebud Creek. A fourth of a mile east is a small pond, and between it and the station runs a road to the Yellowstone River.

Permanent mark: Tripod of pine-tree trunks, 10 feet high.

[Latitude, $45^{\circ} 35' 28''$. Longitude, $109^{\circ} 34' 16''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| White Beaver | 217 47 41 | 37 59 18 | 4.5355021 |
| Shane | 284 15 46 | 104 34 23 | 4.5446244 |
| Pass | 75 53 17 | 255 34 07 | 4.5573305 |
| Wilson | 168 10 01 | 348 06 31 | 4.4902387 |

WHITE BEAVER.

On a high, bare hill east of White Beaver Creek, and about 12 miles north of Yellowstone River. From the point the ridge runs easterly, forming divide between Keyser Creek and Lake Basin. The station is on the boundary between Park and Yellowstone counties, Mont.

Permanent mark: A county monument 3 feet east of the station.

[Latitude, $45^{\circ} 50' 05''$.2. Longitude, $109^{\circ} 18' 01''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Canyon | 269 54 18 | 90 16 04 | 4.5943859 |
| Boundary | 302 15 02 | 122 45 14 | 4.8129805 |
| Shane | 340 18 14 | 160 25 16 | 4.5799908 |
| Wilson | 96 45 00 | 276 29 50 | 4.4401336 |
| Stillwater | 37 59 18 | 217 47 41 | 4.5355021 |
| Pass | 57 31 57 | 237 01 06 | 4.8231473 |

SHANE.

On highest point of a bare, grassy ridge at head of Shane Creek, in Yellowstone Co., Mont., about 12 miles southeast of Stillwater and 5 miles south of Yellowstone River. An old road running between Shane Creek and Red Lodge passes along ridge, 50 feet south of station. Elevation, 4,955 feet.

[Latitude, $45^{\circ} 30' 45''$.3. Longitude, $109^{\circ} 08' 11''$.5.]

| Station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Canyon | 216 34 01 | 36 48 42 | 4.6491423 |
| Boundary | 268 37 07 | 89 00 13 | 4.6251180 |
| Wilson | 134 17 31 | 313 55 21 | 4.7482890 |
| White Beaver | 160 25 16 | 340 18 14 | 4.5799908 |
| Stillwater | 104 34 23 | 284 15 46 | 4.5446244 |

CANYON.

On low, small, grassy knoll, in Yellowstone Co., Mont., one-fourth of a mile north of bluff facing south, overlooking basin of Canyon Creek 4 to 5 miles north. Point is about 10 miles east of Coomb's ranch, on

south fork of Canyon Creek. A great grassy flat stretches to the north and west.

[Latitude, $45^{\circ} 50' 03'' \cdot 2$. Longitude, $108^{\circ} 47' 40'' \cdot 9$.]

| Station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Absaroka | 285 01 21 | 105 29 06 | 4·7164202 |
| Billings | 296 29 56 | 116 44 22 | 4·4655250 |
| Mauvais Terre..... | 309 38 57 | 129 58 59 | 4·6749662 |
| Boundary..... | 336 04 41 | 156 13 11 | 4·5812607 |
| White Beaver | 90 16 04 | 269 54 18 | 4·5943859 |
| Shane..... | 36 48 42 | 216 34 01 | 4·6491423 |

BILLINGS.

On a bald clay butte in Yellowstone Co., Mont., $2\frac{1}{2}$ miles east of Blue Creek and 6 miles south of Billings and 2 miles southwest of road from Yellowstone ferry to Pryor Creek.

[Latitude, $45^{\circ} 42' 59'' \cdot 3$. Longitude, $108^{\circ} 27' 32'' \cdot 2$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Absaroka | 271 19 46 | 91 33 05 | 4·3826370 |
| Mauvais Terre..... | 329 17 20 | 149 22 57 | 4·3011815 |
| Canyon | 116 44 22 | 296 29 56 | 4·4655250 |
| Boundary | 26 19 05 | 206 13 10 | 4·3855090 |

BOUNDARY.

On a high mesa between Pryor Creek and Clark's Ford divide, 7 to 8 miles west of Pryor Creek. It is at the head of Blue Creek, on the west boundary line of the Crow Indian Reservation, in Montana. From the station the mesa drops down abruptly on the south.

Permanent mark: Box elder tree in center of stone monument.

[Latitude, $45^{\circ} 31' 13'' \cdot 7$. Longitude, $108^{\circ} 35' 48'' \cdot 5$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Billings | 206 13 10 | 26 19 05 | 4·3855090 |
| Absaroka | 238 36 17 | 58 55 29 | 4·6111079 |
| Mauvais Terre..... | 257 36 15 | 77 47 46 | 4·3320681 |
| White Beaver | 122 45 14 | 302 15 02 | 4·3129805 |
| Shane | 89 00 13 | 268 37 07 | 4·6251180 |
| Canyon | 156 13 11 | 336 04 41 | 4·5812607 |

MAUVAIS TERRE.

On high grassy ridge or mesa in Crow Indian Reservation, Mont., between drainage of Fly Creek and East Fork (dry) of Pryor Creek;

about 4 miles east of Pryor Creek. The station is on the edge of the "Bad Land" bluff overlooking East Fork.

[Latitude, 45° 33' 41"-9. Longitude, 108° 19' 41"-1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Absaroka..... | 219 59 09 | 40 10 49 | 4.3362426 |
| Mesa..... | 231 35 54 | 51 56 32 | 4.6782773 |
| Far West..... | 262 16 35 | 82 39 53 | 4.6313331 |
| Boundary..... | 77 47 46 | 257 36 15 | 4.3320681 |
| Canyon..... | 129 58 59 | 309 38 57 | 4.6749962 |
| Billings..... | 149 22 57 | 322 17 20 | 4.3011815 |

ABSAROKA.

On south end of mesa between Fly and Pryor creeks, in Crow Indian Reservation, Montana, near head of Indian Creek and 5 miles south of Billings, Fort Custer road.

[Latitude, 45° 42' 39"-7. Longitude, 108° 08' 56"-7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mesa..... | 241 06 23 | 61 19 21 | 4.4279156 |
| Far West..... | 291 01 30 | 111 17 09 | 4.4838382 |
| Billings..... | 91 33 05 | 271 19 46 | 4.3826370 |
| Mauvais Terre.... | 40 10 49 | 219 59 09 | 4.3362426 |
| Boundary..... | 58 55 29 | 238 36 17 | 4.6111079 |
| Canyon..... | 105 29 06 | 285 01 21 | 4.7164202 |

MESA.

On the bare south end of Pine Ridge, in Crow Indian Reservation, Montana, 4 miles north of Billings and Fort Custer road.

[Latitude, 45° 49' 37"-5. Longitude, 107° 50' 50"-3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ryan..... | 253 53 04 | 74 10 06 | 4.5042215 |
| Abbott..... | 294 09 15 | 114 29 12 | 4.5980025 |
| Far West..... | 348 25 01 | 168 27 43 | 4.3371966 |
| Absaroka..... | 61 19 22 | 241 06 23 | 4.4279156 |
| Mauvais Terre.... | 51 56 32 | 231 35 54 | 4.6782773 |
| North Point..... | 271 51 48 | 92 00 34 | 4.2006230 |
| South Point..... | 323 16 24 | 143 22 07 | 4.2598980 |

ABBOTT (ABBOTT'S URN).

On northernmost of four buttes, in Crow Indian Reservation, Montana, from 7 to 8 miles north of Crow Indian Agency and 2 to 3 miles southeast of Fort Custer and Fort Keogh road. There is a peculiar shaped sandstone pinnacle on southeast slope.

Permanent mark: Rock monument 6 feet high.

[Latitude, $45^{\circ} 40' 48''$.8. Longitude, $107^{\circ} 22' 59''$.5]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rotten Grass | 21 15 56 | 201 08 11 | 4.5927058 |
| Far West | 76 32 06 | 256 14 53 | 4.5077235 |
| Pine Ridge | 147 55 20 | 327 43 26 | 4.6056647 |
| Custer | 325 33 07 | 145 37 31 | 4.1510836 |
| Rosebud | 338 07 45 | 158 15 55 | 4.6037525 |
| Mesa | 114 29 12 | 294 09 15 | 4.5980025 |
| South Point | 95 24 57 | 275 10 45 | 4.4128460 |
| North Point | 128 03 24 | 307 52 13 | 4.4092320 |
| Ryan | 168 00 11 | 347 57 14 | 4.4094429 |

NORTH POINT.

In Crow Indian Reservation, Mont., on first bench, three-fourths of a mile west of Big Horn River and 5 miles below Fort Custer Ferry.

Permanent mark: A steel wagon axle 3 inches in diameter, set 2 feet in the ground and projecting a few inches above, with cross cut on upper surface.

[Latitude, $45^{\circ} 49' 20''$.10. Longitude, $107^{\circ} 38' 35''$.41.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Abbott | 307 52 13 | 128 03 24 | 4.409232 |
| East Base | 336 51 34 | 156 54 04 | 4.063616 |
| South Point | 22 21 49 | 202 18 52 | 4.160826 |
| West Base | 28 19 54 | 208 17 48 | 3.903846 |
| Mesa | 92 60 34 | 271 51 48 | 4.200629 |

SOUTH POINT.

In Crow Indian Reservation, Mont., on a small butte 8 miles southwest of Fort Custer and 3 miles south of Billings and Fort Custer road.

Permanent mark: A steel wagon axle 3 inches in diameter, set 2 feet in the ground and projecting a few inches above, with cross cut on upper surface.

[Latitude, $45^{\circ} 42' 06''$.21. Longitude, $107^{\circ} 42' 50''$.11.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mesa | 143 22 07 | 323 16 24 | 4.230808 |
| West Base | 195 01 21 | 15 02 17 | 3.817202 |
| North Point | 202 18 52 | 22 21 49 | 4.160826 |
| East Base | 254 40 37 | 74 46 10 | 3.818203 |
| Abbott | 275 10 45 | 95 24 57 | 4.412846 |

EAST BASE.

In Crow Indian Reservation, Mont., about 100 yards from west bank of Big Horn River, opposite Fort Custer, and three-fourths of a mile above Fort Custer Ferry.

Permanent mark: A 4-inch cast-iron pipe with cap, set 3 feet in the ground and projecting about 1 foot above, with cross cut on upper surface of cap.

[Latitude, 45° 43' 35''-21. Longitude, 107° 35' 05''-0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| South Point | 74 46 10 | 254 40 37 | 3·818203 |
| West Base | 113 18 40 | 293 14 02 | 3·958681 |
| North Point | 156 54 04 | 336 51 34 | 4·063616 |

WEST BASE.

In Crow Indian Reservation, Mont., about 6½ miles northwest of Fort Custer and 2 miles north of Billings and Fort Custer road. One-eighth of a mile north is a spring in dry cañon.

Permanent mark: A 4-inch cast-iron pipe with cap, set 3 feet in the ground and projecting about 1 foot above, with cross cut on upper surface of cap.

[Latitude, 45° 45' 31''-57. Longitude, 107° 41' 31''-38.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| North Point | 208 17 48 | 28 19 54 | 3·903846 |
| East Base | 293 14 02 | 113 18 40 | 3·958681 |
| South Point | 15 02 17 | 195 01 21 | 3·817202 |

RYAN.

On high mesa in Crow Indian Reservation, Montana, about 5 miles east of stage station on Big Horn River, between Custer Station and Fort Custer.

[Latitude, 45° 54' 22''-1. Longitude, 107° 27' 07''-0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Far West | 38 29 14 | 218 14 56 | 4·6199678 |
| Pine Ridge | 119 21 28 | 299 12 31 | 4·2662940 |
| Terry | 158 46 01 | 338 39 29 | 4·5088867 |
| West Base | 159 59 08 | 339 54 41 | 4·3670918 |
| East Base | 168 43 45 | 348 40 58 | 4·4085105 |
| Abbott | 347 57 14 | 168 00 11 | 4·4094429 |
| Mesa | 74 10 06 | 253 53 04 | 4·5042215 |

PINE RIDGE.

On east slope of Pine Ridge, in Crow Indian Reservation, Montana, about 10 miles west of Custer Station.

Permanent mark: A peculiar spreading pine tree, $1\frac{1}{2}$ feet in diameter, leaning down hill.

[Latitude, $45^{\circ} 59' 14''\cdot 6$. Longitude, $107^{\circ} 39' 34''\cdot 7$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Terry..... | 191 40 18 | 11 42 44 | 4·3322294 |
| West Base..... | 212 11 24 | 32 15 55 | 4·1813560 |
| Far West..... | 13 08 51 | 193 03 29 | 4·6317223 |
| Ryan..... | 299 12 31 | 119 21 28 | 4·2662940 |
| Abbott..... | 327 43 26 | 147 55 20 | 4·6056647 |

WEST BASE (CUSTER STATION).

In Crow Indian Reservation, Mont., on highest point (west end) of mesa, south of Custer Station, about $2\frac{1}{2}$ miles west of stage road and from 3 to 4 miles from Custer Station.

[Latitude, $46^{\circ} 06' 10''\cdot 6$. Longitude, $107^{\circ} 33' 18''\cdot 1$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Terry..... | 155 32 32 | 335 30 27 | 3·9547039 |
| East Base..... | 222 20 57 | 42 22 36 | 3·6427125 |
| Pine Ridge..... | 32 15 55 | 212 11 24 | 4·1813560 |
| Ryan..... | 339 54 41 | 159 59 08 | 4·3670918 |

EAST BASE (CUSTER STATION).

On edge of mesa, in Crow Indian Reservation, Mont., 2 miles south-east of Custer Station and two-thirds of a mile east of Fort Custer stage road.

[Latitude, $46^{\circ} 07' 55''\cdot 7$. Longitude, $107^{\circ} 31' 00''\cdot 3$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Terry..... | 126 33 21 | 306 29 36 | 3·9203511 |
| Ryan..... | 348 40 58 | 168 43 45 | 4·4085105 |
| West Base..... | 42 22 36 | 222 20 57 | 3·6427125 |

TERRY.

On south edge of partly timbered mesa, in Yellowstone Co., Mont., 4 miles north of Yellowstone River, at Custer Station. The dry drainage which heads at south foot of mesa, near signal, enters Yellowstone River half a mile above ferry, at Junction City.

[Latitude, $46^{\circ} 10' 36''\cdot 2$. Longitude, $107^{\circ} 36' 12''\cdot 0$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| East Base..... | 306 29 36 | 126 33 21 | 3·9203511 |
| West Base..... | 335 30 27 | 155 32 32 | 3·9547039 |
| Ryan..... | 338 39 29 | 158 46 01 | 4·5088867 |
| Pine Ridge..... | 11 42 44 | 191 40 18 | 4·3322294 |

FAR WEST.

On butte just east of large mesa, in Crow Indian Reservation, Mont., about 6 miles west of Big Horn River and 13 miles southwest of Fort Custer.

[Latitude, 45° 36' 43''-5. Longitude, 107° 47' 04''-3.]

| Station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Pine Ridge | 193 03 29 | 13 08 51 | 4·6317223 |
| Custer | 275 47 06 | 96 08 42 | 4·5970066 |
| Rosebud | 302 48 28 | 122 53 48 | 4·7404811 |
| Rotten Grass | 329 09 57 | 149 19 22 | 4·5270876 |
| Absaroka | 111 17 09 | 291* 01 30 | 4·4838382 |
| Ryan | 38 29 14 | 218 14 56 | 4·6199678 |
| Abbott | 256 14 53 | 76 32 06 | 4·5077235 |
| Mauvaise Terre | 82 39 53 | 262 16 35 | 4·6313331 |
| Mesa | 168 27 43 | 348 25 01 | 4·3871966 |

CUSTER.

In Crow Indian Reservation, Mont., on a rocky butte 8 miles east of Crow Agency, partly timbered below, and having a large sandstone boulder on the summit. A road leaving the Crow Agency and going up the drainage immediately opposite runs directly to the station.

[Latitude, 45° 34' 30''-4. Longitude, 107° 16' 50''-1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Reno | 16 38 43 | 196 31 41 | 4·6548219 |
| Rotten Grass | 41 54 45 | 221 42 37 | 4·5223663 |
| Rosebud | 344 52 50 | 164 56 36 | 4·4234948 |
| Abbott | 145 37 31 | 325 33 07 | 4·1510836 |
| Far West | 96 08 42 | 275 47 06 | 4·5970066 |

ROTTEN GRASS.

A bare grassy butte on divide just east of Rotten Grass Creek, in Crow Indian Reservation, Mont. It is 3 miles east of Rotten Grass Creek, 12 miles southeast of Xavier Mission, and 3 miles north of road from Rotten Grass Creek to Lodge Grass Creek.

[Latitude, 45° 21' 06''-6. Longitude, 107° 33' 51''-7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Reno | 336 06 05 | 153 11 09 | 4·3160829 |
| Far West | 149 19 22 | 329 09 57 | 4·5270876 |
| Custer | 221 42 37 | 41 54 45 | 4·5223663 |
| Rosebud | 271 24 40 | 91 40 33 | 4·4649032 |
| Abbott | 201 08 11 | 21 15 56 | 4·5927058 |

ROSEBUD.

On partly timbered point in Rosebud Mountains, in Crow Indian Reservation, Mont., 8 miles north of east of mouth of Lodge Grass Creek, at head of Snake Creek. There are wood roads crossing the ridge on each side (north and south) of the station, one running up Snake Creek and the other up a creek which enters the Little Horn just above the mouth of Lodge Grass Creek.

[Latitude, $45^{\circ} 20' 41''$.2. Longitude, $107^{\circ} 11' 32''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Red Bluff..... | 00 01 58 | 180 01 57 | 4.5326235 |
| Little Horn..... | 30 26 46 | 210 16 37 | 4.5684396 |
| Reno..... | 48 22 56 | 228 12 09 | 4.4246037 |
| Rotten Grass..... | 91 40 33 | 271 24 40 | 4.4649032 |
| Custer..... | 164 56 36 | 344 52 50 | 4.4234948 |
| Far West..... | 122 53 48 | 302 48 28 | 4.7404811 |
| Abbott..... | 158 15 55 | 338 07 45 | 4.6037525 |

RENO.

On west end of mesa, in Crow Indian Reservation, Mont., 3 miles west of Little Horn Canyon. There is a high, flat-topped butte 8 miles west, and a high mesa beyond this, sloping to Lodge Grass Creek. The station Mesa is between the second and third large drainages south of Lodge Grass Creek.

[Latitude, $45^{\circ} 11' 08''$.3. Longitude, $107^{\circ} 26' 42''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Red Bluff..... | 309 26 16 | 129 37 00 | 4.4111685 |
| Little Horn..... | 355 21 13 | 175 21 50 | 4.1554425 |
| Rotten Grass..... | 153 11 09 | 333 06 05 | 4.3160829 |
| Cloud Peak..... | 346 17 44 | ..... | 4.9625670 |
| Custer..... | 196 31 41 | 16 38 43 | 4.6548219 |
| Rosebud..... | 228 12 09 | 48 22 56 | 4.4246037 |

LITTLE HORN.

In Crow Indian Reservation, Mont., on grassy butte (steep on south with road at foot), between Little Horn and Pass creeks, $3\frac{1}{2}$ miles southwest of stage station and about 2 miles north of Wyoming-Montana line.

[Latitude, $45^{\circ} 03' 26''$. Longitude, $107^{\circ} 25' 49''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Red Bluff..... | 276 26 58 | 96 37 04 | 4.2756655 |
| Rosebud..... | 210 16 37 | 30 26 46 | 4.5684396 |
| Reno..... | 355 21 13 | 175 21 50 | 4.1554425 |

RED BLUFF.

On large red hill, in Crow Indian Reservation, Mont., at south end of Rosebud Range, $1\frac{1}{2}$ miles east of Owl Creek and 2 miles north of Wyoming-Montana line.

Permanent mark: Tripod of pine trees and stones.

[Latitude, $45^{\circ} 02' 16''$. Longitude, $107^{\circ} 11' 33''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Reno | 129 37 00 | 309 26 16 | 4.4111685 |
| Rosebud | 180 01 57 | 000 01 58 | 4.5326235 |
| Little Horn | 96 37 04 | 276 26 58 | 4.2756655 |

CLOUD PEAK.

The highest peak of the Big Horn Mountains, Wyo., about 24 miles west of Fort McKinney, Wyo., and probably on boundary line between Big Horn and Johnson counties. It has not been occupied and is poorly located. Elevation, 12,926 feet.

Permanent mark: A large cairn of rocks on the summit.

[Latitude, $44^{\circ} 23' 00''$. Longitude, $107^{\circ} 10' 23''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|----------|---------------|------------|
| | | ° ' " | Meters. |
| Reno | | 346 17 44 | 4.492567 |

IDAHO.

METHODS OF WORK.

The triangulation in Idaho covers an area of about 15,000 square miles, in the form of a parallelogram, 100 miles in breadth by 150 miles in length, in the center of the southern part of the State, extending from the western boundary as far east as Hailey. Work was begun in the summer of 1889 and continued during the seasons of 1890-'91-'92.

A base line $4\frac{3}{4}$ miles in length was measured near Boise, and the triangulation expansion from this base governs the topographic work. In the measurement of the base a steel tape line 100 feet in length was used with a resulting probable error of 0.19 foot. In the fall of 1889 telegraphic connection was had with the observatory at St. Louis and astronomical observations were taken to determine the position of a pier near the west end of the Boise base and the initial point of triangulation.

In expanding this base a 7-inch theodolite, reading to 10 seconds, was used during the seasons of 1889 and 1890. During the seasons of 1891 and 1892 a 10-inch theodolite, with micrometer microscopes reading to 2 seconds, was used. Circle readings, direct and reverse, were the general order of procedure, and as a rule angles were measured between points, without artificial signals, these signals not being built until the station was occupied, the natural points generally being sufficiently determinate. In a few instances in which the object sighted was not a good natural point, signals were built before observations were made.

During the period of use of the 7-inch theodolite the figures were adjusted by the method of least squares. When the 10-inch theodolite was used arbitrary adjustments were made.

The triangulation and base measurements were made by either Mr. Griswold or one of his assistants, Messrs. E. T. Perkins or F. M. Smith. The astronomical work was performed by Prof. R. S. Woodward, assisted by Mr. Griswold, in conjunction with Prof. H. S. Pritchett, at St. Louis.

DESCRIPTIONS AND POSITIONS OF STATIONS.

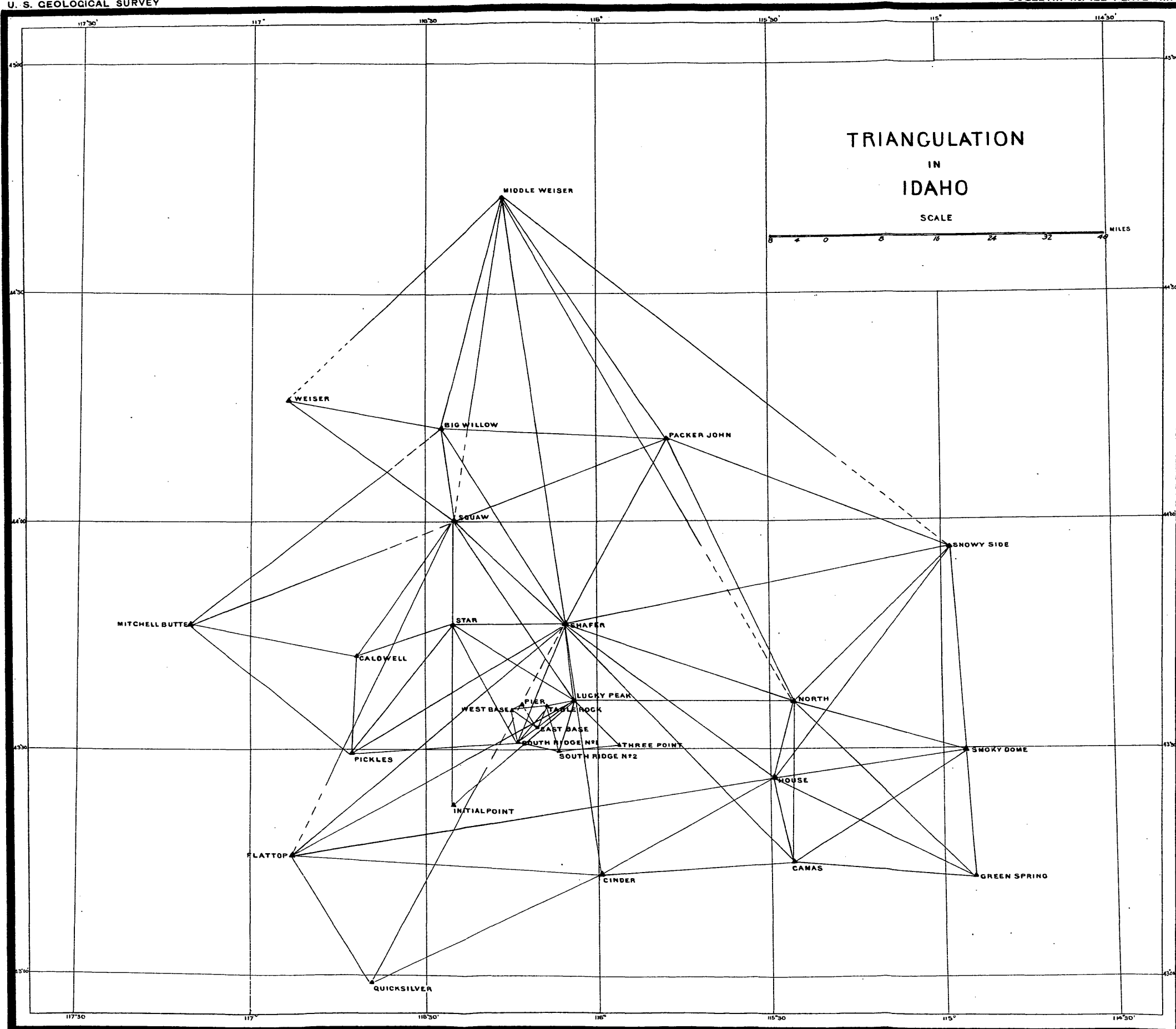
MIDDLE WEISER.

A high, sharp mountain on ridge between Long Valley and Weiser River and the head of Middle Weiser, in Washington Co., Idaho.

Permanent mark: Rock cairn.

[Latitude, $44^{\circ} 42' 37''$.77. Longitude, $116^{\circ} 16' 14''$.15.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Big Willow | 14 24 12.51 | 194 16 38.23 | 4.7626201 |
| Packer John | 326 48 12.80 | 147 07 56.62 | 4.8461400 |



WEISER.

On Sage Brush Hill, in Washington Co., Idaho, 6 miles northeast of the city of Weiser.

[Latitude, $44^{\circ} 15' 56''$.2. Longitude, $116^{\circ} 54' 5''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Squaw..... | 306 34 51.68 | 126 55 17 | 4.6886081 |
| Mitchell..... | 22 15 40.00 | 202 04 09 | 4.7741042 |

BIG WILLOW.

A round, bald knob on ridge between Weiser River and Squaw Creek in Washington Co., Idaho, at head of Big Willow Creek.

Permanent mark: A pile of rocks 7 feet high and 5 feet at base.

[Latitude, $44^{\circ} 12' 20''$.60. Longitude, $116^{\circ} 27' 02''$.71.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Squaw..... | 352 18 29.30 | 172 20 04.48 | 4.3572383 |
| Packer John..... | 272 44 06.00 | 93 11 43.84 | 4.7233831 |
| Middle Weiser.... | 194 16 38.23 | 14 24 12.51 | 4.7626201 |

SQUAW.

Station on the southeast end of a flat-topped mountain in Ada Co., Idaho, about 6 miles north of Emmet.

[Latitude, $44^{\circ} 00' 09''$.66. Longitude, $116^{\circ} 24' 45''$.96.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lucky Peak..... | 327 21 34.40 | 147 36 06.81 | 4.7193885 |
| Star..... | 000 42 21.25 | 180 42 11.51 | 4.4065461 |
| Weiser..... | 126 55 17.00 | 306 34 51.68 | 4.6886081 |
| Big Willow..... | 172 20 04.48 | 352 18 29.30 | 4.3572383 |
| Packer John..... | 248 06 19.28 | 68 32 19.09 | 4.7296846 |

PACKER JOHN.

Highest round peak on range between Deadwood River and Gordon Valley, in Boise Co., Idaho, reached by trail from Gordon Valley to Deadwood to summit, thence $1\frac{1}{2}$ miles northwest on ridge of mountain.

Permanent mark: A stake driven in flat surface, about 5 feet square, amidst a group of rocks. Reference mark: A lone tree about 5 feet north of station.

[Latitude, $44^{\circ} 10' 52''$.00. Longitude, $115^{\circ} 47' 24''$.25.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Squaw..... | 68 32 19.09 | 248 06 19.28 | 4.7296846 |
| Shafer..... | 27 59 17.03 | 207 46 46.40 | 4.7119787 |
| Big Willow..... | 93 11 43.84 | 272 44 06.00 | 4.7233831 |
| Middle Weiser.... | 147 07 56.62 | 326 48 12.80 | 4.8461400 |

SNOWY SIDE.

A high granite peak at head waters of South Boise, Payette, and Solomon rivers, in Alturas Co., Idaho, about 15 miles west of Saw Tooth City.

Permanent mark: A small stone monument.

[Latitude, $43^{\circ} 56' 16''$.25. Longitude, $114^{\circ} 58' 21''$.50.]

| To station.. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| North | 44 30 08.63 | 224 11 09.28 | 4.7218576 |
| Smoky Dome | 356 42 29.43 | 176 43 56.91 | 4.6948826 |

MITCHELL.

On Mitchell Butte, in Malheur Co., Oreg., just north of Owyhee River.
Permanent mark: A large pile of rocks.

[Latitude, $43^{\circ} 46' 12''$.59. Longitude, $117^{\circ} 10' 52''$.19.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pickels | 309 31 40.33 | 129 51 01.33 | 4.6903732 |
| Caldwell | 280 23 51.60 | 100 43 58.32 | 4.5991384 |
| Weiser | 202 04 09.00 | 22 15 40.00 | 4.7741042 |

CALDWELL.

A low sage brush hill on the north bench of the Boise River, in Ada Co., Idaho, about 2 miles north of Caldwell, just where the bridge crosses the river..

[Latitude, $43^{\circ} 42' 16''$.52. Longitude, $116^{\circ} 41' 46''$.82.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Star | 251 12 45.26 | 71 24 21.35 | 4.3762960 |
| Pickels | 3 21 32.51 | 183 20. 49.25 | 4.3813222 |
| Mitchell | 100 43 58.32 | 280 23 51.60 | 4.5991384 |

STAR.

On sand ridge 3 miles to the north of Star post-office, Ada Co., Idaho.

Permanent mark: A wooden stake.

[Latitude, $43^{\circ} 46' 23''$.49. Longitude, $116^{\circ} 25' 00''$.00.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lucky Peak | 303 05 54.18 | 123 20 34.46 | 4.5329758 |
| S. Ridge No. 1 | 332 09 34.49 | 152 17 21.30 | 4.5122886 |
| Squaw | 180 42 11.51 | 000 42 21.25 | 4.4065461 |
| Pickels Butte | 37 15 21.63 | 217 03 03.62 | 4.5987971 |
| Caldwell | 71 24 21.35 | 251 12 45.26 | 4.3762960 |
| Initial Point | 357 47 50.18 | 177 48 42.68 | 4.6495404 |

SHAFER.

Highest rocky point on mountains north of Boise City, in Boise Co., Idaho, at head of Shafer Creek.

Permanent mark: Rock monument 6 feet high.

[Latitude, $43^{\circ} 46' 16''$.45. Longitude, $116^{\circ} 05' 25''$.26.]

| To station. | Azimuth. | | | Back azimuth. | | | Log dist. |
|--------------------|----------|----|-------|---------------|----|-------|-----------|
| | ° | ' | " | ° | ' | " | Meters. |
| Lucky Peak | 353 | 06 | 10.16 | 173 | 07 | 18.99 | 4.2697214 |
| South Ridge No. 1. | 21 | 24 | 21.58 | 201 | 18 | 37.63 | 4.4867354 |
| Flat Top..... | 48 | 58 | 55.13 | 228 | 26 | 01.53 | 4.9328902 |
| Cinder | 352 | 46 | 41.85 | 172 | 50 | 39.05 | 4.7915183 |
| House | 307 | 33 | 50.99 | 127 | 58 | 43.23 | 4.7881882 |
| North..... | 289 | 35 | 18.35 | 110 | 02 | 39.92 | 4.7520931 |
| Camas | 317 | 25 | 28.26 | 137 | 52 | 30.77 | 4.8953144 |
| Packer John | 207 | 46 | 46.40 | 27 | 59 | 17.03 | 4.7119787 |

WEST BASE.

This end of Boise base is located about 2 miles southwest of Boise City, in Ada Co., Idaho, on the second bench from the river, in a sage brush flat.

Permanent mark: A copper bolt sunk in a dressed block of sandstone.

[Latitude, $43^{\circ} 35' 14''$.19. Longitude, $116^{\circ} 14' 49''$.70.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Astronomical Pier.... | 240 | 18 | 12.14 | 60 | 19 | 25.00 | 3.4359450 |
| East Base..... | 307 | 28 | 48.49 | 127 | 31 | 54.61 | 3.8830977 |
| South Ridge No. 1.... | 349 | 39 | 06.42 | 169 | 39 | 51.93 | 3.9170050 |
| Table Rock..... | 265 | 19 | 26.19 | 85 | 23 | 37.41 | 3.9138471 |

EAST BASE.

This end of the Boise base is located on a rocky point about 6 miles southeast of Boise City, in Ada Co., Idaho, on the second bluff above the river, close to the old overland road where it climbs the bluff and south of this road.

Permanent mark: A copper bolt sunk in a sandstone rock.

[Latitude, $43^{\circ} 32' 43''$.47. Longitude, $116^{\circ} 10' 19''$.64.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Astronomical Pier.... | 148 | 26 | 41.15 | 328 | 24 | 47.84 | 3.8479314 |
| West Base..... | 127 | 31 | 54.61 | 307 | 28 | 48.49 | 3.8850977 |
| South Ridge No. 1.... | 52 | 50 | 22.17 | 232 | 48 | 01.67 | 3.7596442 |

ASTRONOMICAL PIER.

The astronomical station from which the positions of all triangulation stations in Idaho were determined is on the plains south of Boise City, in Ada Co., Idaho, in the NW. $\frac{1}{4}$, sec. 16, T. 3 N., R. 2 E. of Boise

Meridian, being 50 feet south of the Nampa Land, Lumber and Irrigation Company's canal and 200 feet east of county road from Boise to Kuna. It is marked by one cubic yard of cemented concrete under the ground, upon which is built a brick pier laid in cement. Longitude determined by telegraphic connection with Saint Louis, Mo., by R. S. Woodward and W. T. Griswold. Latitude determined by Tolcott method.

[Latitude, $43^{\circ} 35' 57''$.98. Longitude, $116^{\circ} 13' 04''$.04.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| East Base..... | 328 24 47.84 | 148 26 41.15 | 3.8479314 |
| West Base..... | 60 19 25.00 | 240 18 12.14 | 3.4359450 |

TABLE ROCK.

Located on the southeast end of table rock, a prominent landmark 2 miles east of Boise City, in Ada Co., Idaho.

Permanent mark: A rock monument, 6 feet high, 5 feet base.

[Latitude, $43^{\circ} 35' 35''$.69. Longitude, $116^{\circ} 08' 45''$.34.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| South Ridge No. 1. | 37 19 39.31 | 217 16 13.76 | 4.0433493 |
| West Base..... | 85 23 37.41 | 265 19 26.19 | 3.9138471 |
| South Ridge No. 2. | 348 37 33.79 | 108 38 55.03 | 4.1284681 |

LUCKY PEAK.

A round-topped bald mountain, called Shaws Mountain, in Ada Co., Idaho, between Moores Creek and Boise River.

Permanent mark: A rock monument 6 feet high, 5 feet base.

[Latitude, $43^{\circ} 36' 17''$.84. Longitude, $116^{\circ} 03' 45''$.61.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| South Ridge No. 1. | 53 07 21.29 | 233 00 29.19 | 4.2251047 |
| South Ridge No. 2. | 15 45 31.35 | 195 43 26.13 | 4.1773476 |
| Three Point..... | 316 51 44.90 | 136 57 00.58 | 4.1775766 |
| Shafer..... | 173 07 18.99 | 353 06 10.16 | 4.2697214 |
| Star..... | 123 20 34.46 | 303 05 54.18 | 4.5329758 |
| Squaw..... | 147 36 06.81 | 327 21 34.40 | 4.7193885 |
| Quicksilver..... | 35 05 16.65 | 214 40 44.51 | 4.9274756 |
| Initial Point..... | 46 12 04.46 | 225 58 20.50 | 4.5722373 |

SOUTH RIDGE NO. 1.

Located on a salient of the third bluff, in Ada Co., Idaho, south of the Boise River.

Permanent mark: A 2-inch stake driven in the ground.

[Latitude, 43° 30' 50''-88. Longitude, 116° 13' 43''-64.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| West Base..... | 169 39 51·93 | 349 39 06·42 | 3·9170050 |
| East Base | 232 48 01·67 | 52 50 22·17 | 3·7596442 |
| Table Rock..... | 217 16 13·76 | 37 19 39·31 | 4·0433493 |
| South Ridge No. 2. | 295 05 57·87 | 115 10 44·46 | 4·0141441 |
| Lucky Peak..... | 233 00 29·19 | 53 07 21·29 | 4·2251047 |
| Star | 152 17 21·30 | 332 09 34·49 | 4·5122886 |
| Shafer..... | 201 18 37·63 | 21 24 21·58 | 4·4867354 |
| Pickels Butte | 85 59 47·65 | 265 39 45·80 | 4·5947018 |

SOUTH RIDGE NO. 2.

Located on dividing ridge between Indian Creek and Boise River, in Ada Co., Idaho, one-fourth mile south of overland road.

Permanent mark: A 2-inch stake driven in ground.

[Latitude, 43° 28' 28''-67. Longitude, 116° 06' 47''-39.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Table Rock..... | 168 38 55·03 | 348 37 33·79 | 4·1284681 |
| South Ridge No. 1. | 115 10 44·46 | 295 05 57·87 | 4·0141441 |
| Lucky Peak | 195 43 26·13 | 15 45 31·35 | 4·1773476 |
| Three Point | 256 18 09·94 | 76 25 30·34 | 4·1701353 |

THREE POINT.

The western of a group of three bald mountains on the south of the Boise River in Elmore Co., Idaho, between the heads of Grouse Creek and Blocks Creek.

Permanent mark: A small stone monument.

[Latitude, 43° 30' 21''-70. Longitude, 115° 56' 07''-48.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lucky Peak | 136 57 00·58 | 316 51 44·90 | 4·1775766 |
| South Ridge No. 2. | 76 25 30·34 | 256 18 09·94 | 4·1701353 |

PICKELS BUTTE.

A lava butte on the north bank of Snake River, in Ada Co., Idaho, about 3 miles north of Warm Spring ferry.

[Latitude, 43° 29' 18''-21. Longitude, 116° 42' 49''-56.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Star | 217 03 03·62 | 37 15 21·63 | 4·5987971 |
| South Ridge No. 1. | 265 39 45·80 | 85 59 47·65 | 4·5947018 |
| Caldwell..... | 183 20 49·25 | 3 21 32·51 | 4·3813222 |
| Mitchell..... | 129 51 01·33 | 309 31 40·33 | 4·6903732 |

INITIAL POINT.

Small black butte on Snake River plains, in Ada Co., Idaho, 4 miles from Kuna (south) Station on Oregon Short Line Railroad. Initial point of the land survey of Idaho.

[Latitude, $43^{\circ} 22' 18''$. 20. Longitude, $116^{\circ} 23' 42''$. 80.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lucky Peak | 225 58 20.50 | 46 12 04.46 | 4.5722373 |
| Star | 177 48 42.68 | 357 47 50.18 | 4.6495404 |

FLAT TOP.

A long, flat-topped mountain in Owyhee Co., Idaho, locally known as Squaw Mountains, between Reynold Creek and Jump Creek, at the head of Squaw Creek.

Permanent mark: A monument of slab rock at the south end of the mountain.

[Latitude, $43^{\circ} 15' 44''$. 31. Longitude, $116^{\circ} 53' 11''$. 56.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shafer..... | 228 26 01.53 | 48 58 55.18 | 4.9328902 |
| Cinder..... | 273 31 17.91 | 94 07 57.53 | 4.8609823 |
| Quicksilver..... | 329 21 45.09 | 149 31 04.79 | 4.5611815 |

QUICKSILVER.

Highest peak to the northeast of Silver City, Owyhee Co., Idaho.

Permanent mark: A large stone monument.

[Latitude, $42^{\circ} 58' 48''$. 47. Longitude, $116^{\circ} 39' 32''$. 46.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Flat Top..... | 149 31 04.79 | 329 21 45.09 | 4.5611815 |
| Lucky Peak | 214 40 44.51 | 35 05 16.65 | 4.9274756 |

CINDER.

Cinder Cone, 200 feet high, in Ada Co., Idaho, 12 miles southwest of Cleft, a station on Union Pacific Railroad.

Permanent mark: A rock monument 8 feet high.

[Latitude, $43^{\circ} 13' 07''$. 26. Longitude, $115^{\circ} 59' 40''$. 65.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shafer..... | 172 50 39.05 | 352 46 41.85 | 4.7915183 |
| Flat Top..... | 94 07 57.53 | 273 31 17.91 | 4.8609823 |
| House..... | 239 42 37.95 | 60 03 26.16 | 4.6756929 |

NORTH.

Highest peak in Granite range, in Elmore Co., Idaho, between Smith Prairie and Trinity lakes, three-fourths of a mile to east from the trail to Smith Prairie from Rocky Bar.

Permanent mark: A large sharp-pointed rock on highest peak.

[Latitude, $43^{\circ} 35' 54''$ -90. Longitude, $115^{\circ} 25' 48''$ -56.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shafer | 110 02 39.92 | 289 35 18.35 | 4.7526931 |
| House | 14 33 10.22 | 194 30 43.82 | 4.2795957 |
| Camas | 000 40 04.62 | 180 39 50.79 | 4.5898895 |
| Green Springs | 315 28 31.54 | 135 49 49.15 | 4.7770614 |
| Smoky Dome | 286 16 52.80 | 106 37 14.71 | 4.6182232 |
| Snowy Side | 224 11 09.28 | 44 30 08.63 | 4.7218576 |

HOUSE.

A bald mountain in the bend of the South Boise River, in Elmore Co., Idaho, between Smith Prairie and Little Camas Prairie.

Permanent mark: A monument of stone on west end.

[Latitude, $43^{\circ} 25' 57''$ -75. Longitude, $115^{\circ} 29' 21''$ -53.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shafer | 127 58 43.23 | 307 33 50.99 | 4.7881882 |
| Cinder | 60 03 26.16 | 239 42 37.95 | 4.6756929 |
| North | 194 30 43.82 | 14 33 10.22 | 4.2795957 |

CAMAS.

High bald mountain between Mountain Home and Camas Prairie, in Elmore Co., Idaho, 2 miles east of road from Mountain Home to Rocky Bar.

Permanent mark: A stone monument 7 feet high.

[Latitude, $43^{\circ} 14' 54''$ -66. Longitude, $115^{\circ} 26' 08''$ -64.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shafer | 137 52 30.77 | 317 25 26.26 | 4.8953144 |
| North | 180 39 50.79 | 000 40 04.62 | 4.5898895 |
| Smoky Dome | 235 55 54.90 | 56 16 26.69 | 4.6871167 |

SMOKY DOME.

A dome-shaped peak in the range to the north of Camas Prairie about north of Soldier Creek, in Logan Co., Idaho.

Permanent mark: A stone monument.

[Latitude, $43^{\circ} 29' 33''$ -93. Longitude, $114^{\circ} 56' 14''$ -94.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| North | 106 37 14.71 | 286 16 52.80 | 4.6182232 |
| Camas | 56 16 26.69 | 235 55 54.90 | 4.6871167 |
| Green Springs | 356 26 17.82 | 176 27 16.58 | 4.4927915 |
| Kelly Mountain | 269 59 16.56 | 90 18 39.94 | 4.5795620 |
| Snowy Side | 176 43 56.91 | 356 42 29.43 | 4.6948826 |

KELLY MOUNTAIN.

High bald peak, northwest from Hailey Hot Springs, in Logan Co., Idaho, on same mountain as Red Elephant Mine.

Permanent mark: Rock monument.

[Latitude, $43^{\circ} 29' 30'' \cdot 71$. Longitude, $114^{\circ} 28' 04'' \cdot 61$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Smoky Dome | 90 18 39·94 | 269 59 16·56 | 4·5795620 |
| Green Springs | 49 34 58·31 | 229 16 36·08 | 4·6773992 |

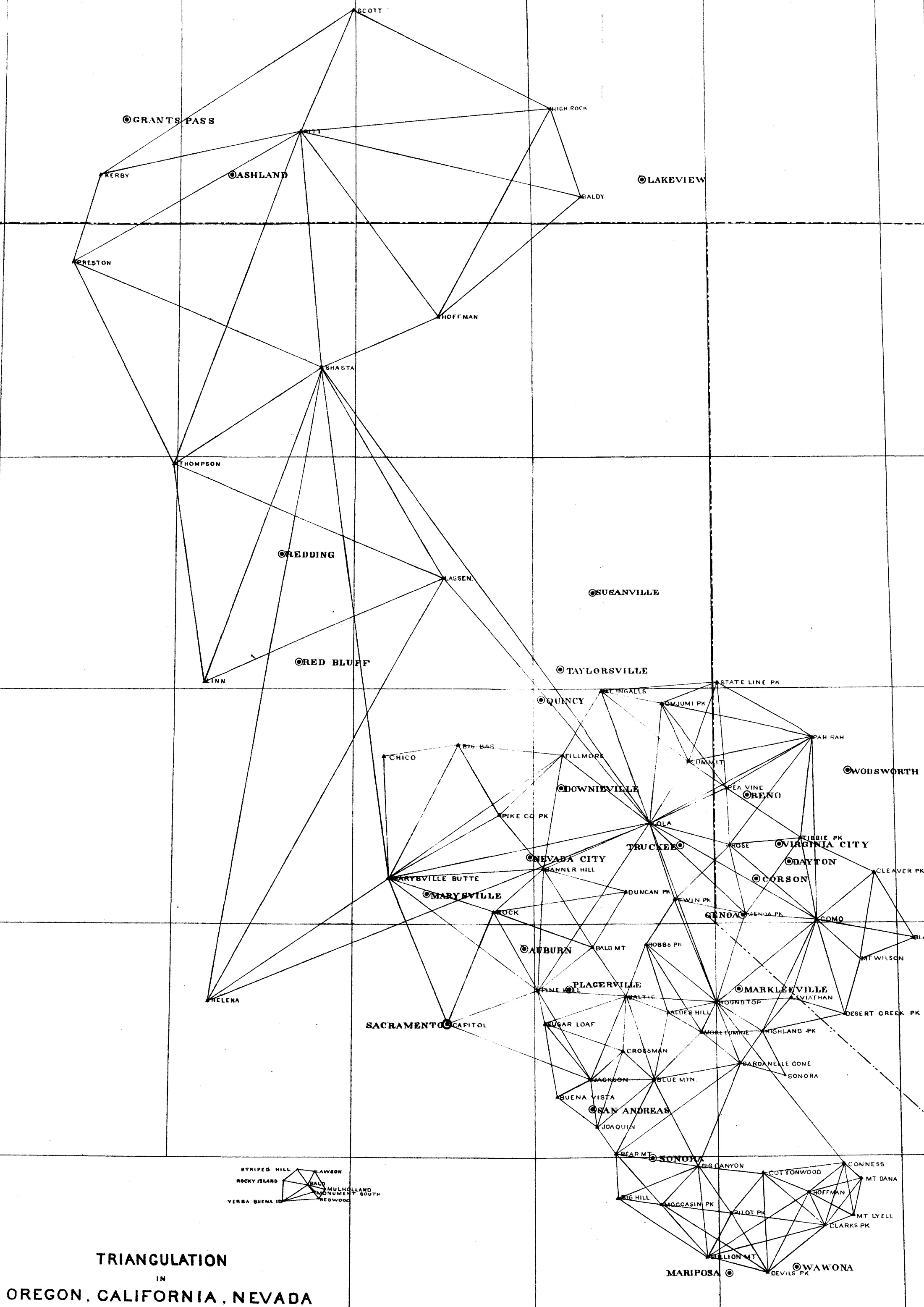
GREEN SPRINGS.

High flat mountain, in Logan Co., Idaho, on ridge between Camas Prairie and King Hill Creek, about 4 miles south of Camas Prairie.

Permanent mark: A large stone monument.

[Latitude, $43^{\circ} 12' 48'' \cdot 03$. Longitude, $114^{\circ} 54' 49'' \cdot 34$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| North | 135 49 49·15 | 315 28 31·54 | 4·7770614 |
| Smoky Dome | 176 27 16·58 | 356 26 17·82 | 4·4927915 |
| Kelly Mountain .. | 229 16 36·68 | 49 34 58·31 | 4·6773992 |



CALIFORNIA, NEVADA, AND SOUTHERN OREGON.

METHODS OF WORK.

The triangulation of California is in three separate and independent sections, namely, the Cascade section, in northern California and southern Oregon; the Gold Belt section, including the Sierras from Red Bluff to Yosemite Valley, and from the Sacramento Valley eastward well into Nevada. The third section includes a few stations in the Coast Range, southeast of San Francisco.

The first work was done in 1882 and continued in 1883 by Gilbert Thompson in the vicinity of Mount Shasta. Work was carried forward in this section by Mark B. Kerr and Eugene Ricksecker until 1886 and by W. T. Griswold in 1887. All distances, azimuths, and positions depend on the position of Lassen and on the line Lassen-Shasta, as computed by E. M. Douglas from unclosed triangles of the U. S. Coast and Geodetic Survey. The instrument used was an 8-inch 10-second vernier theodolite. Natural points were generally sighted and single and double angles measured by circle readings. The work was all adjusted by least squares.

In the Gold Belt section work was commenced in 1885 by H. M. Wilson, who measured a base line with steel tape near Oroville for temporary use. The distances thus obtained were afterwards replaced by others depending on the U. S. Coast and Geodetic Survey transcontinental line Marysville Butte-Pine Hill, afterwards checked by the lines between Lola, Pine Hill, Round Top and Pah Rah and Como. The instrument used for nearly all the work was an 8-inch 10-second theodolite. A few angles were measured in 1885 with a 7-inch theodolite. The method of circle readings was generally adopted for measuring angles, and least-square adjustment was made for station and figure.

During the years from 1889 to 1893 the triangulation was carried on by H. E. C. Feusier, who located points as far south as the Yosemite Valley and eastward into Nevada to Walker Lake. A few stations in California and Nevada, in the vicinity of Taylorsville, Cal., were occupied in 1890 by E. M. Douglas, using an 8-inch micrometer theodolite. The initial stations for this work were Lola-Pah Rah, two stations of the U. S. Coast and Geodetic Survey transcontinental triangulation.

In this work good, bare, natural peaks were found on nearly all of the stations occupied in the Oregon and Nevada portions of the work. On these, stone monuments were erected to mark the stations and serve as signals. In the Gold Belt work, however, many of the hills were timbered or were so flat on top as to require the construction of special signals. In some cases these consisted of trimmed trees to mark the

station and serve as signals. In a few instances, high observing scaffolds were built, notably in the case of Pike County Peak, where the signal was placed on such a scaffold 66 feet in height. In many of the cases where the hills were heavily timbered, heliotropes were used extensively as signals and the stations marked by small cairns of rock.

DESCRIPTIONS AND POSITIONS OF STATIONS.

SCOTT.

Sharp point in Klamath Co., Oreg., 2 miles east of Crater Lake.

[Latitude, $42^{\circ} 55' 18''$.9. Longitude, $122^{\circ} 01' 00''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pitt..... | 24 53 30 | 204 41 19 | 4.7675002 |

HIGH ROCK.

Situated in Lake Co., Oreg., about 16 miles northeast of Bly.

[Latitude, $42^{\circ} 29' 42''$.7. Longitude, $120^{\circ} 52' 40''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pitt..... | 87 42 17 | 266 44 00 | 5.0734618 |
| Baldy..... | 342 33 06 | 162 39 32 | 4.6428586 |

PITT.

A sharp point in Jackson Co., Oreg., 12 miles due west of Klamath Lake. Elevation, 9,760.

[Latitude, $42^{\circ} 26' 36''$.4. Longitude, $122^{\circ} 18' 58''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shasta..... | 354 58 25 | 175 03 16 | 5.0625150 |
| Thompson..... | 19 29 14 | 199 01 49 | 5.2386588 |
| High Rock..... | 266 44 00 | 87 42 17 | 5.0734618 |
| Baldy..... | 284 48 52 | 105 53 22 | 5.1356498 |
| Scott..... | 204 41 19 | 24 53 30 | 4.7675002 |
| Hoffman..... | 325 26 50 | 145 57 28 | 5.0494781 |
| Kerby..... | 75 35 29 | 254 49 12 | 4.9697085 |
| Preston..... | 58 08 48 | 237 16 37 | 5.1029871 |

KERBY.

High point on north end of ridge, 10 miles east of Kerby, Josephine Co., Oreg.

[Latitude, $42^{\circ} 13' 08''$.2. Longitude, $123^{\circ} 27' 42''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dis. |
|--------------|-----------|---------------|-----------|
| | ° ' " | ° ' " | Meters. |
| Preston..... | 16 18 25 | 196 12 22 | 4.6489509 |
| Pitt..... | 254 49 12 | 75 35 29 | 4.9897085 |

BALDY.

Prominent butte 6 miles southeast of Fall River Mills, Shasta Co., Cal.

[Latitude, $42^{\circ} 07' 03''$.7. Longitude, $120^{\circ} 43' 06''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pitt..... | 105 53 22 | 284 48 52 | 5.1356498 |
| Hoffman..... | 51 09 25 | 230 35 59 | 4.9512523 |
| High Rock..... | 162 39 32 | 342 33 06 | 4.6428586 |

PRESTON.

High peak in Siskiyou Range, at the head of Preston Creek, Del Norte Co., Cal.

[Latitude, $41^{\circ} 50' 01''$.7. Longitude, $123^{\circ} 36' 44''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pitt..... | 237 16 37 | 58 08 48 | 5.1029871 |
| Thompson..... | 331 47 06 | 152 11 18 | 5.0356372 |
| Kerby..... | 196 12 22 | 16 18 25 | 4.6489509 |

HOFFMAN.

Rounded butte in Siskiyou Co., Cal., 1 mile northeast of Medicine Lake.

[Latitude, $41^{\circ} 36' 35''$.7. Longitude, $121^{\circ} 33' 13''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pitt..... | 145 57 28 | 325 26 50 | 5.0494781 |
| Shasta..... | 67 27 32 | 247 02 02 | 4.7639981 |
| Baldy..... | 230 35 59 | 51 09 25 | 4.9512523 |

SHASTA.

The highest peak in northern California, in Siskiyou Co., 6 miles northeast of Berryvale.

[Latitude, $41^{\circ} 24' 27''$.6. Longitude, $122^{\circ} 11' 42''$.9.]

| To station. | Azimuth. | Back azimuth. | Log dist. |
|---------------|-----------|---------------|-----------|
| | ° ' " | ° ' " | Meters. |
| Linn..... | 20 17 26 | 199 51 37 | 5.2103160 |
| Thompson..... | 54 39 51 | 234 07 57 | 4.9207588 |
| Pitt..... | 175 03 16 | 354 58 25 | 5.0625150 |
| Hoffmann..... | 247 02 02 | 67 27 32 | 4.7639981 |

THOMPSON.

Sixteen miles north of Junction City, in Trinity Co., Cal.

[Latitude, $40^{\circ} 58' 15'' \cdot 2$. Longitude, $123^{\circ} 00' 09'' \cdot 9$.]

| To station. | Azimuth. | Back azimuth. | Log dist. |
|---------------|-----------|---------------|-----------|
| | ° ' " | ° ' " | Meters. |
| Pitt | 199 01 49 | 19 29 14 | 5·2386588 |
| Shasta | 234 07 57 | 54 39 51 | 4·9207588 |
| Lassen | 292 32 14 | 113 30 51 | 5·1381783 |
| Preston | 152 11 18 | 331 47 06 | 5·0356372 |

LASSEN.

Highest peak in Shasta Co., Cal.

[Latitude, $40^{\circ} 29' 12'' \cdot 0$. Longitude, $121^{\circ} 30' 19'' \cdot 0$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Linn | 66 49 53 | 245 57 34 | 5·0078405 |
| Thompson | 113 30 51 | 292 32 14 | 5·1381783 |

LINN.

Highest peak in the Yallo Bally Mountains, Tehama Co., Cal., near its boundary with Trinity County.

[Latitude, $40^{\circ} 02' 05'' \cdot 7$. Longitude, $122^{\circ} 51' 16'' \cdot 5$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lassen | 245 57 34 | 66 49 53 | 5·0978405 |
| Shasta | 199 51 37 | 20 17 26 | 5·2103160 |

STATE LINE PEAK.

Local name, Fort Sage Peak. Highest point of mountain. Due east of Long Valley Post-Office (Doyle's ranch).

Permanent mark: Rock monument, about in center of hilltop.

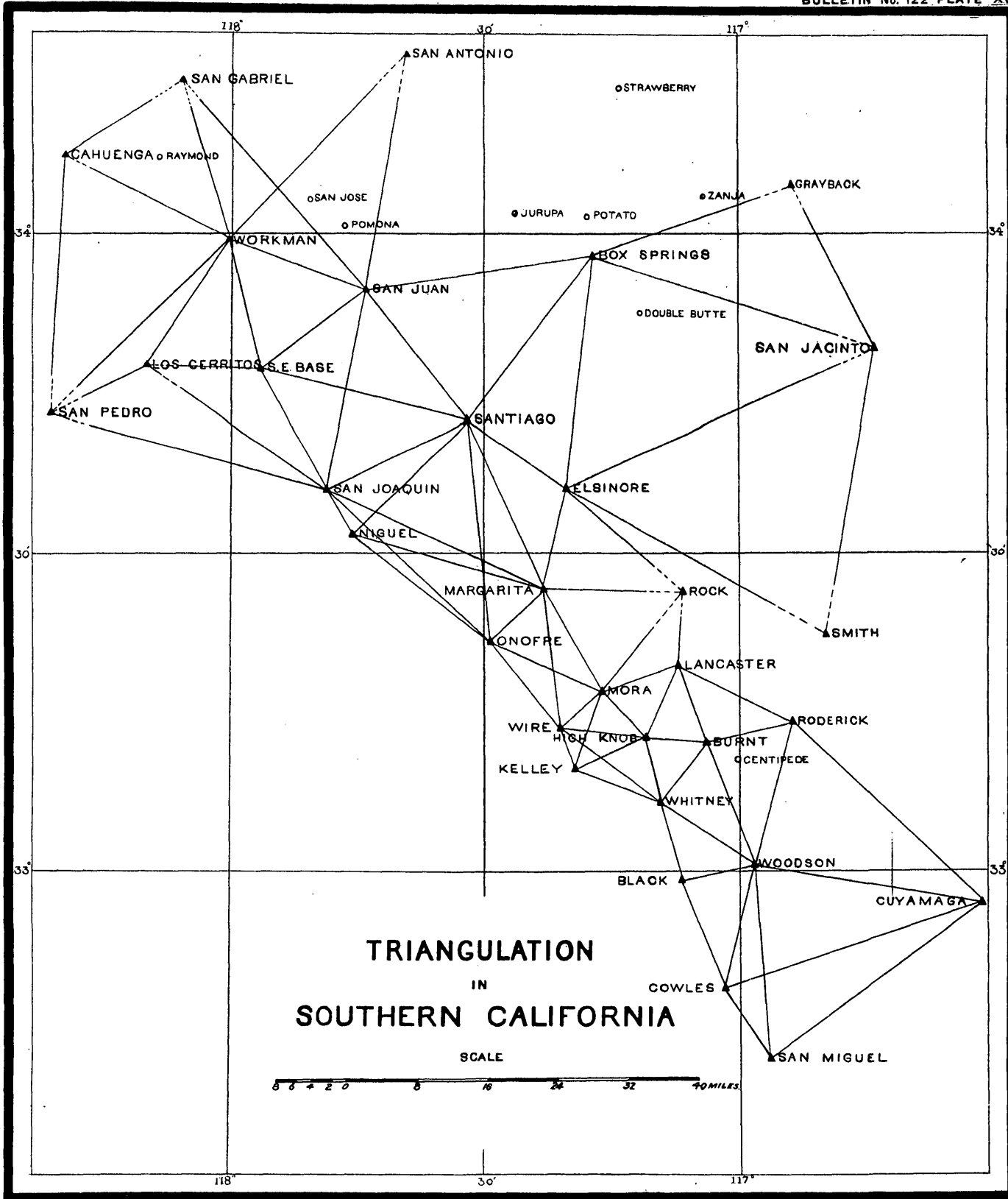
[Latitude, $40^{\circ} 01' 42'' \cdot 1$. Longitude, $119^{\circ} 58' 45'' \cdot 4$.]

MOUNT INGALLS.

A high, bare-topped peak about 20 miles from Beckwith post-office, down Red Clover Valley and 6 miles west of Chase's ranch.

Permanent mark: A rock monument.

[Latitude, $39^{\circ} 59' 33'' \cdot 7$. Longitude, $120^{\circ} 37' 40'' \cdot 1$.]



OMJUMI PEAK.

Local name, Dixie Peak. Highest peak on west side of Last Chance Valley. Station is about the center one, of three or four equally high peaks close together.

Permanent mark: Stone cairn.

[Latitude, $39^{\circ} 56' 14''$.-18. Longitude, $120^{\circ} 17' 08''$.0.]

PAH RAH (C. AND G. S. STATION).

[Latitude, $39^{\circ} 47' 34''$.-73. Longitude, $119^{\circ} 28' 28''$.-74.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lola | 62 35 59.68 | 242 01 55.06 | 4.9364404 |

SUMMIT.

A station of the Wheeler survey; the westernmost of two high rocky peaks, about 2 miles north of where old stage road from Long Valley Creek to Loyaltan crosses the divide.

Permanent mark: A rock cairn about 8 feet high.

[Latitude, $39^{\circ} 42' 03''$.-5. Longitude, $120^{\circ} 08' 37''$.-3.]

BIG BAR HILL.

A high, round topped, heavily timbered hill in Butte Co., Cal., 8 miles north of Merrimac Mills and 6 miles northwest of Mountain House.

Permanent mark: Cairn of rocks under observing tripod, 15 feet high, beneath two tall firs on highest point of hill.

[Latitude, $39^{\circ} 46' 32''$.-7. Longitude, $121^{\circ} 25' 40''$.-0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Marysville Butte .. | 28 11 22 | 207 56 22 | 4.8506666 |
| Fillmore | 275 51 43 | 96 13 46 | 4.6950446 |
| Chico | 81 00 23 | 260 44 17 | 4.5615898 |

CHICO.

In Butte Co., Cal.

Permanent mark: Flagstaff in center of top of waterworks tower, near railroad depot.

[Latitude, $39^{\circ} 43' 25''$.-2. Longitude, $121^{\circ} 50' 51''$.-3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Marysville Butte .. | 357 42 48 | 177 43 49 | 4.7611889 |
| Big Bar Hill | 260 44 17 | 81 00 23 | 4.5615898 |

FILLMORE.

A high, bare-topped peak, situated in Sierra Co., Cal., 3 miles east of Howland Flat and 4 miles southeast of Gibsonville. Scattering timber on west side of hill.

Permanent mark: A pile of brush and rocks 10 feet high on highest point.

[Latitude, $39^{\circ} 43' 43''$.5. Longitude, $120^{\circ} 51' 10''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Marysville Butte. | 55 21 43 | 234 44 48 | 5.0070456 |
| Banner Hill..... | 10 16 15 | 190 11 56 | 4.7376420 |
| Big Bar Hill..... | 96 13 46 | 275 51 43 | 4.6950446 |

PEAVINE MOUNTAIN.

In Washoe Co., Nev., 7 miles northwest of the town of Reno, Nev., and 6 miles northeast of the town of Verdi, Cal.

Permanent mark: Rock monument.

[Latitude, $39^{\circ} 35' 07''$.4. Longitude, $119^{\circ} 55' 57''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rose..... | 357 24 14 | 177 24 47 | 4.4316384 |
| Tibbie Peak | 304 54 18 | 125 09 27 | 4.6204635 |

PIKE COUNTY PEAK.

High, timbered hill in Yuba Co., Cal., about 4 miles east of Brownsville and 1 mile southeast of Challenge Mills.

Permanent mark: Center of 66-foot spruce stump in center of 64-foot scaffold of standing stumps.

[Latitude, $39^{\circ} 28' 24''$.3. Longitude, $121^{\circ} 12' 10''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Marysville Butte. | 60 55 31 | 240 32 00 | 4.7860026 |
| Banner Hill | 321 09 27 | 141 18 28 | 4.5135932 |

LOLA.

U. S. C. & G. S. station, in Nevada Co., Cal. The south summit of the high ridge between Weber and Independence lakes, from either of which it can be reached.

Permanent mark: A cairn of rocks 10 feet high, under which is U. S. C. & G. S. drill hole.

[Latitude, 39° 25' 53''-3. Longitude, 120° 21' 55''-5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pine Hill | 34 32 04 | 214 08 25 | 4·9819924 |
| Marysville Butte | 79 06 06 | 258 10 46 | 5·1073108 |
| Round Top | 339 37 56 | 159 51 42 | 4·9592252 |
| Banner Hill | 68 18 57 | 247 56 07 | 4·7464188 |
| Pah Rah | 242 01 55 | 62 36 00 | 4·9364404 |

TIBBIE PEAK.

A high, bare, and rocky twin peak in Storey Co., Nev.; highest point on Flowery Ridge, 7 miles northwest of Virginia City. Station is on eastern and highest twin summit.

Permanent mark: Monument of rock 7 feet high.

[Latitude, 39° 22' 10''-7. Longitude, 119° 32' 07''-3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Rose | 84 52 08 | 264 37 33 | 4·5204370 |
| Como | 352 15 00 | 172 17 18 | 4·5931781 |
| Cleaver Peak | 295 56 53 | 116 12 09 | 4·5861595 |
| Peavine Mountain | 125 09 27 | 304 54 18 | 4·6204635 |

ROSE.

A peak on bare ridge, west of Washoe Valley, and 6 miles east by north from the town of Washoe, in Washoe Co., Nev.

Permanent mark: Rock monument.

[Latitude, 39° 20' 32''-3. Longitude, 119° 55' 05''-9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Genoa | 354 35 29 | 174 36 52 | 4·5255739 |
| Como | 312 52 50 | 133 09 39 | 4·7199236 |
| Peavine Mountain | 177 24 47 | 357 24 14 | 4·4316384 |
| Tibbie Peak | 264 37 33 | 84 52 08 | 4·5204370 |
| Twin Peak | 46 38 52 | 226 26 57 | 4·5722948 |

CLEAVER PEAK.

Often called Wabuska hill; a bare, rocky, flat topped peak, 6 miles east of north of the town of Wabuska, in Lyons Co., Nev.

Permanent mark: A cairn of rocks 8 feet high.

[Latitude, 39° 13' 01''-1. Longitude, 119° 08' 01''-9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Como | 53 29 16 | 233 16 22 | 4·5645136 |
| Tibbie Peak | 116 12 09 | 295 56 53 | 4·5861595 |
| Black Mountain .. | 327 57 11 | 148 05 37 | 4·5612553 |

BANNER HILL.

Station is about 3 miles southeast of Nevada City, Cal., and 5 miles northeast of Grass Valley, in Nevada Co.

Permanent mark: A large dead oak tree, marked U. S. G. S.

[Latitude, $39^{\circ} 14' 39''$.4. Longitude, $120^{\circ} 57' 56''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bald Mountain | 329 12 26 | 149 22 17 | 4·6446840 |
| Rock Mountain..... | 48 11 46 | 228 01 40 | 4·4914659 |
| Lola | 247 56 07 | 68 18 57 | 4·7464188 |
| Pine Hill..... | 2 07 57 | 182 07 01 | 4·7669790 |
| Duncan Peak..... | 285 53 09 | 106 10 27 | 4·6129737 |
| Fillmore..... | 190 11 56 | 10 16 15 | 4·7376420 |
| Pike County Peak..... | 141 18 28 | 321 09 27 | 4·5135932 |
| Marysville Butte..... | 86 50 11 | 266 17 44 | 4·8691326 |

MARYSVILLE BUTTE.

U. S. C. & G. Survey station, in Sutter Co., Cal., 10 miles north of west from Marysville and 5 miles southeast of Colusa.

Permanent mark: The southern and next to highest rock cropping on South Butte, the highest of the group.

[Latitude, $39^{\circ} 12' 15''$.7. Longitude, $121^{\circ} 49' 15''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Banner Hill | 266 17 44 | 86 50 11 | 4·8691326 |
| Capitol | 337 47 17 | 157 59 36 | 4·8772911 |
| Big Bar Hill..... | 207 56 22 | 28 11 22 | 4·8566666 |
| Chico | 177 43 49 | 357 42 48 | 4·7611889 |
| Fillmore..... | 234 44 48 | 55 21 43 | 5·0070456 |
| Lola | 258 10 46 | 79 06 06 | 5·1073108 |
| Pike County Peak.... | 240 32 00 | 60 55 31 | 4·7860026 |
| Pine Hill | 306 37 37 | 127 08 57 | 4·9540856 |

DUNCAN PEAK.

Rocky and bare projection of a square partly timbered hill in Placer Co., 20 miles east of Iowa Hill, 25 miles northeast of Michigan Bluffs, and 8 miles southeast of Indian Springs.

Permanent mark: The highest point of the rock on southwest part of the hill.

[Latitude, $39^{\circ} 08' 32''$.1. Longitude, $120^{\circ} 30' 33''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Banner Hill | 106 10 27 | 285 53 09 | 4·6129737 |
| Bald Mountain..... | 32 35 05 | 212 27 41 | 4·4991272 |

TWIN PEAK.

This station is a bare rocky peak on a timbered ridge at the head of Blackwood Creek, 4 miles west of Lake Tahoe and 6 miles southwest of Tahoe city, in Placer Co., Cal.

Permanent mark: Rock monument.

[Latitude, $39^{\circ} 06' 39''$.3. Longitude, $120^{\circ} 13' 56''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Genoa | 284 08 30 | 104 21 45 | 4.4954839 |
| Rose | 226 26 57 | 46 38 52 | 4.5722948 |
| Round Top | 338 01 12 | 158 09 54 | 4.7299713 |
| Robbs Peak | 35 34 38 | 215 28 09 | 4.4078178 |

ROCK MOUNTAIN.

High bare hill in Nevada Co., Cal., 4 miles southwest of Spencer-ville and 12 miles east of Wheatland.

Permanent mark: Top of large bare rocky knob on summit.

[Latitude, $39^{\circ} 03' 28''$.0. Longitude, $121^{\circ} 13' 58''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pine Hill | 330 49 41 | 150 58 48 | 4.6353051 |
| Banner Hill | 228 01 40 | 48 11 46 | 4.4914659 |

GENOA PEAK.

In Douglas Co., Nev.; bare rocky cone on ridge between Carson Valley and Lake Tahoe and 4 miles northwest of the town of Genoa.

Permanent mark: Rock monument.

[Latitude, $39^{\circ} 02' 29''$.5. Longitude, $119^{\circ} 52' 54''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Round Top | 13 53 09 | 193 48 39 | 4.6372704 |
| Como | 273 46 30 | 94 01 54 | 4.5485606 |
| Rose | 174 36 52 | 354 35 29 | 4.5255739 |
| Twin Peak | 104 21 45 | 284 08 30 | 4.4954839 |

COMO.

U. S. C. & G. S. station on the Como Mountains, lying between Carson and Mason valleys, in Douglas Co., Nev. It is a bare, sharp cone, about 30 miles by road from either Carson City or Dayton. There is a spring

and camping ground at the head of Pine Mount Valley. From this place a trail leads to the summit.

Permanent mark: Stone monument, 12 feet high, over U. S. C. & G. S. mark.

[Latitude, $39^{\circ} 01' 11''$.4. Longitude, $119^{\circ} 28' 27''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Round Top..... | 49 12 53 | 228 53 03 | 4.7823826 |
| Genoa Peak..... | 94 01 54 | 273 46 30 | 4.5485606 |
| Black Mountain..... | 280 16 25 | 100 37 41 | 4.6958039 |
| Cleaver Peak..... | 233 16 22 | 53 29 16 | 4.5645136 |
| Desert Creek Peak..... | 343 02 38 | 163 08 36 | 4.6744512 |
| Highland Peak..... | 24 51 48 | 204 41 13 | 4.7663800 |
| Leviathan..... | 17 43 54 | 197 38 43 | 4.5952729 |
| Rose..... | 133 09 39 | 312 52 50 | 4.7199236 |
| Tibbie Peak..... | 172 17 18 | 352 15 00 | 4.5931781 |
| Mount Wilson..... | 310 37 13 | 130 46 47 | 4.4625328 |

BLACK MOUNTAIN.

A long timbered ridge in Walker River range of mountains. It lies between Mason Valley and Walker Lake, 15 miles southeast of town of Mason Valley (Poison Switch), in Esmeralda Co., Nev., and 10 miles south of west of Rio Vista railroad station. Summit cleared of timber.

Permanent mark: A lone tree.

[Latitude, $38^{\circ} 56' 19''$.4. Longitude, $118^{\circ} 54' 39''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cleaver Peak..... | 148 05 37 | 327 57 11 | 4.5612553 |
| Como..... | 100 37 41 | 280 16 25 | 4.6958039 |

MOUNT WILSON.

A bare peak, the northernmost summit of the range between Warm Spring Valley and Mason Valley, and 3 miles northeast of Wilson's ranch. In Lyon Co., Nev., on north side of Walker River.

Permanent mark: Rock monument.

[Latitude, $38^{\circ} 50' 57''$.9. Longitude, $119^{\circ} 13' 14''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Como..... | 130 46 47 | 310 37 13 | 4.4625328 |
| Desert Creek Peak..... | 17 32 28 | 197 28 53 | 4.4405014 |

ROBBS PEAK.

A brush-covered hill in Eldorado Co., Cal., 24 miles east by north from Georgetown, near the Uncle Tom's Cabin road, $1\frac{1}{2}$ miles west of Orellis Dairy ranch.

Permanent mark: Rock monument.

[Latitude, $38^{\circ} 55' 24''$.3. Longitude, $120^{\circ} 24' 14''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Round Top..... | 309 32 58 | 129 48 06 | 4.6573774 |
| Twin Peak..... | 215 28 09 | 35 34 38 | 4.4078178 |
| Alder Hill..... | 341 31 45 | 161 36 28 | 4.5390325 |

BALD MOUNTAIN.

High, heavily timbered point, in Eldorado Co., Cal., about 7 miles east of Georgetown. Nearest camp at Twelve Mile House.

Permanent mark: A stone cairn between two blazed pine trees.

[Latitude, $38^{\circ} 54' 09''$.2. Longitude, $120^{\circ} 42' 19''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Duncan..... | 212 27 41 | 32 35 05 | 4.4991272 |
| Baltic Peak..... | 324 41 42 | 144 48 49 | 4.4552510 |
| Pine Hill..... | 50 30 12 | 230 19 23 | 4.5074335 |
| Banner Hill..... | 149 22 17 | 329 12 26 | 4.6446840 |

PINE HILL.

U. S. C. & G. S. station, situated in Eldorado Co., Cal., 6 miles east of Salmon Falls and 3 miles northeast of Green Valley. Highest part of peak is bare.

Permanent mark: A cairn of rocks on northernmost of two rock croppings, situated 30 feet apart and on highest summit of hill.

[Latitude, $38^{\circ} 43' 04''$.4. Longitude, $120^{\circ} 59' 26''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Banner Hill..... | 182 07 01 | 2 07 57 | 4.7669790 |
| Marysville Butte.. | 127 08 57 | 306 37 37 | 4.9540856 |
| Bald Mountain.... | 230 19 28 | 50 30 12 | 4.5074335 |
| Baltic Peak..... | 273 43 37 | 94 01 26 | 4.6170650 |
| Capitol..... | 70 16 26 | 249 57 35 | 4.6681981 |
| Crossman..... | 305 10 38 | 125 27 45 | 4.6885248 |
| Jackson Butte.... | 330 46 53 | 150 56 57 | 4.6832661 |
| Lola..... | 214 08 25 | 34 32 04 | 4.9819924 |
| Rock Mountain... | 150 58 48 | 330 49 41 | 4.6353051 |

BALTIC PEAK.

The westernmost and highest spur of Baltic Ridge, situated in Eldorado Co., Cal., 4 miles due north of Grizzly Flat and 4 miles south-east of Sly Park.

Permanent mark: A cairn of rocks. There is a blazed oak 5 feet west of this cairn.

[Latitude, $38^{\circ} 41' 33'' \cdot 6$. Longitude, $120^{\circ} 30' 57'' \cdot 0$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pine Hill | 94 01 26 | 273 43 37 | 4·6170650 |
| Bald Mountain | 144 48 49 | 324 41 42 | 4·4552510 |
| Crossman | 3 29 42 | 183 29 03 | 4·4060125 |

ROUND TOP.

U. S. C. & G. S. station, situated in Alpine Co., Cal., about 4 miles south by west from Carson Pass and 6 miles east of Silver Lake, 4 miles southeast of Kirkwood's (on Amador road).

Permanent mark: Stone monument over U. S. C. & G. S. mark.

[Latitude, $38^{\circ} 39' 43'' \cdot 6$. Longitude, $120^{\circ} 00' 05'' \cdot 0$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Como | 228 53 03 | 49 12 53 | 4·7823826 |
| Genoa | 193 48 39 | 13 53 09 | 4·6372703 |
| Robbs Peak | 129 48 06 | 309 32 58 | 4·6573774 |
| Twin Peak | 158 09 54 | 338 01 12 | 4·7299713 |
| Alder Hill | 81 05 05 | 260 54 43 | 4·3870881 |
| Highland Peak | 301 49 44 | 121 58 56 | 4·4011548 |
| Lola | 159 51 42 | 339 37 56 | 4·9592252 |
| Mokelumne | 30 20 24 | 210 16 54 | 4·2075502 |

LEVIATHAN.

In Alpine Co., Cal., a bare peak on ridge east of Antelope Valley and northwest of the lower end of Slinkards Valley. It is 6 miles southwest of the Mountain House.

Permanent mark: A rock monument.

[Latitude, $38^{\circ} 40' 54'' \cdot 7$. Longitude, $119^{\circ} 36' 43'' \cdot 7$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Desert Creek Peak | 286 31 52 | 106 42 58 | 4·4297204 |
| Como | 197 38 43 | 17 43 54 | 4·5952729 |

DESERT CREEK PEAK.

A bare peak, the northernmost of the ridge between Desert Creek and the Carson-Aurora road. It is 3 miles south of Hall and Simpson's ranch, in Lyon Co., Nevada.

Permanent mark: A rock monument.

[Latitude, $38^{\circ} 36' 45''$. Longitude, $119^{\circ} 18' 58''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Como | 163 08 36 | 343 02 38 | 4.6744512 |
| Highland Peak | 78 37 23 | 258 20 55 | 4.5923509 |
| Mount Wilson | 197 28 53 | 17 32 28 | 4.4405014 |
| Leviathan | 106 42 58 | 286 31. 52 | 4.4297204 |

ALDER HILL (OFTEN CALLED LEAK SPRING HILL).

A timbered hill at the head of the north fork of the Cosumne River, 11 miles due east from Grizzly Flat and 10 miles west by south from Silver Lake, in Eldorado Co., Cal.

Permanent mark: A tree with limbs trimmed off and marked U. S. G. S.

[Latitude, $38^{\circ} 37' 40''$.0. Longitude, $120^{\circ} 16' 41''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Round Top | 260 54 43 | 81 05 05 | 4.3870881 |
| Robbs Peak | 161 36 28 | 341 31 45 | 4.5390325 |

CAPITOL.

The center of cupola of capitol building at Sacramento, Cal.

[Latitude, $38^{\circ} 34' 30''$.7. Longitude, $121^{\circ} 29' 38''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pine Hill | 249 57 35 | 70 16 26 | 4.6681981 |
| Jackson Butte | 291 03 20 | 111 32 09 | 4.8595054 |
| Marysville Butte | 157 59 36 | 337 47 17 | 4.8772911 |

SUGAR LOAF.

A high cone in Eldorado Co., Cal., 4 miles east of Latrobe.

Permanent mark: A lone digger pine which is blazed and has a cairn of rocks built against it. This tree is 35 feet east of the highest rock cropping on the hill and 8 feet below the summit.

[Latitude, $38^{\circ} 34' 43''$.0. Longitude, $120^{\circ} 56' 59''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Buena Vista | 354 51 13.55 | 174 52 32.79 | 4.5385235 |
| Jackson Butte | 323 09 16.23 | 143 17 47.43 | 4.5222681 |

MOKELUMNE.

A bare rocky peak on the north side of Mokelumne River Canyon and 9 miles due south from Silver Lake.

Permanent mark: Rock monument.

[Latitude, $38^{\circ} 32' 12''$. Longitude, $120^{\circ} 05' 41''$.34.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Highland Peak ... | 268 42 34 | 88 55 14 | 4.4705789 |
| Round Top | 210 16 54 | 30 20 24 | 4.2075502 |
| Dardanelle Cone.. | 307 17 38 | 127 25 56 | 4.3377463 |

HIGHLAND PEAK.

A bare rocky peak 8 miles west of Hermit Valley and 10 miles south of Markleeville, in Alpine Co., Cal. Local name is South Silver Mountain.

Permanent mark: Rock monument.

[Latitude, $38^{\circ} 32' 31''$. Longitude, $119^{\circ} 45' 21''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Como | 204 41 13 | 24 51 48 | 4.7663800 |
| Round Top | 121 58 56 | 301 49 44 | 4.4011548 |
| Dardanelle Cone.... | 33 24 30 | 213 20 10 | 4.2666422 |
| Desert Creek Peak.... | 258 20 55 | 78 37 23 | 4.5923509 |
| Mokelumne..... | 88 55 14 | 268 42 34 | 4.4705789 |
| Sonora..... | 333 31 32 | 153 35 01 | 4.3718484 |

CROSSMAN.

The highest point on wooded rise or knoll on the first ridge south of Sutter Creek, known as Crossman Mount or Mount Heckler. Twenty miles east of Jackson, on Antelope Spring road, or 7 miles a little south of east of Volcano and $1\frac{1}{2}$ miles northwest of Whitmore's sawmill. Hill covered with undergrowth and some timber.

Permanent mark: A small cairn of rocks.

[Latitude, $38^{\circ} 27' 49''$. Longitude, $120^{\circ} 32' 01''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pine Hill..... | 125 27 45 | 305 10 38 | 4.6385248 |
| Baltic Peak..... | 183 29 03 | 3 29 42 | 4.4060125 |
| Blue Mountain.... | 312 50 09 | 132 56 25 | 4.3025616 |
| Jackson Butte.... | 49 47 25 | 229 40 25 | 4.3326197 |

DARDANELLE CONE.

A bare lava cone, 4 miles north by east from the junction of the middle fork of the Stanislaus and Clark's fork of the Stanislaus. Bloods Station on Big Tree road is 12 miles northwest.

Permanent mark: A rock monument.

[Latitude, $38^{\circ} 24' 11''$.5. Longitude, $119^{\circ} 52' 20''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Highland Peak ... | 213 20 10 | 33 24 30 | 4.2666422 |
| Mokelumne..... | 127 25 56 | 307 17 38 | 4.3877463 |
| Bear Mountain ... | 55 54 12 | 235 17 44 | 4.8787191 |
| Sonora..... | ----- | 105 21 40 | 4.3309599 |

SONORA.

[Latitude, $38^{\circ} 21' 08''$.25. Longitude, $119^{\circ} 38' 09''$.18.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Dardanelle Cone.. | 105 21 39.62 | ----- | 4.3309599 |
| Highland Peak ... | 153 35 00.82 | 333 31 32.06 | 4.3718484 |

BLUE MOUNTAIN.

In Calaveras Co., Cal., between north and middle forks of Mokelumne River, on a very prominent hill, locally known as Blue Mountain, about 5 miles due north of Big Trees and 8 miles south of east of West Point. Station on summit of highest rock cropping on Blue Mountain.

[Latitude, $38^{\circ} 20' 26''$.2. Longitude, $120^{\circ} 21' 55''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Jackson Butte.... | 89 39 47 | 269 26 32 | 4.4933875 |
| Crossman..... | 132 56 25 | 312 50 09 | 4.3025616 |
| Bear Mountain.... | 28 28 57 | 208 20 46 | 4.6083280 |
| Joaquin | 51 42 48 | 231 30 44 | 4.5598667 |

JACKSON BUTTE.

Is situated in Amador Co., Cal., 3 miles southeast of Jackson, on an isolated, conical, very steep hill. It is covered with scattered timber which has been cleared from the summit, leaving a single tall oak as a signal.

Permanent mark: A + on a copper bolt, 34 feet north of signal tree,

the bolt projecting three-quarters of an inch above surface rock; over this are two flat stones and a cairn of rocks.

[Latitude, $38^{\circ} 20' 18'' \cdot 3$. Longitude, $120^{\circ} 43' 17'' \cdot 4$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Crossman..... | 229 | 40 | 25·00 | 49 | 47 | 25·00 | 4·3326197 |
| Pine Hill..... | 150 | 56 | 57·00 | 330 | 46 | 53·00 | 4·6832661 |
| Blue Mountain.... | 269 | 26 | 32·00 | 89 | 39 | 47·00 | 4·4933875 |
| Buena Vista..... | 65 | 22 | 42·00 | 245 | 15 | 32·00 | 4·2687901 |
| Joaquin..... | 352 | 59 | 35·00 | 173 | 00 | 47·00 | 4·3514767 |
| Sugar Loaf..... | 143 | 17 | 47·43 | 323 | 09 | 16·23 | 4·5222831 |
| Capitol..... | 111 | 32 | 09·00 | 291 | 03 | 20·00 | 4·8505054 |

BUENA VISTA.

Situated on center of north side of prominent hill locally known as Buena Vista Butte, in Amador Co., Cal., $5\frac{1}{2}$ miles south of Ione and 1 mile south of Buena Vista.

Permanent mark: Tall, lone Digger pine tree on north central side of butte, blazed and marked U. S. G. S. This tree is 125 feet east and 10 feet below the highest rock outcropping of the hill.

[Latitude, $38^{\circ} 16' 06'' \cdot 8$. Longitude, $120^{\circ} 54' 51'' \cdot 8$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Joaquin..... | 306 | 27 | 26·00 | 126 | 35 | 45·00 | 4·3879729 |
| Jackson Butte.... | 245 | 15 | 32·00 | 65 | 22 | 42·00 | 4·2687901 |
| Sugar Loaf..... | 174 | 52 | 32·79 | 354 | 51 | 13·55 | 4·5385235 |

JOAQUIN.

In Calaveras Co., Cal., $3\frac{1}{2}$ miles south of San Andreas, on southernmost high point of Hogback Ridge. Station on the high, rocky outcrop rising from the north end of a thicket of chaparral. Finders, a clump of trees 300 yards north of station on highest point of summit.

[Latitude, $38^{\circ} 03' 15'' \cdot 2$. Longitude, $120^{\circ} 41' 24'' \cdot 9$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Blue Mountain.... | 231 | 30 | 44 | 51 | 42 | 48 | 4·5598667 |
| Jackson Butte.... | 173 | 00 | 47 | 352 | 59 | 35 | 4·3514767 |
| Buena Vista..... | 126 | 35 | 45 | 306 | 27 | 26 | 4·3879729 |

BEAR MOUNTAIN.

Highest point on ridge, 5 miles southwest of Angels, in Calaveras Co., Cal.

[Latitude, $38^{\circ} 01' 08'' \cdot 5$. Longitude, $120^{\circ} 35' 08'' \cdot 4$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Blue Mountain... | 208 | 20 | 46 | 28 | 28 | 57 | 4·6083280 |
| Dardanelle Cone.. | 235 | 17 | 44 | 55 | 54 | 12 | 4·8787191 |
| Big Hill..... | 356 | 05 | 15 | 176 | 05 | 51 | 4·3296475 |

BIG CANYON.

Local name, Duckwall Mount; a high timbered point on a ridge, 14 miles east of Sonora in Tuolumne Co., Cal.

[Latitude, $37^{\circ} 58' 01''$.5. Longitude, $120^{\circ} 07' 13''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Big Hill | 68 38 35 | 248 22 02 | 4° 0276730 |
| Moccasin Peak ... | 45 19 41 | 225 12 01 | 4° 4116285 |
| Bullion Peak | 355 04 57 | 175 06 34 | 4° 6590366 |
| Pilot Peak | 324 39 25 | 144 46 11 | 4° 4473833 |

COTTONWOOD PEAK.

In Tuolumne Co., Cal., immediately south of Hetch-Hetchy Valley and Tuolumne River.

[Latitude, $37^{\circ} 55' 30''$.9. Longitude, $119^{\circ} 44' 07''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Conness | 262 51 29 | 83 06 45 | 4° 5639041 |
| Hoffman | 114 13 52 | 294 05 36 | 4° 3353253 |

CONNESS.

A primary station of the U. S. C. & G. S., 10 miles north of Soda Springs, Mono Co., Cal. In shape an irregular parallelogram of granite; from northwest portion rises the top of peak with precipitous side of 1,000 feet or more.

Permanent mark: Concrete pier with five-eighths copper bolt in center.

[Latitude $37^{\circ} 57' 56''$.0. Longitude $119^{\circ} 19' 18''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hoffman | 51 21 09 | 231 14 11 | 4° 3288340 |
| Cottonwood Peak. | 83 06 45 | 262 51 29 | 4° 5639041 |

MOUNT DANA.

Large, bare, somewhat irregular peak with cone-shaped top, covered with broken sandstones and granite, in Tuolumne Co., Cal.

Permanent mark: Stone monument about 6 feet high.

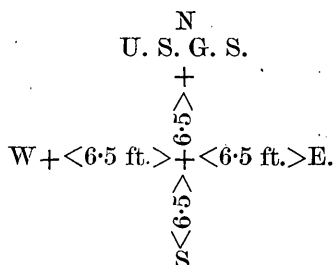
[Latitude, $37^{\circ} 53' 54''$.3. Longitude, $119^{\circ} 13' 17''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lyell | 14 01 13 | 193 59 22 | 4° 2637689 |
| Hoffman | 77 05 00 | 256 54 20 | 4° 4171931 |

HOFFMAN.

About 2 miles west of Lake Tenaiaya and 39 miles from Sequoia, on the west of Tioga road, in Tuolumne Co., Cal. The mountain has three sharp ridges of granite, and the point occupied is the highest and farthest to the west. On this ridge is Chimney Rock, a cylinder of granite rising from main ledge to height of 60 feet, and it is north of this that station occupied is situated.

Point marked thus:



A monument about 5 feet high over the center mark.

[Latitude, $37^{\circ} 50' 43''$.5. Longitude, $119^{\circ} 30' 39''$.2.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Mount Dana..... | 256 | 54 | 20 | 77 | 05 | 00 | 4.4171931 |
| Conness..... | 231 | 14 | 11 | 51 | 21 | 09 | 4.3288340 |
| Clarks Peak..... | 336 | 34 | 42 | 156 | 37 | 42 | 4.2597 |
| Cottonwood Peak..... | 294 | 05 | 36 | 114 | 13 | 52 | 4.3353926 |
| | | | | | | | 253 |

BIG HILL.

In Tuolumne Co., Cal., 6 miles east of Knights Ferry and 6 miles west of the Crimea House.

[Latitude, $37^{\circ} 49' 37''$.3. Longitude, $120^{\circ} 34' 08''$.8.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Bear Mountain..... | 176 | 05 | 51 | 356 | 05 | 15 | 4.3296475 |
| Big Canyon..... | 248 | 22 | 02 | 68 | 38 | 35 | 4.6276730 |
| Bullion..... | 304 | 21 | 06 | 124 | 39 | 12 | 4.7224157 |
| Moccasin Peak..... | 276 | 57 | 29 | 97 | 06 | 20 | 4.3291570 |

MOCCASIN PEAK.

A potato-shaped peak, slightly flattened on top, covered with oak timber. It is situated on southwest side of Moccasin Creek, above Hugh's place, close to bridge across Moccasin Creek, in Tuolumne Co., Cal.

Permanent mark: Bull-pine tree about 40 feet high, 2 feet in diameter.

[Latitude, $37^{\circ} 48' 12''$.5. Longitude, $120^{\circ} 19' 43''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Big Hill | 97 06 20 | 276 57 29 | 4.3291570 |
| Big Canyon..... | 225 12 01 | 45 19 41 | 4.4116285 |
| Pilot Peak..... | 277 38 19 | 97 52 44 | 4.5424939 |

PILOT PEAK.

On boundary of Mariposa and Tuolumne counties, Cal. Rose's ranch is $2\frac{1}{2}$ miles east.

[Latitude, $37^{\circ} 45' 39''$.8. Longitude, $119^{\circ} 56' 10''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Moccasin Peak ... | 97 52 44 | 277 38 19 | 4.5424939 |
| Big Canyon..... | 144 46 11 | 324 39 25 | 4.4473833 |
| Devils Peak | 326 16 40 | 146 23 49 | 4.4928478 |

CLARKS PEAK.

An obelisk-shaped peak on north end of Merced Group, in Mariposa Co., Cal., at head waters of Merced River, about 11 miles southeast of Yosemite. The peak is merely a sharp ridge; there is not space enough on top to stand tripod.

Permanent mark: Monument of stone about 4 feet high.

[Latitude, $37^{\circ} 41' 42''$.0. Longitude, $119^{\circ} 25' 44''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Devils Peak..... | 56 07 20 | 235 55 55 | 4.5212361 |
| Hoffman..... | 156 37 42 | 336 34 42 | 4.2597926 |

MOUNT LYELL.

Situated 14 miles southeast of Soda Springs, at end of Tuolumne Meadows, in Mono Co., Cal. In shape very irregular; the south side a perpendicular wall, the north a series of meadows till the glacier is reached; the east and west sides are rather steep. The highest point is a short, sharp ridge about 200 yards long, running northwest and south-east, the northwest end being the lower.

Permanent mark: Small stone monument; U. S. G. S. chiseled on rock east of it.

[Latitude, $37^{\circ} 44' 16''$.6. Longitude, $119^{\circ} 16' 19''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Mount Dana..... | 193 59 22 | 14 01 13 | 4.2637689 |

BULLION PEAK.

A high point on a timbered ridge, 15 miles north of east of Merced Falls, 2 miles east of Bear Valley, in Mariposa Co., Cal.

[Latitude, $37^{\circ} 33' 27''$.6. Longitude, $120^{\circ} 04' 33''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Big Hill..... | 124 39 12 | 304 21 06 | 4.7224157 |
| Big Canyon | 175 06 34 | 356 04 57 | 4.6590366 |

DEVILS PEAK.

A cone on southeast end of short potato-shaped ridge, 9 miles southwest of Wawona Peak; bare on top and covered with loose rock.

Permanent mark: Fir tree, about 30 feet high, placed in center of monument, 5.6 feet west of U. S. G. S. chiseled on rock.

[Latitude, $37^{\circ} 31' 40''$.2. Longitude, $119^{\circ} 44' 26''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pilot Peak..... | 146 23 49 | 326 16 40 | 4.4928478 |
| Clark's Peak..... | 235 55 55 | 56 07 20 | 4.5212361 |

LAWSON HILL.

At north end of flat ridge, North of Bear Creek (a north branch of San Pablo Creek).

Permanent mark: A 4 by 4 stake (pine) in middle of pile of stones, about 50 feet southwest of large oak tree on edge of steep slope. Hill is timbered on north slope.

[Latitude, $37^{\circ} 56' 34''$. Longitude, $122^{\circ} 11' 36''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bald | 20 53 59 | 200 52 55 | 3.8552896 |
| Striped Hill..... | 94 27 02 | 273 23 32 | 3.9211217 |

STRIPED HILL.

A bare, round hill at northern end of ridge between Wild Cat and San Pablo creeks. Small slide on west slope from which the station is named.

[Latitude, $37^{\circ} 56' 49''$. Longitude, $122^{\circ} 17' 17''$.]

| To station. | Azimuth | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Yerba Buena..... | 24 07 15 | 204 04 22 | 4 2271188 |
| Rocky Island..... | 45 51 57 | 225 49 27 | 3 9195784 |
| Lawson Hill..... | 273 23 32 | 94 27 02 | 3 9211217 |

ROCKY ISLAND.

Highest point of Rocky or Sheep Island, Bay of San Francisco.
Permanent mark: Cross cut in rock.

[Latitude, $37^{\circ} 53' 42''$. Longitude, $122^{\circ} 21' 21''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Striped Hill..... | 225 49 27 | 45 51 57 | 3 9195784 |

BALD.

[Latitude, $37^{\circ} 52' 56''$. Longitude, $122^{\circ} 13' 20''$.48.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Lawson Hill..... | 200 52 55 | 20 53 59 | 3 8552896 |
| Mulholland Hill.. | 291 40 28 | 111 43 22 | 3 8742967 |
| Yerba Buena..... | 56 57 37 | 237 01 00 | 4 1788065 |

MULHOLLAND HILL.

Highest point on ridge south of road through Moroga Valley, about one-half mile south of residence of Mr. Mulholland; one small oak tree on north side of point; distance from station about 50 feet.

Permanent mark: Mound of stones.

[Latitude, $37^{\circ} 51' 26''$. Longitude, $122^{\circ} 08' 36''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bald..... | 111 43 22 | 291 40 28 | 3 8742967 |
| Redwood..... | 33 10 03 | 213 08 49 | 3 7315417 |

MONUMENT SOUTH.

[Latitude, $37^{\circ} 50' 55''$. Longitude, $122^{\circ} 11' 35''$.52.]

REDWOOD.

Highest point on ridge between Contra Costa and Alameda counties, Cal., covered with redwood timber and sandstone rocks, about three-fourths of a mile southwest of Redwood Canyon.

Permanent mark: Redwood tree, 15 feet high and 6 inches in diameter, marked U. S. G. S. Southwest of which, and about 2 feet distant, is large sandstone marked U. S. G. S.

[Latitude, $37^{\circ} 49' 00''$. Longitude, $122^{\circ} 10' 37''$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------------|----------|----|----|---------------|----|----|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Yerba Buena..... | 86 | 52 | 49 | 266 | 45 | 50 | 4.2230198 |
| Mulholland Hill... | 213 | 08 | 49 | 33 | 10 | 03 | 3.7315417 |

YERBA BUENA.

Highest point of Yerba Buena, or Goat Island, Bay of San Francisco. U. S. Coast and Geodetic Survey Point.

[Latitude, $37^{\circ} 48' 30''$. Longitude, $122^{\circ} 21' 59''$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Bald..... | 237 | 01 | 00 | 56 | 57 | 37 | 4.1788065 |
| Striped Hill..... | 204 | 04 | 22 | 24 | 07 | 15 | 4.2271188 |
| Redwood..... | 266 | 45 | 50 | 86 | 52 | 49 | 4.2230198 |

SOUTHERN CALIFORNIA.

METHODS OF WORK.

The triangulation in southern California was begun in July, 1891, and covers an area of about 5,000 square miles. The line Wire-Kelly, as fixed by positions obtained from the U. S. Coast and Geodetic Survey, was taken as the basis of the work of 1891, which includes the line Wire-Mora and all points south of that line. Subsequent work depends upon the line Southeast Base-San Juan, as given by the same organization. The instrument used in this work was an 8-inch nonrepeating theodolite reading by micrometer to two seconds, and by estimation to one-fifth of a second. The angles were measured individually and by directions with telescope direct and reversed and on different positions of the circle. The station adjustment was made arbitrarily, the angles being required to agree among themselves and to close the horizon. Figures were adjusted by the method of least squares. All work in connection with this triangulation was done by Mr. A. P. Davis.

DESCRIPTIONS AND POSITIONS OF STATIONS.

WOODSON.

A high, prominent, and very rocky butte in San Diego Co., Cal., 6 miles south of San Pascual Valley, and just west of Woodson's ranch. It is surmounted by a huge granite boulder, the highest point of which is the station.

Permanent mark: A cairn of stones.

[Latitude, 33° 00' 25".1. Longitude, 116° 58' 17".8.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Whitney..... | 122 | 51 | 51.8 | 302 | 45 | 49.4 | 4.3119354 |
| Burnt..... | 157 | 35 | 13.1 | 337 | 32 | 05.7 | 4.3675063 |
| Cuyamaca..... | 281 | 18 | 22.6 | 101 | 30 | 16.2 | 4.5407133 |
| San Miguel..... | 354 | 42 | 02.0 | 174 | 43 | 09.0 | 4.5414240 |
| Cowles..... | 14 | 46 | 27.4 | 194 | 44 | 27.7 | 4.3515457 |
| Black..... | 77 | 33 | 36.7 | 257 | 28 | 51.2 | 4.1442189 |

CUYAMACA.

Cuyamaca Mountain is the highest mountain in San Diego County. The station is not on the highest point, but is indicated by a large, lone spruce tree east of the summit, which was trimmed up for a signal.

[Latitude, $32^{\circ} 56' 42''$. Longitude, $116^{\circ} 36' 26''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Woodson | 101 30 16.2 | 281 18 22.6 | 4.5407133 |
| Cowles | 69 38 51.9 | 249 25 00.6 | 4.6282849 |

SAN MIGUEL.

A high prominent mountain peak, about 12 miles east of San Diego, in San Diego Co., Cal. It is approached from the southwest by a good trail leading to the top. The station is on the highest point.

Permanent mark: A large cairn of stones.

[Latitude, $32^{\circ} 41' 41''$. Longitude, $116^{\circ} 56' 14''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Woodson | 174 43 09 | 354 42 02 | 4.541424 |
| Cowles | 145 19 09 | 325 16 03 | 4.196130 |

COWLES.

The highest of a range of hills 4 miles west of Santee Station, in San Diego Co., Cal., on the Cuyamaca railroad, and south of the San Diego River.

Permanent mark: A cairn of stones on the highest point marks the station.

[Latitude, $32^{\circ} 48' 39''$. Longitude, $117^{\circ} 01' 58''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Woodson | 194 44 27.7 | 14 46 27.4 | 4.3515457 |
| Black | 157 08 06.4 | 337 65 21.3 | 4.3077783 |
| Cuyamaca | 249 25 00.6 | 69 38 51.9 | 4.6282849 |
| San Miguel | 325 16 03.0 | 145 19 09.0 | 4.1961300 |

BLACK.

A prominent hill, 7 miles southwest of Bernardo Post-Office, in San Diego Co., Cal., and the highest point on the Penasquitas ranch.

Permanent mark: A cairn of stones on the highest point.

[Latitude, $32^{\circ} 58' 47''$.4. Longitude, $117^{\circ} 07' 02''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Whitney | 165 34 22.7 | 345 33 06.3 | 4.1639436 |
| Woodson | 257 28 51.2 | 77 33 36.7 | 4.1442189 |
| Cowles | 337 05 21.3 | 157 08 06.4 | 4.3077783 |

WHITNEY.

A round prominent knoll, the highest peak of a cluster of hills, in San Diego Co., Cal., about 5 miles west of Escondido.

Permanent mark: A cairn of stones on the highest point.

[Latitude, 33° 06' 25''-9. Longitude, 117° 09' 22''-2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Kelley..... | 111 15 04.5 | 291 09 35.6 | 4.2234196 |
| High Knob..... | 166 44 32.3 | 340 43 35.2 | 4.0712031 |
| Burnt..... | 218 34 29.7 | 38 37 25.4 | 4.1253160 |
| Woodson..... | 302 45 49.4 | 122 51 51.8 | 4.3119354 |
| Black..... | 345 33 06.3 | 165 34 22.7 | 4.1639436 |

BURNT.

A sharp rocky peak, surmounted by a large boulder, 2½ miles southwest of Valley Center, in San Diego Co., Cal., and 6 miles north of Escondido.

Permanent mark: A cairn of stones on the highest point.

[Latitude, 33° 12' 04''-4. Longitude, 117° 04' 00''-9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| High Knob..... | 95 24 39.0 | 275 20 45.9 | 4.0442018 |
| Whitney..... | 38 37 25.4 | 218 34 29.7 | 4.1253160 |
| Lancaster..... | 154 07 58.4 | 334 05 42.6 | 4.1667805 |
| Roderick..... | 257 10 20.0 | 77 15 41.5 | 4.1927250 |
| Centipede..... | 309 04 10.0 | 129 06 18.0 | 3.8724620 |
| Woodson..... | 337 32 05.7 | 157 35 13.1 | 4.3675063 |

RODERICK.

A bare, rocky summit, about 10 miles east of Valley Center, in San Diego Co., Cal.

Permanent mark: A granite boulder, surmounted by a cairn of stones.

[Latitude, 33° 13' 56''-4. Longitude, 116° 54' 14''-0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|----------------|
| | ° ' " | ° ' " | <i>Meters.</i> |
| Lancaster..... | 114 22 56.1 | 294 15 18.2 | 4.3747615 |
| Burnt..... | 77 15 41.5 | 257 10 20.0 | 4.1927250 |

HIGH KNOB.

A prominent summit, the highest point of the San Marcos Mountains, in San Diego Co., Cal., 3½ miles nearly east of Vista, a station on the Southern California Railway.

Permanent mark: A cairn of stones on the highest point, with a pole in the center.

[Latitude, $33^{\circ} 12' 38''$.1. Longitude, $117^{\circ} 11' 06''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wire | 95 32 48.4 | 275 26 47.5 | 4.2339837 |
| Kelley | 67 13 57.4 | 247 09 25.2 | 4.1453561 |
| Lancaster | 200 42 49.9 | 20 44 27.5 | 4.1143860 |
| Burnt | 275 20 45.9 | 95 24 30.0 | 4.0442018 |
| Centipede | 288 48 23.0 | 108 51 18.0 | 4.2494800 |
| Whitney | 346 43 35.2 | 166 44 32.3 | 4.0712031 |

KELLEY.

A station of the U. S. Coast and Geodetic Survey, on top of the ridge back of Carlsbad, in San Diego Co., Cal., 2 miles from the coast. It is on a rise slightly higher than the rest of the ridge. A black glass bottle was buried neck up, 20 inches below ground, and the center of its mouth marks the station. A 3 by 4 by 24 inch redwood stub, nail in center of its top, buried 20 inches in ground, is the surface mark.

[Latitude, $33^{\circ} 09' 42''$.3. Longitude, $117^{\circ} 19' 23''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wire | 149 21 30.3 | 329 20 01.8 | 3.9140790 |
| Mora | 197 53 02.6 | 17 54 46.2 | 4.2021598 |
| High Knob | 247 09 25.2 | 67 13 57.4 | 4.1453561 |
| Whitney | 291 09 35.6 | 111 15 04.5 | 4.2234196 |

WIRE.

A station of the U. S. Coast and Geodetic Survey, on the Santa Margarita ranch, in San Diego Co., Cal. It is situated on the top of the ridge between the San Luis Rey and the Santa Margarita rivers, about 2 miles from the coast, and 300 yards north of the wire fence on the ranch line which crosses this ridge. A black glass bottle was buried neck up, with its top 24 inches beneath the surface of the ground, the center of the mouth of the bottle denoting the station. A 3 by 4 by 24 inch redwood stub, buried 24 inches in the ground, is the surface mark, and a nail driven in the center of the top of this stub marks the station.

[Latitude, $33^{\circ} 13' 31''$.4. Longitude, $117^{\circ} 22' 05''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kelley | 329 20 01.8 | 149 21 30.3 | 3.9140790 |
| Mora | 228 13 20.8 | 48 16 33.0 | 4.0850062 |
| High Knob | 275 26 47.5 | 95 32 48.4 | 4.2339837 |

MORA.

A round, prominent butte on the northern edge of the San Luis Rey Valley, in San Diego Co., Cal., about 3 miles northeast of the San Luis Rey Mission, and is exactly on the southern line of the Santa Margarita grant.

Permanent mark: A cairn of stones on the highest point.

[Latitude, $33^{\circ} 17' 54''$.4. Longitude, $117^{\circ} 16' 14''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Wiro | 48 16 33.0 | 228 13 20.8 | 4.0850062 |
| Kelley | 17 54 46.2 | 197 53 02.6 | 4.2021598 |

CENTIPEDE.

A prominent and very brushy and rocky knoll in San Diego Co., Cal., $5\frac{1}{2}$ miles northeast of Escondido and 2 miles east of the road from Escondido to Valley Center. The station is on the summit of an immense boulder.

Permanent mark: A small cairn of stones.

[Latitude, $33^{\circ} 09' 32''$. Longitude, $117^{\circ} 00' 18''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| High Knob | 108 54 18 | 288 48 23 | 4.249480 |
| Burnt | 129 06 18 | 309 04 16 | 3.872482 |

LANCASTER.

A prominent, rocky point about 1 mile south of the San Luis Rey River, between that river and Moosa Canyon, in San Diego Co., Cal.

Permanent mark: A cairn of stones on the highest point.

[Latitude, $33^{\circ} 19' 13''$.2. Longitude, $117^{\circ} 08' 08''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| High Knob | 20 44 27.5 | 200 42 49.9 | 4.1143860 |
| Burnt | 334 05 42.6 | 154 07 58.4 | 4.1667805 |
| Roderick | 294 15 18.2 | 114 22 56.1 | 4.3747615 |

MARGARITA.

The highest point on the Santa Margarita ranch, in San Diego Co., Cal., about 10 miles north of the main ranch house and about the same distance from the coast.

Bull. 122—23

Permanent mark: A cairn of stones on the highest point.

[Latitude, $33^{\circ} 26' 34''$.5. Longitude, $117^{\circ} 23' 30''$.0]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Santiago | 155 43 39.9 | 335 38 54.0 | 4.5103156 |
| Elsinore | 194 04 00.2 | 14 05 34.2 | 4.2567592 |
| Niguel | 103 22 57.9 | 283 11 35.7 | 4.5160349 |
| Onofre | 47 25 14.6 | 227 21 47.8 | 4.1200442 |

ONOFRE.

This is a summit on the range of hills on the coast between the railway stations San Onofre, in San Diego Co., Cal., and Las Flores, on the Santa Margarita grant. It is the highest point on the coast south of San Pedro, and is about 4 miles north of the Las Flores ranch house.

Permanent mark: A large cairn of stones built on the highest point.

[Latitude, $33^{\circ} 21' 44''$.8. Longitude, $117^{\circ} 29' 45''$.5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Santiago | 174 35 12.4 | 354 33 54.3 | 4.5866848 |
| Niguel | 126 34 19.4 | 306 26 24.8 | 4.4421641 |
| Margarita | 227 21 47.8 | 47 25 14.6 | 4.1200442 |

NIGUEL.

A station of the U. S. C. & G. S. It is on the highest point of the flat summit of the highest ridge, Orange Co., Cal., between San Juan Capistrano and Aliso Canyon, and is the highest summit overlooking the coast between Aliso Canyon and the Canada Salado.

Permanent mark: A hole drilled in a large stone, buried about 1 foot below surface.

[Latitude, $33^{\circ} 30' 39''$.3. Longitude, $117^{\circ} 44' 06''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Santiago | 220 08 02.7 | 40 14 41.2 | 4.4587607 |
| San Joaquin | 145 07 31.0 | 325 04 56.2 | 4.1012967 |
| Margarita | 283 11 35.7 | 103 22 57.9 | 4.5160349 |
| Onofre | 306 26 24.8 | 126 34 19.4 | 4.4421641 |

SAN JOAQUIN.

This station is the highest point of the range of hills on the coast, Orange Co., Cal., on the San Joaquin ranch, and just east of the bay of Newport. It is in plain view from the San Joaquin ranch house, and is crowned with a collection of bowlders that show black from the

ranch house. It is about 500 meters east of the Coast Survey station of the same name, which is not so high and does not afford so good a view to the east.

Permanent mark: A large wire nail driven into the rotten rock at the center of station. The stone monument stands directly over the station.

[Latitude, $33^{\circ} 36' 15''$.4. Longitude, $117^{\circ} 48' 46''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| S. E. Base | 149 48 09.5 | 329 43 49.2 | 4.3801679 |
| San Juan | 191 18 21.0 | 11 20 48.7 | 4.5419586 |
| Niguel | 325 04 56.2 | 145 07 31.0 | 4.1012967 |

SANTIAGO.

The highest peak of the group of mountains lying south of Riverside and South Riverside. It is on the county line between Los Angeles and Riverside counties, and a bowlder marked with lead, which was placed to indicate the county line, marks the station. Of the two highest peaks that surmount the range, Santiago is the higher, the less sharp, and the more southern.

[Latitude, $33^{\circ} 42' 32''$.4. Longitude, $117^{\circ} 32' 07''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| S. E. Base | 103 40 31.3 | 283 26 55.1 | 4.5899081 |
| San Juan | 140 06 15.4 | 319 59 26.9 | 4.4683918 |
| Jurupa | 193 20 12.0 | 13 23 16.0 | 4.5647520 |
| Strawberry | 205 28 50.0 | 25 38 52.0 | 4.8068850 |
| Potato | 212 22 21.0 | 32 30 17.0 | 4.6123800 |
| Niguel | 40 14 41.2 | 220 08 02.7 | 4.4587607 |
| Box Springs | 220 03 43.4 | 40 12 11.7 | 4.5613244 |
| Zania | 227 53 15.0 | 48 08 55.0 | 4.7634030 |
| Elsinore | 304 03 19.3 | 124 09 40.2 | 4.3301272 |
| Margarita | 335 38 54.0 | 155 43 39.9 | 4.5163156 |
| Onofre | 354 33 54.3 | 174 35 12.4 | 4.5866848 |

ELSINORE.

A knoll upon the ridge back of Lake Elsinore, in San Diego Co., Cal., opposite the town of Elsinore, and about 3 miles southwest of the lake. The station is on the highest point of the knoll and is marked by an 8-inch iron bolt, driven in the ground with head 6 inches beneath the surface. A cairn of stones is built over the spot, with a flag pole in the center.

[Latitude, $33^{\circ} 36' 03''$.1. Longitude, $117^{\circ} 20' 39''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Santiago | 124 09 40.2 | 304 03 19.3 | 4.3301272 |
| Box Springs | 188 16 36.5 | 8 18 42.0 | 4.6048463 |
| Double Butte | 236 30 20.0 | 56 37 40.0 | 4.3884170 |
| Margarita | 14 05 34.2 | 194 04 00.2 | 4.2567592 |

BOX SPRINGS.

This station is on that spur of the San Jacinto Mountains, in San Bernardino Co., Cal., that lies between the San Timoteo Canyon and the San Jacinto Valley. It extends from the main spur toward Alessandro, and lies about 5 miles northeast of the station of Box Springs, on the Perris branch of the Southern California Railroad. The station is on an elevation above the rest of the ridge.

Permanent mark: A cairn of stones.

[Latitude, $33^{\circ} 57' 36''$. Longitude, $117^{\circ} 16' 54''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| San Juan..... | 82 58 48.8 | 262 43 29.3 | 4.6297259 |
| Santiago..... | 40 12 11.7 | 220 03 43.4 | 4.5613244 |
| Double Butte..... | 331 01 45.0 | 151 07 00.0 | 4.4787560 |
| Elsinore..... | 8 18 42.0 | 188 16 36.5 | 4.6048463 |

DOUBLE BUTTE.

A small double butte, about 8 miles east of the town of Perris, in San Diego Co., Cal. It lies between the railroad and wagon road connecting Perris with San Jacinto. The station is on the highest point.

Permanent mark: A small pile of rocks on a large boulder.

[Latitude, $33^{\circ} 43' 21''$. Longitude, $117^{\circ} 07' 28''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Elsinore..... | 56 37 40 | 236 30 20 | 4.388417 |
| Box Springs..... | 151 07 00 | 331 01 45 | 4.478756 |

ZANJA.

The highest point of the Crafton Hills, San Bernardino Co., about 5 miles southeast of Redlands.

Permanent mark: A cairn of stones.

[Latitude, $34^{\circ} 03' 32''$. Longitude, $117^{\circ} 04' 09''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Santiago..... | 48 08 55 | 227 53 15 | 4.763403 |
| Strawberry..... | 141 07 04 | 321 01 27 | 4.388602 |

STRAWBERRY.

An elevation or knoll on the main ridge of the San Bernardino Mountains, in San Bernardino Co., Cal., just above Arrowhead Hot

Springs, and 3 miles southwest of Little Bear Valley. The knoll has been nearly cleared of timber.

Permanent mark: A lone tree.

[Latitude, $34^{\circ} 13' 49''$. Longitude, $117^{\circ} 14' 10''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| San Juan | 52 54 55 | 232 38 00 | 4.765922 |
| Santiago | 25 38 52 | 205 28 50 | 4.806885 |
| Zanja | 321 01 27 | 141 07 04 | 4.388602 |

JURUPA.

The highest point of a range of rocky hills in San Bernardino Co., Cal., about 3 miles southwest of Bloomington, and 6 miles northwest of Riverside.

Permanent mark: A hole drilled in the boulder on the highest point, and filled with lead. A large cairn of stones is built over the spot.

[Latitude, $34^{\circ} 01' 51''$. Longitude, $117^{\circ} 26' 37''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| San Juan | 64 19 58 | 244 10 03 | 4.481820 |
| Santiago | 13 23 16 | 193 20 12 | 4.564752 |

POTATO.

A prominent butte rising abruptly from its base, in San Bernardino Co., Cal., about 3 miles southeast of Colton.

Permanent mark: A small pile of stones on the highest boulder on the summit.

[Latitude, $34^{\circ} 01' 14''$. Longitude, $117^{\circ} 17' 52''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| San Juan | 73 41 12 | 253 26 30 | 4.628655 |
| Santiago | 32 30 17 | 212 22 21 | 4.612380 |

WORKMAN.

The highest point of a cluster of hills in Los Angeles Co., Cal., lying directly between the towns of Whittier and Puente. An indifferent wagon road leads to the summit from Whittier.

Permanent mark: A glass bottle, neck upward, about a foot under the surface.

[Latitude, $33^{\circ} 59' 24''$. Longitude, $118^{\circ} 00' 14''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| San Juan | 289 22 11 | 109 31 03 | 4.414242 |
| Southeast Base | 345 43 11 | 165 45 20 | 4.357178 |
| Pomona | 261 54 40 | 82 02 08 | 4.316835 |

POMONA.

A high, round, prominent hill in Los Angeles Co., Cal., about 4 miles southwest of the town of Pomona.

Permanent mark: A small pile of stones on the highest point.

[Latitude, $34^{\circ} 00' 58''$. Longitude, $117^{\circ} 46' 54''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| San Juan | 341 11 58 | 161 13 23 | 4.085854 |
| Workman | 82 02 08 | 261 54 40 | 4.316835 |
| San Jose | 123 33 08 | 303 30 47 | 3.889230 |

SAN JOSE.

The highest point of the San Jose hills, in Los Angeles Co., Cal., about 5 miles northeast of the town of Puente. It is a prominent and rather sharp point, and is directly in line with the tangent of the Southern Pacific Railroad running from Pomona eastward to Bloomington.

Permanent mark: A small pile of stones on the highest point.

[Latitude, $34^{\circ} 03' 17''$. Longitude, $117^{\circ} 51' 06''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| San Juan | 326 40 27 | 140 44 13 | 4.277008 |
| Pomona | 303 30 47 | 123 33 08 | 3.889230 |

RAYMOND.

The tower of the Raymond (Los Angeles Co., Cal.) Hotel, on a hill 2 miles southeast of Pasadena.

[Latitude, $34^{\circ} 07' 20''$. Longitude, $118^{\circ} 08' 57''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Cahuenga | 95 12 46 | 275 06 48 | 4.216838 |
| San Gabriel | 198 57 45 | 18 59 26 | 4.147545 |

SOUTHEAST BASE.

In Los Angeles Co., near Los Angeles, Cal., about 100 meters west of the main road from Anaheim to Garden Grove and 1 mile from the last-named place.

Permanent mark: A small hole in the silver core of a copper bolt, set in a granite block, 20 inches square, which is set in the brick foundation of the pier. A tower 14 feet square at base and 40 feet high erected around the brick pier.

[Latitude, $33^{\circ} 47' 28''$.38. Longitude, $117^{\circ} 56' 36''$.08.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Los Angeles, N. W. Base . | 142 37 01.1 | 322 33 10.8 | 4.2428968 |
| San Joaquin..... | 329 43 49.2 | 149 48 09.5 | 4.3801679 |
| Santiago..... | 283 26 55.1 | 103 40 31.3 | 4.5899081 |
| Workman..... | 165 45 20.0 | 345 43 11.0 | 4.3571780 |

PLATEAU REGION OF NEW MEXICO, EASTERN ARIZONA, AND UTAH.

METHODS OF WORK.

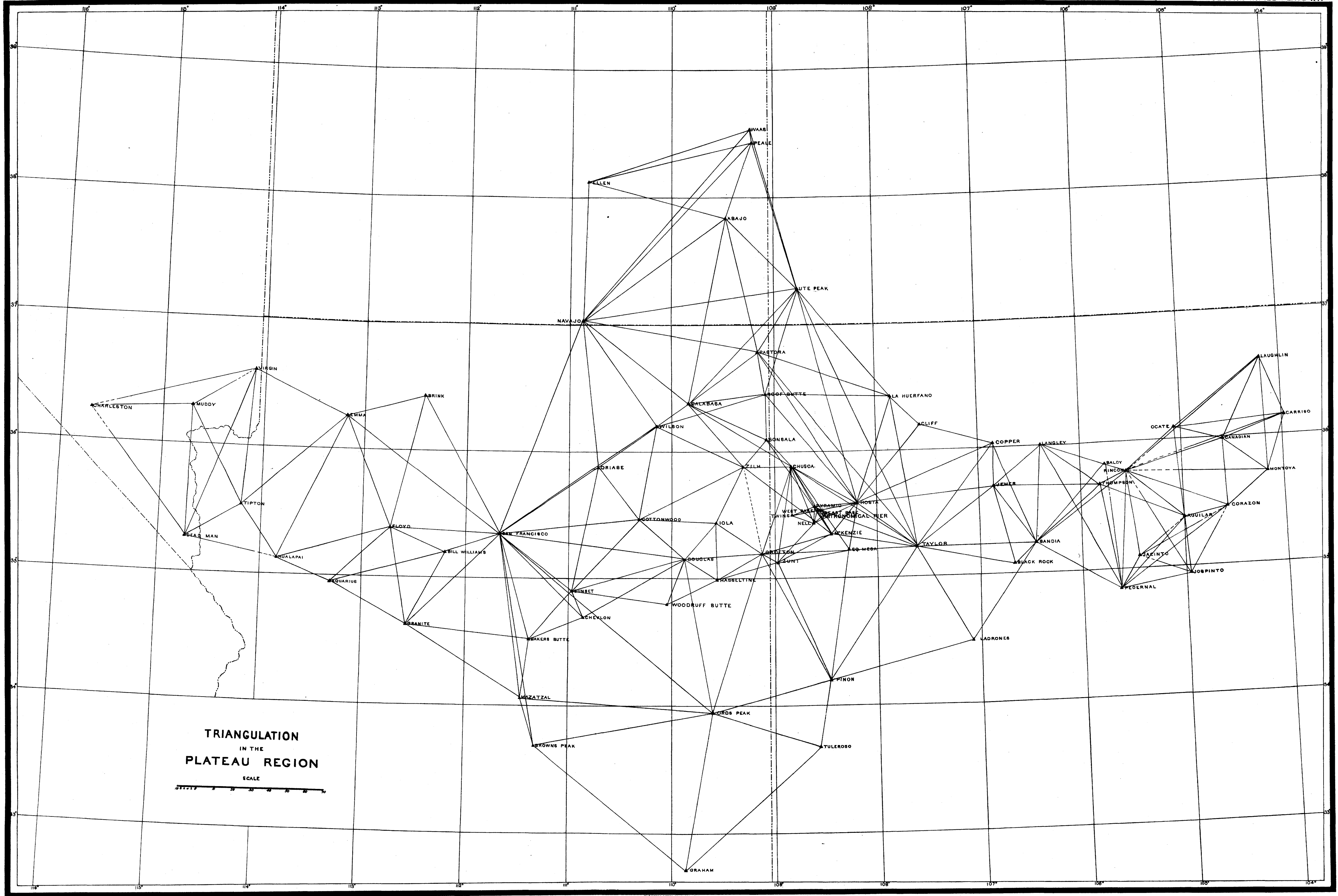
This triangulation extends over parts of northern New Mexico and eastern Arizona and southeastern Utah, with a few points reaching into Nevada, California, and Colorado. The work depends on the base line at Fort Wingate, New Mexico, which was measured and expanded in 1881 and 1882, and the triangulation carried forward as required for topographic work until the year 1890.

The base line was measured by Prof. J. Howard Gore in 1881, in the valley of the Rio Puerco, near Fort Wingate, using a 4-meter base bar apparatus designed by the U. S. Coast and Geodetic Survey, and has a length, after all corrections are applied, of 6,721,893 meters. The latitude, longitude, and azimuth of the base were determined in 1883 by Prof. A. H. Thompson, assisted by Arthur P. Davis. A Wurdeman combined zenith telescope and transit was used. Longitude was obtained by exchange of time signals with the observatory of the Washington University at St. Louis, Prof. H. S. Pritchett conducting the observations and exchanges at this place. Latitude was determined by the method of zenith distances.

The final results of these observations gives as the position of the east end of the Wingate base line: Latitude, $35^{\circ} 30' 17'' 80$. Longitude, $108^{\circ} 30' 28'' 08$.

The expansion was made by Prof. Gilbert Thompson, in 1881, and Prof. A. H. Thompson in 1882 and 1883, from the base line, both using a Kubel 10-inch repeating vernier theodolite reading to five seconds. Different stations were used in these separate expansions. Subsequent triangulation was performed with the same instrument by Arthur P. Davis until 1890, when a nonrepeating 8-inch micrometer theodolite was used. In the latter part of the season of 1890 the observations were made by Mr. Fred. J. Knight. All that portion of the triangulation west of the one hundred and twelfth meridian was executed by Mr. H. M. Wilson in 1884, with an 8-inch vernier theodolite reading to ten seconds.

In general, the method adopted for the measurement of angles was that of directions, the aim being to obtain from eight to twelve complete sets, including all visible stations. Readings were made on different parts of the circle and with the telescope in direct and reversed position. Measurements were made of single angles and of combinations, in order to obtain conditions for the adjustment, which was made both of stations and figures, by the method of least squares.



Many of the stations in this triangulation were natural points. Upon these no signals were erected before observing. In other cases, signals, either of stone, brush, or trees, were erected. In all cases permanent marks were left to indicate the exact point sighted.

The triangulation covered and gave control points for topography over an area of, approximately, 94,000 square miles.

A descriptive list of stations follows:

DESCRIPTIONS AND POSITIONS OF STATIONS.

CARRISO.

A low, bare, rounded butte, about 150 or 200 feet above the plain, being the southeastern of two buttes in the northern part of township 22 north, range 28 east, and east of Carriso Creek, New Mexico.

Permanent mark: A stone monument on highest point.

[Latitude, $36^{\circ} 09' 12''$. Longitude, $103^{\circ} 58' 35''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Canadian | 71 20 46.1 | 250 59 11.3 | 4.7645271 |
| Montoya | 19 20 07.5 | 199 13 35.8 | 4.7047279 |
| Laughlin | 160 23 07.9 | 340 15 41.7 | 4.7455943 |
| Ocate | 86 31 46.4 | 265 53 25.8 | 4.9903355 |

LAUGHLIN.

A bare, rounded peak, not rocky, about 16 miles east of Maxwell station, at head of Tinaja Arroya, in township 28 north, range 26 west, in Colfax Co., N. Mex.

Station on highest point.

[Latitude, $36^{\circ} 37' 33''$. Longitude, $104^{\circ} 11' 07''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Canadian | 27 00 45.5 | 206 46 28.6 | 4.9021113 |
| Carriso | 340 15 41.7 | 160 23 07.9 | 4.7455943 |
| Ocate | 53 24 08.0 | 232 53 00.3 | 4.9919418 |

MONTOKA.

A wooded mesa, about 45 miles east of Watrous, on the north line of the Montoya grant, in San Miguel Co., N. Mex.

Permanent mark: A lone tree on flat, partly cleared summit.

[Latitude, $35^{\circ} 43' 20''$. Longitude, $104^{\circ} 09' 43''$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Canadian | 127 12 39.1 | 306 57 42.0 | 4.6828758 |
| Corazon | 50 50 54.9 | 230 36 48.7 | 4.6747201 |
| Carriso | 199 13 35.8 | 19 20 07.5 | 4.7047279 |

CANADIAN.

The highest point of the Cornudo hills in Mora Co., N. Mex. It is a bare, round-topped knoll, 25 miles northeast of Watrous.

Permanent mark: A stone monument on highest point.

[Latitude, $35^{\circ} 59' 03''$ -64. Longitude, $104^{\circ} 35' 15''$ -10.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Rincon | 74 | 51 | 38.4 | 254 | 17 | 41.2 | 4.9564545 |
| Corazon | 358 | 05 | 50.0 | 178 | 06 | 35.4 | 4.7709692 |
| Carriso | 250 | 59 | 11.3 | 71 | 20 | 46.1 | 4.7645271 |
| Laughlin | 206 | 46 | 28.6 | 27 | 00 | 45.5 | 4.9021113 |
| Montoya | 306 | 57 | 42.0 | 127 | 12 | 39.1 | 4.6828758 |
| Ocate | 106 | 14 | 22.1 | 285 | 57 | 40.1 | 4.6471564 |

CORAZON.

A mesa butte in San Miguel Co., N. Mex. About 1,000 feet higher than and 3 miles northeast of the Mexican village of Corazon. The top is flat and has been cleared of timber, leaving a lone tree to mark the station, near north end.

[Latitude, $35^{\circ} 27' 09''$ -82. Longitude, $104^{\circ} 33' 57''$ -39.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Rincon | 111 | 36 | 57.6 | 291 | 02 | 28.2 | 4.9823850 |
| Aguilar | 78 | 10 | 56.4 | 257 | 56 | 03.8 | 4.5990019 |
| Pederal | 55 | 52 | 19.6 | 235 | 15 | 05.3 | 5.0759472 |
| Jospinto No. 2 | 31 | 49 | 28.6 | 211 | 36 | 13.2 | 4.8221737 |
| Canadian | 178 | 06 | 35.4 | 358 | 05 | 50.0 | 4.7709692 |
| Montoya | 230 | 36 | 48.7 | 50 | 50 | 54.9 | 4.6747201 |

OCATE.

An old crater or cinder cone about 12 miles north of Fort Union, Mora Co., N. Mex.

Permanent mark: A monument of rough lava rock on highest point.

[Latitude, $36^{\circ} 05' 42''$ -93. Longitude, $105^{\circ} 03' 38''$ -27.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Rincon | 50 | 51 | 26.0 | 230 | 34 | 05.5 | 4.7591135 |
| Canadian | 285 | 57 | 40.1 | 106 | 14 | 22.1 | 4.6471564 |
| Carriso | 265 | 53 | 25.8 | 86 | 31 | 46.4 | 4.9903355 |
| Laughlin | 232 | 53 | 00.3 | 53 | 24 | 08.0 | 4.9919418 |

AGUILAR.

The mesa Aguilar is a flat-topped mesa butte, 2 miles southwest of the Mexican village of Torres, on Gallinas Creek, about 25 miles south-east of Las Vegas, in San Miguel Co., N. Mex.

Permanent mark: A lone tree on about the highest part.

[Latitude, 35° 22' 43''-14. Longitude, 104° 59' 37''-65.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Thompson | 114 | 07 | 09.4 | 293 | 38 | 49.7 | 4.9063551 |
| Rincon | 130 | 33 | 24.7 | 310 | 13 | 53.2 | 4.8233282 |
| Pedernal | 45 | 15 | 03.4 | 224 | 52 | 37.1 | 4.9228933 |
| Corazon | 257 | 56 | 03.8 | 78 | 10 | 56.4 | 4.5990019 |
| Jospinto No. 2 | 355 | 10 | 43.9 | 175 | 12 | 16.3 | 4.6851871 |

JOSPINTO NO. 1.

On a mesa about 12 miles southwest of Las Colonias, San Miguel Co., N. Mex.

[Latitude, 34° 56' 42''. Longitude, 104° 57' 10'']

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pedernal | 80 | 16 | 44 | 259 | 52 | 50 | 4.807075 |
| Jospinto No. 2 | 298 | 41 | 20 | 118 | 41 | 27 | 2.557580 |

JOSPINTO NO. 2.

The highest point of Jospinto Mesa, about 12 miles southwest of Las Colonias, San Miguel Co., N. Mex, and about one-half mile south-east of Jospinto No. 1.

Permanent mark: A leaning lone tree.

[Latitude, 34° 56' 36''-8. Longitude, 104° 56' 57''-2.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|----------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| San Jose | 134 | 16 | 13.6 | 313 | 56 | 38.4 | 4.8567790 |
| Pedernal | 80 | 28 | 53.4 | 260 | 05 | 02.8 | 4.8090772 |
| Aguilar | 175 | 12 | 16.3 | 355 | 10 | 43.9 | 4.6851871 |
| Corazon | 211 | 36 | 13.2 | 81 | 49 | 28.6 | 4.8221737 |
| Jospinto No. 1 | 118 | 41 | 27.0 | 298 | 41 | 20.0 | 2.5575800 |

JACINTO.

A slight wooded elevation in the plain about 19 miles southwest of Anton Chico and 6 miles south of Cañon Blanca, San Miguel Co., N. Mex.

Permanent mark: A conspicuous lone tree.

[Latitude, 35° 05' 26''. Longitude, 105° 26' 59''-4.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|--------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Bernal | 199 | 13 | 19 | 19 | 17 | 33 | 4.528035 |

PEDERNAL.

A large, lone granite cone, about 60 miles east of Albuquerque. It was used in the Wheeler triangulation.

Permanent mark: A stone monument on highest point.

[Latitude, $34^{\circ} 50' 43''$.96. Longitude, $105^{\circ} 38' 38''$.28.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Sandia..... | 120 | 29 | 58.9 | 300 | 02 | 0.2 | 4.9334895 |
| Thompson..... | 170 | 53 | 58.6 | 350 | 48 | 21.1 | 4.9682933 |
| Aquilar..... | 224 | 52 | 37.1 | 45 | 15 | 03.4 | 4.9228933 |
| Corazon..... | 235 | 15 | 05.3 | 55 | 52 | 19.6 | 5.0759472 |
| Jospinto No. 1..... | 259 | 52 | 50.0 | 80 | 16 | 44.0 | 4.807075 |
| Rincon..... | 184 | 35 | 24.7 | 4 | 38 | 33.7 | 5.0112350 |
| Jospinto No. 2..... | 260 | 05 | 02.8 | 80 | 28 | 53.4 | 4.8090772 |

RINCON.

A high knoll on the summit of the Las Vegas Mountains, on the main backbone east of the Pecos River.

Permanent mark: A stone monument on the highest point.

[Latitude, $35^{\circ} 46' 03''$.1. Longitude, $105^{\circ} 33' 11''$.4.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Sandia..... | 54 | 29 | 01.3 | 233 | 57 | 33.6 | 5.0042487 |
| Baldy..... | 111 | 23 | 05.9 | 291 | 15 | 54.9 | 4.2980256 |
| Thompson..... | 65 | 25 | 49.1 | 245 | 16 | 57.0 | 4.4015151 |
| Pedernal..... | 4 | 38 | 33.7 | 184 | 35 | 24.7 | 5.0112350 |
| Aquilar..... | 310 | 13 | 53.2 | 130 | 33 | 24.7 | 4.8233282 |
| Canadian..... | 254 | 17 | 41.2 | 74 | 51 | 38.4 | 4.9564545 |
| Corazon..... | 291 | 02 | 28.2 | 111 | 36 | 57.6 | 4.9823850 |
| Ocate..... | 230 | 34 | 05.5 | 50 | 51 | 26.0 | 4.7591135 |

THOMPSON.

The highest peak of the southern group of the Santa Fe Mountains, 8 miles east of the city of Santa Fe.

Permanent mark: A slender balsam tree north of the highest point.

[Latitude, $35^{\circ} 40' 22''$.07. Longitude, $105^{\circ} 48' 22''$.89.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | '' | ° | ' | '' | Meters. |
| Sandia..... | 50 | 44 | 36.3 | 230 | 21 | 59.4 | 4.8830092 |
| James..... | 91 | 50 | 15.2 | 271 | 13 | 25.8 | 4.9789888 |
| Aquilar..... | 293 | 38 | 49.7 | 114 | 07 | 09.4 | 4.9063551 |
| Langley..... | 125 | 36 | 48.7 | 305 | 16 | 30.6 | 4.8067770 |
| Pedernal..... | 350 | 48 | 21.1 | 170 | 53 | 58.6 | 4.9682933 |
| Rincon..... | 245 | 16 | 57.0 | 65 | 25 | 49.1 | 4.4015151 |

BALDY.

A high, round, bald peak in the Santa Fe Mountains, about 15 miles northeast of Santa Fe, N. Mex. It was a triangulation point of the Wheeler Survey.

Permanent mark: A large stone monument on the highest point.

[Latitude, 35° 49' 57"-54. Longitude, 105° 45' 27"-91.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Sandia..... | 43 54 30.5 | 223 30 09.3 | 4.9622107 |
| Langley | 109 08 44.2 | 288 46 46.4 | 4.7766344 |
| Rincon | 291 15 54.9 | 111 23 05.9 | 4.2980256 |

LANGLEY.

Called Santa Clara by Wheeler Survey. The highest peak of the Tewan Mountains, about 17 miles west of Espanola, a station on the Denver and Rio Grande Railroad, in Rio Arriba Co., N. Mex.

Permanent mark: A large stone monument.

[Latitude, 36° 00' 27"-96. Longitude, 106° 23' 03"-31.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| James | 51 11 47.1 | 230 55 07.1 | 4.7409990 |
| Thompson | 305 16 30.6 | 125 36 48.7 | 4.8067770 |
| Baldy..... | 288 46 46.4 | 109 08 44.2 | 4.7766344 |

SANDIA.

The highest peak of the Sandia Mountains, about 15 miles northeast of Albuquerque, N. Mex.

Permanent mark: A lone tree.

[Latitude, 35° 14' 07"-33. Longitude, 106° 27' 22"-03.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| James | 144 32 54.4 | 324 18 53.9 | 4.7979000 |
| Taylor..... | 90 33 25.7 | 269 53 33.0 | 5.0206116 |
| Baldy..... | 223 30 09.3 | 43 54 30.5 | 4.9622107 |
| Federal..... | 300 02 00.2 | 120 29 58.9 | 4.9334895 |
| Rincon | 233 57 33.6 | 54 29 01.3 | 5.0042487 |
| Thompson | 230 21 59.4 | 50 44 36.3 | 4.8830092 |

JEMES.

The highest peak of the southern end of the Sierra Nacimiento, about 19 miles northwest of the Pueblo of Jemes, Bernalillo Co., N. Mex.

Permanent mark: A lone pine tree near the highest point.

[Latitude, 35° 41' 44"-66. Longitude, 106° 51' 30"-59.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Taylor..... | 53 32 43.5 | 233 06 37.7 | 4.9285535 |
| Hosta..... | 84 41 15.2 | 263 54 38.6 | 5.0840194 |
| Langley | 230 55 07.1 | 51 11 47.1 | 4.7409990 |
| Sandia..... | 324 18 53.9 | 144 32 54.4 | 4.7979000 |
| Thompson | 271 13 25.8 | 91 50 15.2 | 4.9789883 |
| Copper..... | 180 31 34.3 | 00 31 42.4 | 4.5735262 |

COPPER,

Otherwise called Copper Mountain, is a small butte on the summit of the Sierra Nacimiento range, about 6 miles east of Copper City, Rio Arriba Co., N. Mex. It is just north of the gap through which flows the ditch that conveys water to Copper City.

Permanent mark: A large lone tree northwest of the highest point.

[Latitude, $36^{\circ} 01' 59''$.9. Longitude, $106^{\circ} 51' 16''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hosta | 68 06 43.4 | 247 19 47.2 | 5.1158874 |
| Jemes | 00 31 42.4 | 180 31 34.3 | 4.5735262 |

WAAS.

A high sharp point on the northern end of the Sierra La Sal, Grand Co., Utah. It is of loose rock from the top to some distance down. It is the point occupied by the Powell survey, whose monument stands on the highest point. Observations were taken near this monument and reduced to it. Waas is a good natural point.

[Latitude, $38^{\circ} 32' 21''$.2. Longitude, $109^{\circ} 13' 39''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Navajo | 41 23 00.0 | 224 19 53.6 | 5.3442340 |

PEALE.

The highest peak of the Sierra La Sal, in Grand Co., Utah. The same point under same name was used in the Hayden triangulation.

Permanent mark: A small stone monument.

[Latitude, $38^{\circ} 26' 18''$.1. Longitude, $109^{\circ} 13' 44''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ute Peak | 342 39 53.9 | 162 56 29.3 | 5.1274286 |
| Abajo | 17 09 56.4 | 197 01 18.1 | 4.8422017 |
| Navajo | 43 21 12.8 | 222 20 58.9 | 5.3275052 |

ABAJO.

Abajo is the highest point of the Sierra Abajo, in San Juan Co., Utah, and is the same point as occupied by A. D. Wilson of the Hayden survey. It was timbered nearly to the top, the trees showing far above

the highest point, but it is now cleared. The highest point was occupied and used.

[Latitude, $37^{\circ} 50' 22''$.5. Longitude, $109^{\circ} 27' 43''$.7.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Peale..... | 197 | 01 | 18.1 | 17 | 09 | 56.4 | 4.8422017 |
| Ute Peak..... | 315 | 22 | 19.7 | 135 | 47 | 20.1 | 4.9360333 |
| Pastora..... | 347 | 09 | 02.5 | 167 | 19 | 51.7 | 5.0709876 |

UTE PEAK.

The highest point of the Sierra El Late, in Montezuma Co., Colo. The top was sparsely timbered, but it is now cleared.

Permanent mark: A stone monument on highest point.

[Latitude, $37^{\circ} 17' 03''$.0. Longitude, $108^{\circ} 46' 42''$.5.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pastora..... | 32 | 12 | 09.9 | 211 | 58 | 12.5 | 4.8108075 |
| Abajo..... | 135 | 47 | 20.1 | 315 | 22 | 19.7 | 4.9360333 |
| La Huerfano..... | 318 | 32 | 54.6 | 139 | 06 | 30.8 | 5.1020647 |
| Peale..... | 162 | 56 | 29.3 | 342 | 39 | 53.9 | 5.1274286 |

NAVAJO.

In San Juan Co., Utah, south of the Colorado River, near Lee's Ferry. It is difficult to approach except from the south. It is heavily timbered, with tall pine and balsam. The station consists of a scaffold, built of five tall trees near the highest point. The instrument was placed on this scaffold, and lanes cut to the points sighted. The signal was seen from Wilson, Oraibe, Calabasa, Sonsala, Pastora, Ute Peak, Abajo, and Peale, the latter being over 140 miles distant. When Navajo was occupied the tallest tree had to be cut off for a support for the theodolite independent of the platform. The instrument was 27 feet above the ground.

[Latitude, $37^{\circ} 02' 02''$.9. Longitude, $110^{\circ} 52' 08''$.7.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Waas..... | 224 | 19 | 53.6 | 41 | 23 | 00.0 | 5.3442340 |
| Pastora..... | 279 | 35 | 18.1 | 100 | 36 | 43.6 | 5.1883026 |
| Peale..... | 222 | 20 | 58.9 | 43 | 21 | 12.6 | 5.3275052 |
| Wilson..... | 324 | 41 | 48.2 | 145 | 07 | 24.4 | 5.0465085 |
| Oraibe..... | 353 | 44 | 30.2 | 173 | 50 | 02.7 | 5.1097488 |
| Calabasa..... | 308 | 16 | 22.1 | 128 | 53 | 21.0 | 5.0713882 |

PASTORA.

The highest point of the Carriso Mountains, in northeastern Apache Co., Ariz. It is a bare rounded knoll and not a natural point.

Permanent mark: A stone monument.

[Latitude, $36^{\circ} 47' 25''$.1. Longitude, $109^{\circ} 09' 52''$.8.]

| To station. | Azimuth. | | | Back azimuth. | | | Log dist. |
|-------------------|----------|----|------|---------------|----|------|-----------|
| | ° | ' | " | ° | ' | " | Meters. |
| Navajo | 100 | 36 | 43.6 | 279 | 35 | 18.1 | 5.1883026 |
| A bajo | 167 | 19 | 51.7 | 347 | 09 | 02.5 | 5.0769376 |
| Calabasa | 52 | 34 | 32.4 | 232 | 10 | 27.9 | 4.8812791 |
| La Huerfana | 288 | 29 | 43.3 | 109 | 16 | 56.9 | 5.0962691 |
| Roof Butte | | | | 170 | 04 | 16.1 | 4.5705043 |
| Ute Peak | 211 | 58 | 12.5 | 32 | 12 | 09.9 | 4.8108075 |

ROOF BUTTE.

A high butte in the eastern part of the Tunitcha Mountains, in Apache Co., Ariz. The top is nearly flat, several hundred yards across, and is not a natural point.

[Latitude, $36^{\circ} 27' 37''$.1. Longitude, $109^{\circ} 05' 31''$.4.]

| To station. | Azimuth. | | | Back azimuth. | | | Log dist. |
|----------------|----------|----|------|---------------|----|------|-----------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pastora | 170 | 04 | 16.1 | | | | 4.5705043 |
| Zilk | 12 | 27 | 29.3 | 192 | 21 | 58.4 | 4.8141432 |
| Calabasa | 81 | 51 | 19.4 | 261 | 24 | 47.2 | 4.8295738 |
| Sonsala | 358 | 06 | 15.7 | 178 | 06 | 37.8 | 4.6003783 |

LA HUERFANA.

The highest point of a group of mesas, about 15 miles south of the San Juan River, San Juan Co., N. Mex. This is by no means a natural point, and the absence of suitable rock renders it impracticable to build a monument.

[Latitude, $36^{\circ} 25' 34''$.1. Longitude, $107^{\circ} 50' 41''$.2.]

| To station. | Azimuth. | | | Back azimuth. | | | Log dist. |
|----------------|----------|----|------|---------------|----|------|-----------|
| | ° | ' | " | ° | ' | " | Meters. |
| Pastora | 109 | 16 | 56.9 | 288 | 29 | 43.3 | 5.0962691 |
| Ute Peak | 139 | 06 | 30.8 | 318 | 32 | 54.6 | 5.1020647 |

CALABASA.

Calabasa, in Apache Co., Ariz., is on a slight rise on Calabas mesa, near its edge. It was timbered with cedar and piñon. The timber has been cut, with the exception of one piñon tree near the highest point, which constitutes a part of the station. The instrument was

placed over the center. A large red pine stands about 150 feet to the southwest and serves for a witness tree.

[Latitude, $36^{\circ} 22' 18''$.3. Longitude, $109^{\circ} 50' 16''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Navajo | 128 53 21.0 | 308 16 22.1 | 5.0713882 |
| Pastora | 232 10 27.9 | 52 34 32.4 | 4.8812791 |
| Roof Butte | 261 24 47.2 | 81 51 19.4 | 4.8295738 |
| Sonsala | 293 29 17.0 | 113 56 04.5 | 4.8726795 |
| Wilson | 58 19 24.9 | 238 08 11.9 | 4.5233561 |

WILSON.

A high wooded mesa, about 20 miles north of Kean's Canyon, Apache Co., Ariz. The point occupied is marked by a signal built of poles and trees on the highest point. Lanes are cut to all points sighted.

[Latitude, $36^{\circ} 12' 48''$.3. Longitude, $110^{\circ} 09' 13''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Zilh | 293 42 16.2 | 114 14 13.8 | 4.9506506 |
| Calabasa | 238 08 11.9 | 58 19 24.9 | 4.5233561 |
| Cottonwood | 10 40 44.7 | 190 35 01.4 | 4.9014405 |
| Navajo | 145 07 24.4 | 324 41 48.2 | 5.0465085 |
| Oraibo | 53 58 11.0 | 233 58 25.0 | 4.7960006 |

SONSALA.

The eastern of two buttes, and just east of Washington Pass and 25 miles north of Fort Defiance, Apache Co., Ariz. It is not a good natural point. The sides are timbered, but the top is not.

Permanent mark: A stone monument on highest point.

[Latitude, $36^{\circ} 06' 05''$.2. Longitude, $109^{\circ} 04' 41''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| McKenzie | 325 03 00.20 | 145 25 15.4 | 5.0033911 |
| Calabasa | 113 56 04.50 | 293 29 17.0 | 4.8726795 |
| Roof Butte | 178 06 37.80 | 358 06 15.7 | 4.6003783 |
| Chusca | 317 46 14.40 | 137 54 44.1 | 4.5100664 |
| Zilh | 32 50 54.98 | 212 44 54.5 | 4.4527421 |

ZILH.

A small butte standing on Navajo Plateau, in Apache Co., Ariz., 12 miles northwest of Fort Defiance. It was heavily timbered but

is now cleared with the exception of a tall pine tree, left for a signal, to which the observations were reduced. It is not a natural point.

[Latitude, $35^{\circ} 53' 11''$.65. Longitude, $109^{\circ} 14' 55''$.11.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|-------|---------------|----|-------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Sonsala | 212 | 44 | 54.50 | 32 | 50 | 54.98 | 4.4527421 |
| Cottonwood | 66 | 47 | 37.24 | 246 | 10 | 13.88 | 5.0228907 |
| Chusca | 270 | 06 | 42.20 | 90 | 21 | 10.10 | 4.5698015 |
| Iola | 35 | 26 | 01.20 | 215 | 06 | 27.60 | 4.7843436 |
| McKenzie | 308 | 41 | 48.40 | 129 | 09 | 57.40 | 4.9722791 |
| Roof Butte | 192 | 21 | 58.40 | 12 | 27 | 29.30 | 4.8141432 |
| Wilson | 114 | 14 | 13.80 | 293 | 42 | 16.20 | 4.9506506 |

CHUSCA.

Is a sharp peak, on the end of a spur that juts out to the south from the Chusca Plateau, in Bernalillo Co., N. Mex. It is bare and an excellent natural point, affording a good view in all directions except north, where the Chusca Plateau cuts off the view.

[Latitude, $35^{\circ} 53' 06''$.75. Longitude, $108^{\circ} 50' 14''$.52.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Nell | 339 | 21 | 40.2 | 159 | 29 | 08.7 | 4.7410188 |
| Twins | 359 | 40 | 03.1 | 179 | 40 | 08.9 | 4.6371148 |
| Zuñi | 40 | 33 | 18.8 | 184 | 30 | 44.4 | 4.9280539 |
| McKenzie | 323 | 36 | 30.1 | 148 | 50 | 16.8 | 4.8376057 |
| Zili | 90 | 21 | 10.1 | 270 | 06 | 42.2 | 4.5698015 |
| Sonsala | 137 | 54 | 44.1 | 317 | 46 | 14.4 | 4.5100664 |
| Crofton | 18 | 13 | 51.4 | 198 | 03 | 51.7 | 4.9067286 |
| Square Mesa | 325 | 28 | 09.2 | 145 | 47 | 36.5 | 4.9521800 |
| Taylor | 302 | 23 | 33.0 | 123 | 06 | 24.7 | 5.1222508 |
| Hosta | 299 | 19 | 49.5 | 119 | 42 | 27.2 | 4.8269210 |

PYRAMID.

A sandstone butte, 7 miles northwest of Fort Wingate, Bernalillo Co., N. Mex., and 1 mile west of the "Navajo church."

Permanent mark: A stone monument on the highest point.

[Latitude, $35^{\circ} 33' 18''$.80. Longitude, $108^{\circ} 37' 01''$.12.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-----------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| East Base | 299 | 21 | 41.5 | 119 | 25 | 29.9 | 4.0555817 |
| Nell | 2 | 17 | 56.7 | 182 | 17 | 42.9 | 4.1751919 |
| Twins | 71 | 11 | 05.8 | 251 | 03 | 30.6 | 4.3193257 |

HOSTA.

A flat-topped mesa butte, 13 miles northeast of Coolidge, Bernalillo Co., N. Mex.

Permanent mark: A large pine tree with trunk trimmed and heavy foliage in top.

[Latitude, $35^{\circ} 35' 13''$.5. Longitude, $108^{\circ} 11' 29''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Square Mesa..... | 11 06 11.9 | 191 03 08.2 | 4.6194709 |
| Taylor..... | 305 54 10.6 | 126 14 27.0 | 4.8167308 |
| James..... | 263 54 38.6 | 84 41 15.2 | 5.0840194 |
| Copper..... | 247 19 47.2 | 68 06 43.4 | 5.1158874 |
| Chusca..... | 119 42 27.2 | 299 19 49.5 | 4.8269210 |

TWINS.

The eastern of two symmetrical cones, joined at the base, 6 miles southwest of Gallup, Bernalillo Co., N. Mex.

Permanent mark: A stone monument on the summit.

[Latitude, $35^{\circ} 29' 39''$.79. Longitude, $108^{\circ} 50' 04''$.54.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pyramid..... | 251 03 30.6 | 71 11 05.8 | 4.3193257 |
| Nell..... | 293 07 57.8 | 113 15 18.5 | 4.3188760 |
| Chusca..... | 179 40 08.9 | 359 40 03.1 | 4.6371148 |

NELL.

A rocky peak on a monoclinical ridge, 6 miles southwest of Fort Wingate, Bernalillo Co., N. Mex.

Permanent mark: A small stone monument.

[Latitude, $35^{\circ} 25' 13''$.47. Longitude, $108^{\circ} 37' 24''$.92.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| West base..... | 199 49 31.70 | 19 51 12.78 | 4.1118837 |
| East base..... | 228 13 24.91 | 48 17 26.75 | 4.1488124 |
| Chusca..... | 159 29 08.70 | 339 21 40.20 | 4.7410188 |
| Zuñi..... | 38 34 54.70 | 218 24 56.90 | 4.6236305 |
| Twins..... | 113 15 18.50 | 293 07 57.80 | 4.3188760 |
| Pyramid..... | 182 17 42.90 | 2 17 56.70 | 4.1751919 |

WEST BASE.

This station is situated near the foot of some low cliffs about 2 miles northwest from Wingate Station, in Valencia Co., N. Mex.

Permanent mark: A stone post set firmly in the ground. A cross on the upper surface marks the end of the base line and the position of the theodolite in observing angles. Witness stones are placed in

the form of a square about the stone, and the intersection of the diagonals of the square marks the position of the stone post indicating the end of the base line.

[Latitude, $35^{\circ} 31' 48'' \cdot 38$. Longitude, $108^{\circ} 34' 30'' \cdot 74$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Nell | 19 51 12·78 | 199 49 31·70 | 4·1118837 |
| East base..... | 294 31 11·17 | 114 33 32·15 | 3·8274916 |

EAST BASE.

This station is on a low knoll in Valencia Co., N. Mex., about 2 miles east of the astronomical pier at Wingate Station, N. Mex.

Permanent mark: A stone post set firmly in the ground. A cross cut in the upper surface marks the exact point of the base line and the position of the theodolite in observing angles. The azimuth of the base line was determined by observations at this station on Polaris. Four witness stones were set in the form of a square about the stone post marking this station. The intersection of the diagonals of this square mark the position of the cross on the upper surface of the post.

[Latitude, $35^{\circ} 30' 17'' \cdot 80$. Longitude, $108^{\circ} 30' 28'' \cdot 08$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|--------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| West base | 114 33 32·15 | 294 31 11·17 | 3·8274916 |
| Nell | 48 17 26·75 | 228 13 24·91 | 4·1488124 |
| Pyramid..... | 119 25 29·91 | 299 21 41·50 | 4·0535817 |

ASTRONOMICAL PIER.

The position of the astronomical pier from which the latitude and longitude of the Fort Wingate base was determined is 105 feet northeast from ticket office at Wingate, N. Mex. It was marked by a limestone post set firmly in the ground. A cross was cut on the upper face of the stone to indicate the exact position of the instrument. Longitude of the pier was determined by exchange of time signals for 5 nights with the observatory of the Washington University at St. Louis, Mo. Latitude by observations made on 22 pairs of stars.

Latitude, $35^{\circ} 30' 51'' \cdot 38$. Longitude, $108^{\circ} 32' 27'' \cdot 32$.

MCKENZIE.

Situated on a wooded ridge about 8 miles east of Fort Wingate, Valencia Co., N. Mex. The station is a scaffold about 40 feet high and the instrument was placed part way up. An enormous amount of chopping has been done here from time to time, and this station has

been a source of great annoyance on account of the difficulty of finding the signal, at long distances, among the trees. On this account it was abandoned in extending the triangulation and Square Mesa substituted in its place.

[Latitude, $35^{\circ} 21' 18''$.7. Longitude, $108^{\circ} 26' 35''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Zuñi | 59 04 24.9 | 238 48 12.5 | 4.6967127 |
| Zilh | 129 09 57.4 | 308 41 48.4 | 4.9722791 |
| Chusca | 148 50 16.8 | 328 36 30.1 | 4.8370657 |
| Sonsala | 145 25 15.4 | 325 03 00.2 | 5.0039911 |
| Taylor | | 99 52 07.0 | 4.8866779 |

TAYLOR.

The highest point of the San Mateo Mountains, a high volcanic mountain mass in Valencia Co., N. Mex. The northern slope was timbered and is partly cleared. The highest point was occupied and used, and is marked by a tripod signal. It is the same point published by the Wheeler survey.

[Latitude, $35^{\circ} 14' 30''$.7. Longitude, $107^{\circ} 36' 29''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Chusca | 123 06 24.7 | 302 23 33.0 | 5.1222508 |
| McKenzie | 99 52 07.0 | | 4.8866779 |
| Square Mesa | 88 05 10.1 | 267 41 55.4 | 4.7866140 |
| Hosta | 126 14 27.9 | 305 54 10.6 | 4.8167308 |
| Jemes | 233 06 37.7 | 53 32 43.5 | 4.9285535 |
| Pinon | 34 25 07.8 | 213 55 50.8 | 5.1450548 |
| Sandia | 269 53 33.0 | 90 33 25.7 | 5.0206116 |

CROFTON.

A rise on a ridge originally covered by a thick growth of cedars, and situated 6 miles east of south of Allantown, Apache Co., Ariz. It has been cleared, and a signal built of cedar poles with brush in the top. The center of the station is marked by a large nail driven in a cedar bough projecting from the parent stump near the ground.

[Latitude, $35^{\circ} 11' 39''$.26. Longitude, $109^{\circ} 06' 51''$.84.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Iola | 119 52 13.1 | 299 34 07.0 | 4.7375673 |
| Pinon | 331 30 29.0 | 151 52 40.8 | 5.0989330 |
| Ords Peak | 18 01 11.2 | 197 44 30.3 | 5.1656953 |
| Hasseltine | 53 12 06.1 | 233 00 41.3 | 4.5766780 |
| Chusca | 198 03 51.7 | 18 13 31.4 | 4.9067286 |
| Douglas | 86 23 30.5 | 265 57 10.4 | 4.8424105 |
| Square Mesa | 267 42 22.7 | 88 11 15.1 | 4.8811374 |
| Zuñi | 292 48 13.2 | 112 55 14.4 | 4.3030530 |

ZUÑI.

The smaller and southeastern of two buttes, northwest of Zuñi Town, Valencia Co., N. Mex.; accessible only from the west.

Permanent mark: A stone monument.

[Latitude, 35° 07' 25"-93. Longitude, 108° 54' 40"-29.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Nell | 218 24 56.9 | 38 34 54.7 | 4.6236305 |
| Crofton | 112 55 14.4 | 292 48 13.2 | 4.3030530 |
| Chusca | 184 30 44.4 | 4 33 18.8 | 4.9280539 |
| McKenzie | 238 48 12.5 | 50 05 24.9 | 4.6967127 |

SQUARE MESA.

A high, timbered "square mesa" in the Zuñi Mountains, Valencia Co., N. Mex., and 13 miles south of Chaves. Lanes were cut to the points sighted, and observations were taken from a scaffold and reduced to the mark.

Permanent mark: A very tall tree trimmed up to about 12 feet from the top.

[Latitude, 35° 13' 07"-7. Longitude, 108° 16' 46"-9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Crofton | 88 11 15.1 | 267 42 22.7 | 4.8811374 |
| Chusca | 145 47 36.5 | 325 28 09.2 | 4.9521800 |
| Hosta | 191 03 08.2 | 11 06 11.9 | 4.6194709 |
| Pinon | 8 33 02.9 | 183 26 44.1 | 5.0589954 |
| Taylor | 267 41 55.4 | 88 05 10.1 | 4.7866140 |

PINON.

The highest peak of the Datil Range, in Socorro Co., N. Mex. It was sparsely timbered on top and has been cleared, leaving a small signal tree near the top. Observations were taken at the highest point and were reduced to the tree. Some of the trees growing on the side are about as high as the top of the mountain, and might be mistaken for the highest point from some directions. The mountain is easiest climbed from the southeast. It was published by Wheeler's survey under the name of Alamocita.

[Latitude, 34° 11' 51"-1 Longitude, 108° 27' 52"-1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Square Mesa | 188 26 44.1 | 8 33 02.9 | 5.0589954 |
| Taylor | 213 55 50.8 | 34 25 07.8 | 5.1450548 |
| Crofton | 151 52 40.8 | 331 30 29.0 | 5.0989330 |
| Ords Peak | 75 00 27.5 | 254 22 08.7 | 5.0378288 |
| Tularosa | 10 11 31.6 | 190 07 46.8 | 4.7681763 |

TULAROSA.

In Socono Co., N. Mex., about 20 miles south of old Fort Tularosa. The same point was occupied by Wheeler survey under the name of Eagle Peak.

Permanent mark: A stone monument on the highest point of the mountain.

[Latitude, $33^{\circ} 40' 37''\cdot 7$. Longitude, $108^{\circ} 34' 34''\cdot 9$.]

| To station. | Azimuth. | | | Back azimuth. | Log. dist. | | |
|----------------|----------|----|------|---------------|------------|------|-----------|
| | ° | ' | " | ° | ' | " | Meters. |
| Ords Peak..... | 107 | 10 | 40·2 | 286 | 36 | 20·9 | 4·9977404 |
| Piñon | 190 | 07 | 46·8 | 10 | 11 | 31·6 | 4·7681763 |
| Graham | 48 | 29 | 12·1 | 227 | 46 | 41·8 | 5·2096385 |

ORDS PEAK,

Otherwise known as Baldy, is a high, bald knob in the White Mountains, Ariz. Thomas Peak to the east is higher and a better natural point, but affords no view to the west which is cut off by Ords Peak, and for this reason the latter was used as the triangulation point.

Permanent mark: A stone monument 16 feet high and 10 feet in diameter at the base on the highest point.

[Latitude, $23^{\circ} 56' 16''\cdot 0$. Longitude, $109^{\circ} 36' 15''\cdot 8$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Browns Peak..... | 80 | 28 | 42·2 | 259 | 31 | 15·5 | 5·2088659 |
| San Francisco | 130 | 00 | 48·4 | 308 | 50 | 07·1 | 5·3909744 |
| Piñon..... | 254 | 22 | 08·7 | 75 | 00 | 27·5 | 5·0378288 |
| Tularosa..... | 286 | 36 | 20·9 | 107 | 10 | 40·2 | 4·9977404 |
| Crofton..... | 197 | 44 | 30·3 | 18 | 01 | 11·2 | 5·1656953 |
| Douglas..... | 169 | 34 | 44·7 | 349 | 25 | 31·3 | 5·1368081 |
| Graham | 10 | 18 | 59·9 | 190 | 10 | 13·9 | 5·1438981 |
| Mazatzal | 95 | 08 | 17·8 | 274 | 06 | 00·6 | 5·2356658 |

GRAHAM.

Highest point of Graham Mountain, south of the Gila River, near Solomonsville, Graham Co., Ariz. The mountain is heavily timbered, and lanes are cut to Piñon Mountain, Ords Peak, and Browns Peak.

Permanent mark: A small clump of very tall trees, growing close together.

[Latitude, $32^{\circ} 42' 07''\cdot 0$. Longitude, $109^{\circ} 52' 13''\cdot 4$.]

| To station. | Azimuth. | | | Back azimuth | | | Log. dist. |
|------------------|----------|----|------|--------------|----|------|----------------|
| | ° | ' | " | ° | ' | " | <i>Meters.</i> |
| Ords Peak | 190 | 10 | 13·9 | 10 | 18 | 59·9 | 5·1438981 |
| Tularosa..... | 227 | 46 | 41·8 | 48 | 29 | 12·1 | 5·2096385 |
| Browns Peak..... | 129 | 10 | 31·6 | 308 | 22 | 44·7 | 5·2405049 |

BROWNS PEAK.

The highest and most northern of the "Four Peaks," west of Tonto Basin, Ariz. It is very difficult to climb, bare on top, and a fair natural point.

Permanent mark: A stone monument on the highest point.

[Latitude, $33^{\circ} 41' 04'' \cdot 2$. Longitude, $111^{\circ} 19' 29'' \cdot 6$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Graham | 308 22 44·7 | 129 10 31·6 | 5·2405049 |
| San Francisco..... | 170 09 50·6 | 349 56 54·1 | 5·2722252 |
| Mazatzal | 163 22 45·7 | 343 17 13·2 | 4·6413886 |
| Ords Peak..... | 259 31 15·5 | 80 28 42·2 | 5·2088659 |

MAZATZAL.

The highest point of the northern group of the Mazatzal Mountains west of Tonto Basin, Yavapai Co., Ariz. The point is best approached by climbing the long ridge reaching down to the east.

Permanent mark: A small pile of stones.

[Latitude, $34^{\circ} 03' 45'' \cdot 7$. Longitude, $111^{\circ} 27' 38'' \cdot 5$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Browns Peak | 343 17 13·2 | 163 22 45·7 | 4·6413886 |
| Granite..... | 122 43 59·9 | 302 07 02·5 | 5·0754858 |
| Ords Peak..... | 274 06 00·6 | 95 08 17·8 | 5·2356658 |
| San Francisco..... | 172 56 41·9 | 352 00 38·4 | 5·1576796 |
| Bakers Butte..... | 190 00 56·1 | 10 03 44·4 | 4·6422243 |

BAKERS BUTTE.

Is a knoll on the edge of the Mogollon mesa, above Tonto Basin, about 8 miles west of the "Tunnel," in Yavapai Co., Ariz. It was heavily timbered, but has been cleared, except a large pine tree near the top, to which observations were reduced. The "Potato Ranch," a mile to the north, is a convenient and excellent camp from which to visit the butte.

[Latitude, $34^{\circ} 27' 08'' \cdot 6$. Longitude, $111^{\circ} 22' 39'' \cdot 6$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| San Francisco | 164 39 15·4 | 344 28 58·5 | 5·0123560 |
| Mazatzal | 10 03 44·4 | 190 00 56·1 | 4·6422243 |
| Granite..... | 101 08 50·0 | 280 28 52·9 | 5·0404877 |
| Del Pasco..... | 75 24 21·0 | ..... | 4·974008 |
| Chevron..... | 241 06 48·0 | 61 24 50·4 | 4·7439038 |
| Sunset..... | 217 11 21·6 | 37 25 35·0 | 4·7993065 |

CHEVLON.

Is a large, flat-topped, timbered butte about 30 miles south of Winslow, Apache Co., Ariz. The horizon from south around by the west to the northeast is commanded, but the east and southeast are cut off by the timber.

Permanent mark: A lone tree near the northeast end of summit.

[Latitude, $34^{\circ} 41' 33'' \cdot 8$. Longitude, $110^{\circ} 50' 52'' \cdot 1$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Bakers Butte..... | 61 24 50·4 | 241 06 48·0 | 4·7439038 |
| San Francisco..... | 134 00 32·2 | 306 43 39·8 | 5·0204678 |
| Douglas..... | 239 49 38·9 | 60 23 29·5 | 5·0090390 |
| Sunset..... | 156 11 11·5 | 336 07 18·9 | 4·4088258 |

SUNSET.

The knoll on the mesa that forms the western wall of Sunset Pass, 18 miles southwest of Winslow, Yavapai Co., Ariz. It is a fair, natural point.

Permanent mark: A stone monument on the highest point.

[Latitude, $34^{\circ} 54' 14'' \cdot 7$. Longitude, $110^{\circ} 57' 39'' \cdot 8$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Chevron..... | 326 07 18·9 | 156 11 11·5 | 4·4088258 |
| Bakers Butte..... | 37 25 35·0 | 217 11 21·6 | 4·7993065 |
| Cottonwood..... | 221 03 26·5 | 41 25 43·8 | 4·9494996 |
| Douglas..... | 254 08 15·2 | 74 45 36·4 | 5·0117591 |
| San Francisco..... | 127 08 23·0 | 306 43 39·7 | 4·9120243 |
| Woodruff Butte.. | 277 37 30·4 | 98 09 01·2 | 4·9286824 |

WOODRUFF BUTTE.

A sharp lava cone near the town of Woodruff, Ariz., occupied as a secondary station.

Permanent mark: A stone monument on the highest point.

[Latitude, $34^{\circ} 47' 56'' \cdot 7$. Longitude, $110^{\circ} 02' 31'' \cdot 1$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Douglas..... | 201 02 55·7 | 21 08 37·4 | 4·6233254 |
| Hasseltine..... | 248 36 03·1 | 68 56 32·0 | 4·7672366 |
| Sunset..... | 98 09 01·2 | 277 37 30·4 | 4·9286824 |

HASSELTINE.

A slight elevation on the wooded ridge trending in an east and west direction, about 8 miles south of Navajo Springs, Apache Co., Ariz. It is about one-half mile west of where the road from Navajo to St.

Johns climbs the ridge. The point is marked by two trees standing close together, the vicinity having been cleared. The instrument was placed on the highest point, and the observations reduced to the signal. This station is hard to find, and is not used in the main scheme of triangulation.

[Latitude, $34^{\circ} 59' 24'' \cdot 3$. Longitude, $109^{\circ} 26' 43'' \cdot 1$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Douglas | 114 | 43 | 38·5 | 294 | 28 | 46·8 | 4·6359622 |
| Iola | 160 | 47 | 08·0 | 340 | 40 | 31·5 | 4·7217592 |
| Crofton | 233 | 00 | 41·3 | 53 | 12 | 06·1 | 4·5766780 |
| Woodruff Butte .. | 68 | 56 | 32·0 | 248 | 36 | 03·1 | 4·7672366 |

DOUGLAS.

A large, prominent butte, about 12 miles north of Carrizo, Apache Co., Ariz. It is of lava, and stands perhaps 600 feet above the base. Permanent mark: A stone monument on the highest point.

[Latitude, $35^{\circ} 09' 08'' \cdot 6$. Longitude, $109^{\circ} 52' 35'' \cdot 1$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Crofton | 265 | 57 | 10·4 | 86 | 23 | 30·5 | 4·8424105 |
| Sunset | 74 | 45 | 36·4 | 254 | 08 | 15·2 | 5·0117591 |
| Chevon | 60 | 23 | 29·5 | 239 | 49 | 58·9 | 5·0090390 |
| Ords Peak | 349 | 25 | 31·3 | 169 | 34 | 44·7 | 5·1368081 |
| San Francisco | 98 | 00 | 03·5 | 276 | 57 | 42·2 | 5·2182681 |
| Hasseltine | 294 | 28 | 46·8 | 114 | 43 | 38·5 | 4·6359622 |
| Iola | 214 | 28 | 01·0 | 34 | 36 | 20·5 | 4·5857480 |
| Woodruff Butte .. | 21 | 08 | 37·4 | 201 | 02 | 55·7 | 4·6233254 |

IOLA.

Situated on a sand ridge, about 9 miles northeast of Tanners Springs, Apache Co., Ariz. A lone piñon tree serves as a signal, and a nail driven in a low horizontal branch marks the center of the station.

[Latitude, $35^{\circ} 26' 18'' \cdot 4$. Longitude, $109^{\circ} 38' 10'' \cdot 6$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|------------------|----------|----|------|---------------|----|------|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Zilh | 215 | 06 | 27·6 | 35 | 20 | 01·2 | 4·7843436 |
| Cottonwood | 97 | 15 | 55·8 | 276 | 52 | 14·6 | 4·7938988 |
| Douglas | 34 | 36 | 20·5 | 214 | 28 | 01·0 | 4·5857480 |
| Crofton | 299 | 34 | 07·0 | 119 | 52 | 13·1 | 4·7375673 |
| Hasseltine | 340 | 40 | 31·5 | 160 | 47 | 08·0 | 4·7217592 |

COTTONWOOD.

Is a small knoll, in Apache Co., Ariz., on the mesa, about 30 miles north of Holbrook, in which Cottonwood Spring is situated. It is difficult to recognize, and is not a good natural point.

Permanent mark: A stone monument.

[Latitude, $35^{\circ} 30' 26''$.8. Longitude, $110^{\circ} 18' 59''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Oraibe | 139 09 30.4 | 318 55 36.3 | 4.7390394 |
| Sunset | 41 25 43.8 | 221 03 26.5 | 4.9494990 |
| San Francisco | 82 09 59.9 | 261 22 41.3 | 5.0963786 |
| Wilson | 190 35 01.4 | 10 40 44.7 | 4.9014405 |
| Iola | 276 52 14.6 | 97 15 55.8 | 4.7938988 |
| Zilk | 246 10 13.9 | 66 47 37.2 | 5.0228997 |

ORAIBE.

A butte (Apache Co., Ariz.) on the end of a spur reaching to the south from the long mesa on which the Moqui towns are built. It is about 6 miles west of Oraibe village.

Permanent mark: A stone monument.

[Latitude, $35^{\circ} 52' 50''$.4. Longitude, $110^{\circ} 42' 49''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Navajo | 173 50 02.7 | 353 44 30.2 | 5.1097488 |
| Wilson | 233 38 25.0 | 53 58 11.0 | 4.7969006 |
| Cottonwood | 318 55 36.3 | 139 09 30.4 | 4.7390394 |

SAN FRANCISCO.

A well-known volcanic mountain, standing on the Colorado Plateau, in Coconino Co., Ariz.

Permanent mark: A stone cairn 10 feet high.

[Latitude, $35^{\circ} 20' 47''$.0. Longitude, $111^{\circ} 40' 37''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ords Peak | 308 50 07.1 | 130 00 48.4 | 5.3909744 |
| Cottonwood | 261 22 41.3 | 82 09 59.9 | 5.0963786 |
| Douglas | 276 57 42.2 | 98 00 03.5 | 5.2182681 |
| Chevron | 306 43 39.8 | 134 00 32.2 | 5.0204678 |
| Bakers Butte | 344 28 58.5 | 164 39 15.4 | 5.0123560 |
| Mazatzal | 352 00 38.4 | 172 56 41.9 | 5.1576253 |
| Browns Peak | 349 56 54.1 | 170 09 50.6 | 5.2722252 |
| Granite | 45 43 39.8 | 225 13 33.2 | 5.0494630 |
| Floyd | 93 23 34.4 | 272 47 14.3 | 4.9787020 |
| Sunset | 306 43 39.7 | 127 08 23.0 | 4.9120243 |

GRANITE.

A sharp, rocky peak, 8 miles northwest of Prescott, Yavapai, Co., Ariz. It is difficult to climb, being most easily accessible from the northwest. It is a good natural point, being rather sharp, and sur-

mounted by a large boulder. The observations were taken near this boulder and reduced to its center.

[Latitude, $34^{\circ} 38' 17''$.0. Longitude, $112^{\circ} 33' 08''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| San Francisco | 225 13 33.2 | 45 43 39.8 | 5.0494630 |
| Bakers Butte | 280 28 52.9 | 101 08 50.8 | 5.0404877 |
| Floyd..... | 169 28 59.7 | 349 23 06.3 | 4.9302200 |
| Aquarius..... | 117 02 10.3 | 296 36 39.5 | 4.8832267 |
| Mazatzal | 302 07 02.5 | 122 43 59.9 | 5.0754858 |

BILL WILLIAMS.

A good natural point; the highest point of Bill Williams Mountain, about 5 miles south of Williams, a station on the Atlantic and Pacific Railroad, in Yavapai Co., Ariz.

Permanent mark: A cairn of stones.

[Latitude, $35^{\circ} 11' 59''$.6. Longitude, $112^{\circ} 12' 15''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Floyd..... | 114 31 04.3 | 294 13 04.6 | 4.7146148 |
| Aquarius..... | 74 42 51.4 | 254 05 09.9 | 5.0150355 |

FLOYD.

A sharp peak, about 8 miles north of Crookton, Yavapai Co., Ariz.

Permanent mark: A stone monument 12 feet high and 10 feet in diameter, built by the Powell Survey.

[Latitude, $35^{\circ} 23' 33''$.6. Longitude, $112^{\circ} 43' 24''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Aquarius..... | 46 54 04.0 | 226 34 13.5 | 4.8562771 |
| San Francisco | 272 47 14.3 | 93 23 34.4 | 4.9787020 |
| Granite..... | 349 23 06.3 | 169 28 59.7 | 4.9302200 |
| Hualapai | 72 04 56.8 | 251 24 19.9 | 5.0510471 |
| Tipton..... | 97 21 59.8 | 276 30 52.6 | 5.1279544 |
| Emma..... | 157 27 56.7 | 337 12 15.2 | 5.0202043 |
| Bill Williams..... | 294 13 04.6 | 114 31 04.3 | 4.7146148 |

AQUARIUS.

Highest point of Aquarius Mountain, in Yavapai Co., Ariz., about 25 miles south of Peach Spring.

Permanent mark: A cairn of rocks 8 feet high.

[Latitude, $34^{\circ} 56' 56''$.2. Longitude, $113^{\circ} 17' 51''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Granite..... | 296 36 39.5 | 117 02 10.3 | 4.8832267 |
| Floyd..... | 226 34 13.5 | 46 54 04.0 | 4.8562771 |
| Hualapai | 104 31 14.8 | 284 10 37.0 | 4.7517284 |
| Bill Williams..... | 254 05 09.9 | 74 42 51.4 | 5.0150355 |

HUALAPAI.

In Mohave Co., Ariz., on highest point of Hualapai Mountain, 8 miles south of Kingman.

Permanent mark: Two large rocks on summit.

[Latitude, $35^{\circ} 04' 30''$.2. Longitude, $113^{\circ} 53' 48''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Floyd..... | 251 24 19.9 | 72 04 56.8 | 5.0510471 |
| Aquarius..... | 284 10 37.0 | 104 31 14.8 | 4.7517284 |
| Emma..... | 206 17 47.4 | 26 43 12.9 | 5.1685025 |

EMMA.

The highest southerly peak of the Uinkaret Mountains, in Mohave Co., Ariz., about 7 miles north of the Colorado River, on the brink of the Grand Canyon, and 10 miles south of Trumbull Spring.

Permanent mark: A stone monument.

[Latitude, $36^{\circ} 15' 50''$.2. Longitude, $113^{\circ} 10' 12''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Brink..... | 254 07 01.4 | 74 33 44.8 | 4.8453629 |
| Floyd..... | 337 12 15.2 | 157 27 56.7 | 5.0202043 |
| Hualapai..... | 26 43 12.9 | 206 17 47.4 | 5.1685025 |
| Tipton..... | 49 12 09.4 | 228 36 12.8 | 5.0877102 |
| Virgin..... | 114 17 40.3 | 293 44 09.1 | 4.9654204 |

TIPTON.

In Mohave Co., Ariz., on highest point of Mount Tipton, 6 miles north of Mineral Park.

Permanent mark: Large pine tree on summit of peak.

[Latitude, $35^{\circ} 32' 21''$.1. Longitude, $114^{\circ} 11' 30''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Charleston..... | 121 22 54.8 | 300 30 02.9 | 5.1989854 |
| Emma..... | 228 36 12.8 | 49 12 09.4 | 5.0877102 |
| Floyd..... | 276 30 52.6 | 97 21 59.8 | 5.1279543 |
| Virgin..... | 183 30 28.7 | 3 33 20.2 | 5.0728221 |
| Dead Man..... | 58 53 00.0 | 238 34 33.3 | 4.7512024 |
| Muddy..... | 150 59 22.7 | 330 41 02.1 | 4.9840258 |

VIRGIN.

The highest peak of the Virgin Mountains, 16 miles northeast of St. Thomas, Lincoln Co., Nev. This station was formerly occupied by the Powell Survey.

[Latitude, $36^{\circ} 36' 09''$.6. Longitude, $114^{\circ} 06' 39''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Tipton..... | 3 33 20.2 | 183 30 28.7 | 5.0728221 |
| Emma..... | 293 44 09.1 | 114 17 40.3 | 4.9654204 |
| Dead Man..... | 20 42 53.8 | 200 21 21.7 | 5.1967173 |
| Charleston..... | 75 57 55.9 | 255 01 30.6 | 5.1662173 |

DEAD MAN.

The highest point of Dead Mountain, in Lincoln Co., Nev., 16 miles north and a little west of Camp Mojave, and 8 miles west of the Colorado River. Station is on the highest point of rocks at extreme north-west end of peak, which is not a good natural point.

Permanent mark: A stone monument.

[Latitude, $35^{\circ} 16' 30'' \cdot 3$. Longitude, $114^{\circ} 43' 20'' \cdot 3$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Virgin..... | 200 21 21·7 | 20 42 53·8 | 5·1967173 |
| Tipton..... | 238 34 33·3 | 58 53 00·0 | 4·7512024 |
| Muddy..... | 180 25 48·9 | 360 26 08·9 | 5·0552302 |

MUDDY.

Highest point of Muddy Mountains, 24 miles southwest of St. Thomas, Lincoln Co., Nev. Peak is a good natural point.

[Latitude, $36^{\circ} 17' 54'' \cdot 8$. Longitude, $114^{\circ} 42' 46'' \cdot 1$.]

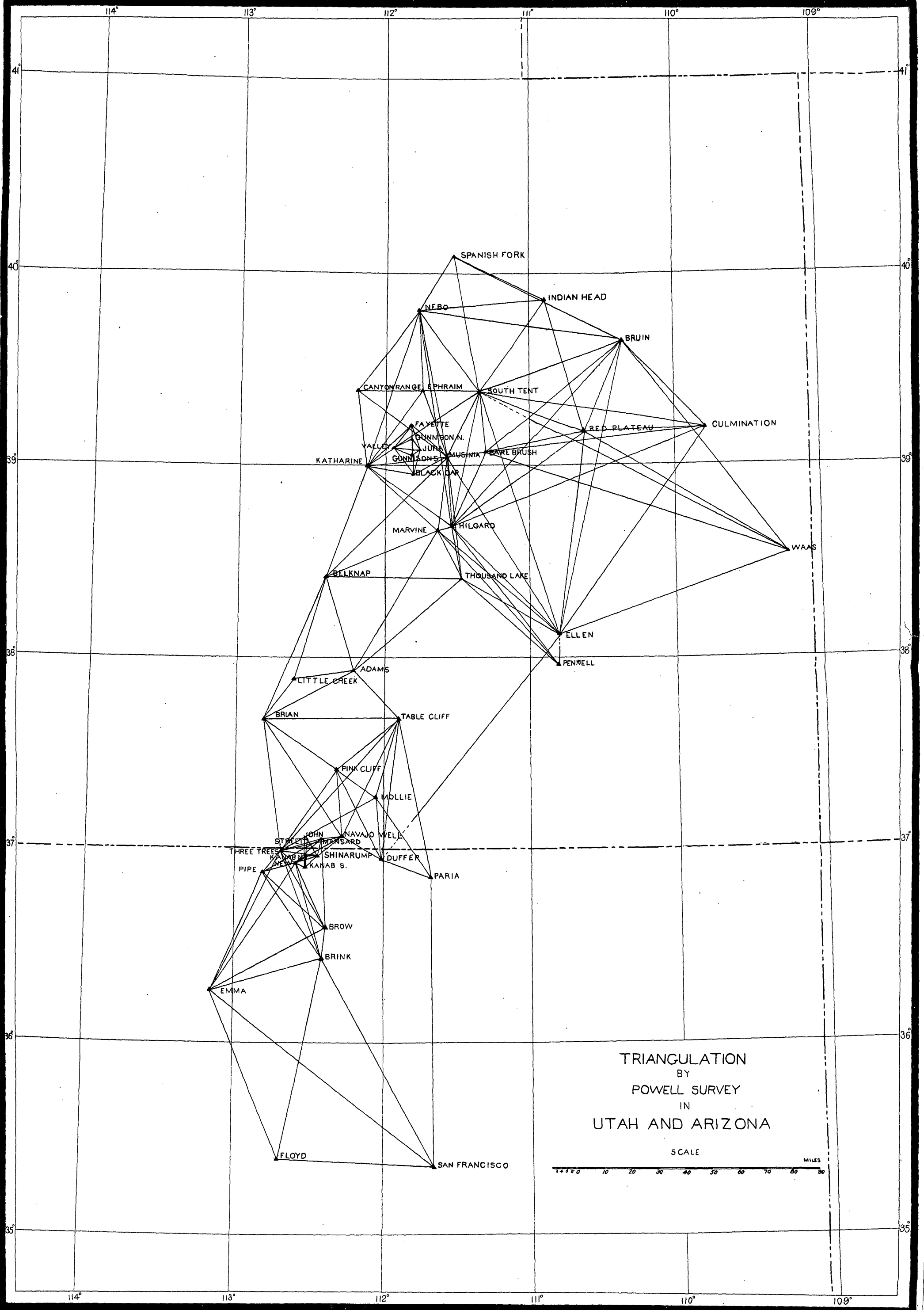
| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Dead Man..... | 360 26 08·9 | 180 25 48·9 | 5·0552302 |
| Tipton..... | 330 41 02·1 | 150 59 22·7 | 4·9846258 |

CHARLESTON.

In Lincoln, Nev., on highest peak of Timber Mountain, 15 miles southwest of Los Vegas, Nev. Signal is natural point of rocks.

[Latitude, $36^{\circ} 16' 18'' \cdot 0$ Longitude, $115^{\circ} 41' 38'' \cdot 7$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------|-------------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Tipton..... | 300 30 02·9 | 121 22 54·8 | 5·1989854 |
| Virgin..... | 255 01 30·6 | 75 57 55·9 | 5·1662173 |



TRIANGULATION OF THE POWELL SURVEY.

METHODS OF WORK.

The triangulation in this State was developed from two base lines, the first being measured at Kanab, Utah, and the second at Gunnison, in the same State. These base lines are 150 miles apart, the Gunnison line being the more northern and eastern. The Kanab base was first located and measured under direction of Prof. A. H. Thompson, in the winter of 1871-'72. Trussed wooden bars, supported upon adjustable trestles, were used. These bars were oiled and varnished to prevent absorption of moisture and tested by comparison with a standard steel tape, whose length and coefficient of temperature were known.

In the fall of 1878 a portion of this base line was remeasured under direction of Prof. G. K. Gilbert, with the apparatus used in the measurement of the Gunnison base line, and the result of this latter measurement adopted as the length of the Kanab base. The ends of the base line were marked by stone posts of basalt set firmly in the ground, the ends of the line being marked by a cut in the upper surface of the posts.

The latitude and longitude of the Kanab base line were determined by Prof. A. H. Thompson, in 1872. For longitude, time signals were exchanged with the astronomical observatory of the Deseret University at Salt Lake City, Mr. E. P. Austin, astronomer of the U. S. Engineers Geographical Survey west of the one hundredth meridian, whose services were kindly tendered by Lieut. Geo. M. Wheeler, in charge of that organization, conducting the observations and exchanges at that place.

Latitude was determined by the Talcott method of zenith distances, the instrument used being a combined transit and zenith telescope. Azimuth was determined by observations on Polaris.

The final adjusted results of these observations gives, as the position of the north end of the Kanab base line, longitude $112^{\circ} 31' 21'' \cdot 42$ W., latitude $36^{\circ} 57' 46'' \cdot 54$ N.

The Gunnison base line was measured under the direction of Prof. A. H. Thompson, in 1875, the measurement being made by wooden rods carried in a trussed wooden case. These rods were oiled and varnished to prevent absorption of moisture, and their length was carefully determined by comparisons with standard steel rods furnished by the U. S. Coast and Geodetic Survey.

The Gunnison base line was located in the meridian of the astronomical station at Gunnison, determined in 1872 by the U. S. engineers'

survey west of the one hundredth meridian, and the longitude of their monument adopted as the longitude of the north end of the base line. Its latitude was determined from observations of zenith distances by Prof. A. H. Thompson, in 1874. The adopted position of the north end of the base line is latitude $39^{\circ} 08' 28''$ 30 N., longitude $111^{\circ} 49' 16''$ 23 W. Both ends of this base are marked by a cross on the upper surface of a stone post set firmly in the ground.

The Gunnison and Kanab bases were connected by triangulation, the angles being measured by a theodolite having a 10-inch circle and reading by two verniers to 5 seconds. This triangulation was adjusted by the method of least squares, and the result, giving for the Gunnison base a length of 32,182.39 feet, and for the Kanab base a length of 22,619.73 feet, adopted for the computation of the latitudes and longitudes of the triangulation stations in Utah and northwestern Arizona.

Signals were erected on all triangulation stations, which were not good natural points, before the angles were observed.

The method adopted for observations of angles was usually by directions and on different parts of the circle. These angles were then repeated with the telescope in reversed position. From three to eight sets of these observations were made. After making an arbitrary station adjustment, all figures were adjusted by the method of least squares.

This system of triangulation covered and gave control points for topography over an area of approximately 108,000 square miles. Following is a descriptive list of triangulation stations, giving latitude and longitude of each station, together with azimuth and distances to such other stations as were used in the adjustment of figures.

DESCRIPTIONS AND POSITIONS OF STATIONS.

SPANISH FORK.

A well-defined and well-known peak of the Wasatch Range, in Utah Co., Utah, seven miles east of the village of Spanish Fork.

Permanent mark: A small cairn of stone.

[Latitude, $40^{\circ} 05' 13''$ 5. Longitude, $111^{\circ} 31' 40''$ 7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Nebo..... | 33 35 57 | 213 26 45 | 4 5672955 |
| Indian Head..... | 294 25 25 | 114 49 59 | 4 7773526 |
| Bruin..... | 295 38 14 | 116 23 34 | 5 0501985 |
| South Tent..... | 349 15 10 | 169 21 41 | 4 8954328 |

NEBO.

The most southerly high peak of the Wasatch Mountains in Juab Co., Utah. The summit shows three sharp points of nearly the same altitude, and the station was made upon the one farthest south. It

is 8 miles north-northeast from the town of Nephi and $4\frac{1}{2}$ miles east from Mona.

Permanent mark: A cairn 7 feet high.

[Latitude, $39^{\circ} 48' 35''$.4. Longitude, $111^{\circ} 45' 59''$.7.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Katharine | 19 | 39 | 31 | 199 | 25 | 18 | 4.9832646 |
| Canyon Range..... | 39 | 21 | 02 | 219 | 04 | 10 | 4.7773485 |
| Spanish Fork..... | 213 | 26 | 45 | 33 | 35 | 57 | 4.5672955 |
| Indian Head..... | 265 | 16 | 45 | 85 | 50 | 25 | 4.8762365 |
| Bruin..... | 278 | 10 | 52 | 99 | 05 | 14 | 5.0896693 |
| South Tent..... | 322 | 47 | 26 | 143 | 03 | 04 | 4.7651455 |
| Musinia..... | 349 | 14 | 31 | 169 | 21 | 41 | 4.9418712 |
| Hilgard..... | 351 | 11 | 37 | 171 | 20 | 05 | 5.1021473 |
| Ephraim..... | 358 | 26 | 11 | 178 | 26 | 46 | 4.6881882 |

INDIAN HEAD.

A rounded summit of the west Tavaputs Plateau, north of Emma Park, in Utah Co., Utah. It is the highest point in the vicinity.

Permanent mark: A 5-foot cairn of rocks.

[Latitude, $39^{\circ} 51' 44''$.2. Longitude, $110^{\circ} 53' 26''$.4.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| South Tent..... | 37 | 38 | 48 | 217 | 20 | 55 | 4.8188333 |
| Nobo | 85 | 50 | 25 | 265 | 16 | 45 | 4.8762365 |
| Spanish Fork..... | 114 | 40 | 59 | 294 | 25 | 25 | 4.7773526 |
| Bruin..... | 297 | 26 | 01 | 117 | 46 | 48 | 4.7192701 |
| Red Plateau..... | 343 | 01 | 56 | 163 | 12 | 17 | 4.9044670 |

BRUIN.

A summit of the west Tavaputs Plateau, Emery Co., Utah, 17 miles west from the Green River. It is the highest point of the vicinity.

Permanent mark: A cairn 5 feet high.

[Latitude, $39^{\circ} 38' 37''$.1. Longitude, $110^{\circ} 20' 56''$.4.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Ellen | 13 | 35 | 55 | 193 | 18 | 21 | 5.2401173 |
| Red Plateau..... | 24 | 01 | 37 | 203 | 51 | 19 | 4.7593733 |
| Hilgard..... | 44 | 28 | 34 | 223 | 43 | 19 | 5.1714955 |
| Bare Brush..... | 52 | 44 | 14 | 232 | 07 | 38 | 5.0195761 |
| South Tent..... | 72 | 26 | 06 | 251 | 47 | 36 | 4.9598213 |
| Nobo | 99 | 05 | 14 | 278 | 10 | 52 | 5.0896693 |
| Spanish Fork..... | 116 | 23 | 34 | 295 | 38 | 14 | 5.0501985 |
| Indian Head..... | 117 | 46 | 48 | 297 | 26 | 01 | 4.7192701 |
| Waas | 321 | 19 | 28 | 142 | 01 | 53 | 5.1941553 |

CANYON RANGE.

The mountain range through which the Sevier River cuts in its lower course bears a number of sharp peaks in Millard Co., Utah. The one

selected stands about midway between the canyon of the Sevier and the town of Scipio. It was not occupied, but was sighted from a number of stations at the east.

[Latitude, $39^{\circ} 23' 30'' \cdot 7$. Longitude, $112^{\circ} 12' 26'' \cdot 5$.]

| Station. | Azimuth. | Back azimuth. | Log. dist. |
|-----------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Nebo | 219 04 10 | 39 21 02 | 4·7773485 |
| South Tent..... | 269 46 16 | 90 18 37 | 4·8644279 |
| Ephraim..... | 270 05 04 | 90 22 26 | 4·5937830 |
| Musinia..... | 305 50 21 | 126 14 13 | 4·8274974 |
| Katharine..... | 352 30 28 | 172 33 13 | 4·6498542 |

EPHRAIM.

A flat-topped summit of the Gunnison Plateau, in Sanpete Co., Utah, 9 miles west-northwest from the town of Ephraim.

Permanent mark: A cairn 5 feet high.

[Latitude, $39^{\circ} 23' 25'' \cdot 6$. Longitude, $111^{\circ} 45' 06'' \cdot 6$.]

| Station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Katharine | 37 22 37 | 217 07 53 | 4·7437159 |
| Canyon Range..... | 90 22 26 | 270 05 04 | 4·5937830 |
| Nebo..... | 178 26 46 | 358 26 11 | 4·6681882 |
| South Tent..... | 269 41 51 | 89 56 51 | 4·5307425 |
| Musinia..... | 339 04 58 | 159 11 33 | 4·6248411 |
| Hilgard..... | 347 01 18 | 167 09 09 | 4·9059241 |

SOUTH TENT.

A summit of the Wasatch Plateau, in Sanpete Co., Utah, 10 miles southeast from Springtown. There is no well-defined point, but a rounded profile is seen from most directions.

Permanent mark: A cairn 5 feet high.

[Latitude, $39^{\circ} 23' 29'' \cdot 1$. Longitude, $111^{\circ} 21' 28'' \cdot 2$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hilgard..... | 11 38 54 | 191 31 53 | 4·9043279 |
| Musinia..... | 25 46 45 | 205 38 23 | 4·6418233 |
| Katharine..... | 57 03 08 | 236 33 28 | 4·9072577 |
| Ephraim..... | 89 56 51 | 269 41 51 | 4·5307425 |
| Canyon Range..... | 90 18 37 | 269 46 16 | 4·8644279 |
| Nebo..... | 143 03 04 | 322 47 26 | 4·7651455 |
| Spanish Fork..... | 169 21 41 | 349 15 10 | 4·8954328 |
| Indian Head..... | 217 20 55 | 37 38 48 | 4·8188333 |
| Bruin..... | 251 47 36 | 72 26 06 | 4·9598213 |
| Culmination..... | 278 47 20 | 99 47 19 | 5·1397025 |
| Red Plateau..... | 290 49 14 | 111 17 16 | 4·8340901 |
| Ellen..... | 241 20 00 | 161 40 22 | 5·1724351 |
| Bare Brush..... | 353 32 00 | 173 33 44 | 4·5564419 |

FAYETTE.

A low cliff 4 miles east of the town of Fayette, in Sanpete Co., Utah.

Permanent mark: A small cairn.

[Latitude, $39^{\circ} 12' 31''$.5. Longitude, $111^{\circ} 49' 20''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Valley | 38 22 37 | 218 18 11 | 4.2107543 |
| Katharine | 49 03 11 | 228 51 09 | 4.5618306 |
| Musinia | 312 12 35 | 132 21 50 | 4.5557721 |
| Jura | 341 22 19 | 161 24 25 | 4.1767984 |
| Gunnison North.. | 359 15 42 | 179 15 47 | 3.8751250 |
| Black Cap | 359 46 31 | 179 46 33 | 4.4505756 |

GUNNISON NORTH.

The north end of the Gunnison base line, in Sanpete Co., Utah, is in the meridian of the U. S. Engineer monument in the town of Gunnison and 5,972 feet to the southward.

Permanent mark: A monument of cut stone 1 foot square and standing about 18 inches high.

[Latitude, $39^{\circ} 08' 28''$.3. Longitude, $111^{\circ} 49' 16''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Valley | 62 47 26 | 242 42 55 | 4.0588179 |
| Fayette | 179 15 47 | 359 15 42 | 3.8751250 |
| Jura | 325 05 08 | 145 07 10 | 3.9146604 |
| Black Cap | 359 57 49 | 179 57 49 | 4.3164200 |
| Gunnison South.. | 359 59 52 | 179 59 52 | 3.9916158 |

GUNNISON SOUTH.

The south end of the Gunnison base line, in Sanpete Co., Utah, is likewise in the meridian of the Engineer Astronomical Station in Gunnison. It is 7 miles to the southward and on the north side of Willow Creek.

Permanent mark: A monument of cut stone, dressed with an edge at top like a gable roof. It stands 6 inches above the ground.

[Latitude, $39^{\circ} 03' 10''$.2. Longitude, $111^{\circ} 49' 16''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Valley | 114 10 59 | 294 06 30 | 4.0477966 |
| Gunnison North.. | 179 59 52 | 359 59 52 | 3.9916158 |
| Jura | 236 50 44 | 56 52 47 | 3.7494590 |
| Black Cap | 359 55 58 | 179 55 58 | 4.0379303 |

VALLEY.

The station was made on the eastern slope of the Valley Range near the base, in Sanpete Co., Utah, 7 miles west northwest from Gunnison.

Permanent mark: A cairn of rocks.

[Latitude, $39^{\circ} 05' 38''$.3. Longitude, $111^{\circ} 56' 20''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Fayette..... | 218 18 11 | 38 22 37 | 4·2107543 |
| Gunnison North.. | 242 42 55 | 62 47 26 | 4·0588179 |
| Jura..... | 275 41 08 | 95 47 37 | 4·1749626 |
| Gunnison South.. | 294 06 30 | 114 10 59 | 4·0477966 |
| Black Cap..... | 326 33 45 | 146 38 11 | 4·2681391 |

JURA.

An inconspicuous point among the Jurassic Hills, in Sanpete Co., Utah, 6 miles south southeast from Gunnison.

Permanent mark: A small cairn.

[Latitude, $39^{\circ} 04' 49''$.7. Longitude, $111^{\circ} 46' 00''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Black Cap..... | 18 34 16 | 198 32 11 | 4·1687790 |
| Gunnison South.. | 56 52 47 | 236 50 44 | 3·7494590 |
| Valley..... | 95 47 37 | 275 41 08 | 4·1749626 |
| Gunnison North.. | 145 07 10 | 325 05 08 | 3·9146604 |
| Fayette..... | 161 24 25 | 341 22 19 | 4·1767984 |

KATHARINE.

A summit of the Pavant Range, in Millard Co., Utah, 20 miles west southwest from Gunnison and 8 miles east northeast from Fillmore. The point is not the highest of the vicinity and is not acute, but is rounded and bush-covered. A lone tree at the top was used for the station and a small cairn was built near it to identify it.

[Latitude, $38^{\circ} 59' 35''$. Longitude, $112^{\circ} 08' 24''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Belknap..... | 20 28 10 | 200 17 55 | 4·8327198 |
| Canyon Range.... | 172 33 13 | 352 30 38 | 4·6498542 |
| Nebo..... | 199 25 18 | 19 39 31 | 4·9832646 |
| Ephraim..... | 217 07 53 | 37 22 37 | 4·7437159 |
| Fayette..... | 228 51 09 | 49 03 11 | 4·5618906 |
| South Tent..... | 236 33 28 | 57 03 08 | 4·9072577 |
| Musinia..... | 264 16 42 | 84 37 56 | 4·6894906 |
| Black Cap..... | 278 41 25 | 98 53 30 | 4·4469548 |
| Hilgard..... | 303 23 46 | 123 46 12 | 4·7933449 |
| Marvine..... | 309 40 40 | 129 59 27 | 4·7514342 |

BLACK CAP.

An acute conical peak among the Jurassic hills, in Sevier Co., Utah, 2 miles east from Salina.

Permanent mark: A rock cairn.

[Latitude, $38^{\circ} 57' 16''$.3. Longitude, $111^{\circ} 49' 15''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Katharine..... | 98 53 30 | 278 41 25 | 4.4409548 |
| Valley..... | 146 38 11 | 326 33 45 | 4.2681391 |
| Fayette..... | 179 46 33 | 359 46 31 | 4.4505756 |
| Gunnison South.. | 179 55 58 | 359 55 58 | 4.0379303 |
| Gunnison North.. | 179 57 49 | 359 57 49 | 4.3164200 |
| Jura..... | 198 32 11 | 18 34 16 | 4.1687790 |
| Musinia..... | 246 46 17 | 66 55 26 | 4.3598409 |

MUSINIA.

A south southwestern outline of the Wasatch Plateau, in Sevier Co., Utah, 14 miles east southeast from Gunnison. The peak is white and is very conspicuous from the Sevier Valley.

Permanent mark: A small cairn.

[Latitude, $39^{\circ} 02' 08''$.3. Longitude, $111^{\circ} 34' 40''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Marvine..... | 7 40 16 | 187 37 52 | 4.6152683 |
| Belknap..... | 46 53 03 | 226 23 41 | 4.9991085 |
| Black Cap..... | 66 55 26 | 246 46 17 | 4.3598409 |
| Katharine..... | 84 37 56 | 264 16 42 | 4.6894906 |
| Canyon Range.... | 126 14 13 | 305 50 21 | 4.8274974 |
| Fayette..... | 132 21 50 | 312 12 35 | 4.5557721 |
| Ephraim..... | 159 11 33 | 339 04 58 | 4.6248411 |
| Nebo..... | 169 21 41 | 349 14 31 | 4.9418712 |
| South Tent..... | 205 38 23 | 25 46 45 | 4.6418233 |
| Bare Brush..... | 260 47 32 | 80 57 36 | 4.3694478 |
| Ellen..... | 326 33 09 | 147 01 32 | 5.0841937 |
| Thousand Lake... | 352 51 13 | 172 54 53 | 4.8406418 |
| Hilgard..... | 355 40 12 | 175 41 30 | 4.5933804 |

BARE BRUSH.

An outlier at the east edge of the Wasatch Plateau, in Sevier Co., Utah, 27 miles east from the town of Gunnison. The top slopes to the north and breaks off southward in a cliff.

Permanent mark: A cairn 5 feet high.

[Latitude, $39^{\circ} 04' 08''$.7. Longitude, $111^{\circ} 18' 39''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Hilgard..... | 25 21 26 | 205 12 42 | 4.6752708 |
| Musinia..... | 80 57 36 | 280 47 32 | 4.3694478 |
| South Tent..... | 173 33 44 | 353 32 00 | 4.5564419 |
| Bruin..... | 232 07 38 | 52 44 14 | 5.0195701 |
| Red Plateau..... | 259 06 40 | 79 32 51 | 4.7841618 |
| Culmination..... | 263 41 15 | 84 39 16 | 5.1241292 |
| Waas..... | 287 22 43 | 108 41 02 | 5.2793519 |

SAN FRANCISCO.

A well-known volcanic mountain standing on the Colorado Plateau, in Coconino Co., Ariz.

Permanent mark: A stone cairn, 10 feet high.

[Latitude, $35^{\circ} 20' 44''$. Longitude, $111^{\circ} 40' 40''$.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Floyd | 93 | 23 | 54 | 272 | 47 | 34 | 4·9787442 |
| Emma | 127 | 27 | 47 | 306 | 35 | 21 | 5·2280572 |
| Brink | 151 | 11 | 19 | 330 | 45 | 12 | 5·1400820 |
| Paria Station | 179 | 56 | 05 | 359 | 56 | 01 | 5·2216020 |

This station was also determined by Mr. A. P. Davis, in 1885, from the Fort Wingate base line in the triangulation of New Mexico and northeastern Arizona, with the following adopted result: Latitude, $35^{\circ} 20' 47''$.02. Longitude, $111^{\circ} 40' 37''$.84.

RED PLATEAU.

A timbered plateau in Emery Co., Utah, with a south-facing cliff standing between Price and San Rafael rivers, and about 30 miles west from Green River.

Permanent mark: A cairn near the most southerly salient.

[Latitude, $39^{\circ} 10' 14''$.0. Longitude, $110^{\circ} 37' 10''$.9.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Ellen | 8 | 21 | 43 | 188 | 14 | 23 | 5·0710545 |
| Hilgard | 56 | 17 | 11 | 235 | 42 | 22 | 4·9853721 |
| Bare Brush | 79 | 32 | 51 | 259 | 06 | 40 | 4·7841618 |
| South Tent | 111 | 17 | 16 | 290 | 49 | 14 | 4·8340901 |
| Indian Head | 163 | 12 | 17 | 343 | 01 | 56 | 4·9044670 |
| Brin | 203 | 51 | 19 | 24 | 01 | 37 | 4·7593733 |
| Culmination | 287 | 57 | 27 | 88 | 29 | 18 | 4·8609616 |
| Waas | 299 | 42 | 58 | 120 | 35 | 21 | 5·1451364 |

CULMINATION.

A summit of the east Tavaputs Plateau, Grand Co., Utah, 22 miles east from the Green River and 4 miles east from the most southerly salient of the plateau.

Permanent mark: A rock cairn 5 feet high.

[Latitude, $39^{\circ} 11' 27''$.1. Longitude, $109^{\circ} 46' 47''$.5.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Ellen | 37 | 30 | 22 | 216 | 51 | 32 | 4·1734765 |
| Hilgard | 70 | 20 | 27 | 249 | 31 | 56 | 5·2121867 |
| Bare Brush | 84 | 39 | 16 | 263 | 41 | 15 | 5·1241292 |
| Red Plateau | 88 | 29 | 18 | 267 | 57 | 27 | 4·8609616 |
| South Tent | 99 | 47 | 19 | 278 | 47 | 20 | 5·1397025 |
| Waas | 326 | 21 | 46 | 146 | 42 | 32 | 4·9385435 |

MARVINE.

The highest point of a rugged comb, in Sevier Co., Utah, separating Moraine and Summit valleys. It is 6 miles north from the foot of Fish Lake.

Permanent mark: A cairn 8 feet high.

[Latitude, 38° 40' 02''-9. Longitude, 111° 38' 28''-3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Adams | 31 20 05 | 210 50 04 | 4-9797391 |
| Belknap | 67 54 14 | 247 25 23 | 4-8615500 |
| Katharine | 129 50 27 | 309 40 40 | 4-7514342 |
| Musinia | 187 37 52 | 7 40 16 | 4-6152683 |
| Hilgard | 258 09 28 | 78 13 08 | 3-9308816 |
| Ellen | 309 48 05 | 130 18 53 | 4-9745688 |
| Pennell | 316 27 42 | 136 59 21 | 5-0352986 |
| Thousand Lake... | 333 05 44 | 153 11 47 | 4-4949190 |

HILGARD.

A well-defined peak in Sevier Co., Utah, 5 miles east from Mount Marvine.

Permanent mark: A small cairn.

[Latitude, 38° 41' 00''-4. Longitude, 111° 32' 38''-2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Marvine | 78 13 08 | 258 09 28 | 3-9268816 |
| Katharine | 123 40 12 | 303 23 46 | 4-7933449 |
| Ephraim | 167 09 09 | 347 01 18 | 4-9059241 |
| Nebo | 171 20 05 | 351 11 37 | 5-1021473 |
| Musinia | 175 41 30 | 355 40 12 | 4-5933804 |
| South Tent | 191 31 53 | 11 38 54 | 4-9043279 |
| Bare Brush | 205 12 42 | 25 21 26 | 4-6752708 |
| Bruin | 223 43 19 | 44 28 34 | 5-1714955 |
| Red Plateau | 235 42 22 | 56 17 11 | 4-9853721 |
| Culmination | 249 13 56 | 70 20 27 | 5-2121867 |
| Ellen | 314 13 20 | 134 40 28 | 4-9503856 |
| Pennell | 320 34 19 | 141 02 20 | 5-0178011 |
| Thousand Lake... | 349 12 56 | 169 15 20 | 4-4798016 |

BELKNAP.

A well-defined, symmetric peak, bare of vegetation; one of the principal summits of the Tushar Mountains in Piute Co., Utah, 10 miles west from Marysville and 16 miles northeast from Beaver.

Permanent mark: A stone cairn 5 feet high.

[Latitude, 38° 25' 06''-6. Longitude, 112° 24' 45''-5.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Little Creek | 16 21 54 | 196 14 25 | 4-7942160 |
| Brian | 24 17 27 | 204 01 55 | 4-9532313 |
| Katharine | 200 17 55 | 20 28 10 | 4-8327198 |
| Musinia | 226 23 41 | 46 53 03 | 4-9991085 |
| Marvine | 247 25 23 | 67 54 14 | 4-8615500 |
| Thousand Lake... | 269 53 18 | 90 28 06 | 4-9111942 |
| Adams | 341 23 56 | 161 31 38 | 4-7558697 |

THOUSAND LAKE.

Thousand Lake Mountain is a lofty trachytic plateau in Wayne Co., Utah, 3 miles long and nearly 2 miles broad, overlooking Rabbit Valley from the northeast. The station is upon the highest point, a small eminence near the center, visible only from the surrounding summits, not from the valleys. The plateau is difficult of access, but the best approaches for horsemen are from the east and northeast.

Permanent mark: A stone cairn.

[Latitude, $38^{\circ} 24' 58''$.5. Longitude, $111^{\circ} 28' 45''$.3.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Adams | 50 01 44 | 229 34 46 | 4.9208549 |
| Belknap | 90 28 06 | 269 53 18 | 4.9111942 |
| Marvine | 153 11 47 | 333 05 44 | 4.4949190 |
| Hilgard | 169 15 20 | 349 12 56 | 4.4798016 |
| Musinia | 172 54 53 | 352 51 13 | 4.8406418 |
| Ellen | 299 14 01 | 119 38 43 | 4.8245111 |
| Pennell | 310 04 04 | 130 29 19 | 4.8977835 |

WAAS.

A sharp peak of the La Sal Mountains, in Grand Co., Utah. Seen from the east or west, it appears as the third high peak of the group, counting from the north.

Permanent mark: A stone monument, 11 feet high.

[Latitude, $38^{\circ} 32' 18''$.6. Longitude, $109^{\circ} 13' 41''$.8.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Ellen | 72 00 34 | 251 01 30 | 5.1651937 |
| Bare Brush | 108 41 02 | 287 22 43 | 5.2793519 |
| Red Plateau | 120 35 21 | 299 42 58 | 5.1451364 |
| Bruin | 142 01 53 | 321 19 25 | 5.1941553 |
| Culmination | 146 42 32 | 326 21 46 | 4.9385435 |

This position was also determined by Mr. A. P. Davis in 1884, from the Wingate base line, with results as follows: Latitude, $38^{\circ} 32' 21''$.20 north. Longitude, $109^{\circ} 13' 39''$.70 west.

ELLEN.

The well defined, most northerly and highest peak of the Henry Mountains, in Garfield Co., Utah.

Permanent mark: A stone cairn, 8 feet high.

[Latitude, $38^{\circ} 07' 14''$.3. Longitude, $110^{\circ} 48' 53''$.6.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Duffer | 99 | 30 | 25 | 299 | 14 | 01 | 5·2250042 |
| Thousand Lake | 119 | 38 | 43 | 309 | 48 | 05 | 4·8245111 |
| Marvine | 130 | 18 | 53 | 314 | 13 | 20 | 4·9745688 |
| Hilgard | 134 | 40 | 28 | 326 | 33 | 00 | 4·9503856 |
| Musinia | 147 | 01 | 32 | 241 | 20 | 00 | 5·0841937 |
| South Tent | 161 | 40 | 22 | 8 | 21 | 43 | 5·1724351 |
| Red Plateau | 188 | 14 | 23 | 13 | 35 | 55 | 5·0710545 |
| Bruan | 193 | 18 | 21 | 37 | 30 | 22 | 5·2401173 |
| Culmination | 216 | 51 | 32 | 72 | 00 | 34 | 4·1734765 |
| Vaas | 251 | 01 | 30 | 173 | 28 | 20 | 5·1651937 |
| Pennell | | | | | | | 4·2647348 |

PENNELL.

A conspicuous peak of the Henry Mountains, in Garfield Co., Utah, 11 miles south of Mount Ellen. The apex is double, the western point being the higher and bearing the monument.

Permanent mark: A stone monument, 7 feet high.

[Latitude, $37^{\circ} 57' 21''$.4. Longitude, $110^{\circ} 47' 27''$.9.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Thousand Lake | 130 | 29 | 19 | 310 | 04 | 04 | 4·8977835 |
| Marvine | 136 | 59 | 21 | 316 | 27 | 42 | 5·0352986 |
| Hilgard | 141 | 02 | 20 | 320 | 34 | 19 | 5·0178011 |
| Ellen | 173 | 28 | 20 | | | | 4·2647348 |

ADAMS.

A conspicuous summit of the Sevier Plateau, in Garfield Co., Utah, 13 miles north-northeast from Panguitch. The principal eminence is subtabular and timbered. The point occupied is a naked crag at its western edge, visible from the high points of the vicinity but not from the valley of the Sevier.

Permanent mark: A stone monument on an acute natural elevation.

[Latitude, $37^{\circ} 55' 53''$.8. Longitude, $112^{\circ} 12' 20''$.9.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Brian | 63 | 20 | 41 | 242 | 57 | 38 | 4·7905702 |
| Little Creek | 81 | 02 | 03 | 260 | 47 | 05 | 4·5584322 |
| Belknap | 161 | 31 | 38 | 341 | 23 | 56 | 4·7558697 |
| Marvine | 210 | 59 | 04 | 31 | 20 | 05 | 4·9797391 |
| Thousand Lake | 229 | 34 | 46 | 50 | 01 | 44 | 4·9208549 |
| Table Cliff | 315 | 30 | 43 | 135 | 41 | 50 | 4·5819377 |

LITTLE CREEK.

An acute peak of trachyte, in Iron Co., Utah, 11 miles east from Paragonah and 12 miles west-northwest from Panguitch.

Permanent mark: A stone cairn 6 feet high.

[Latitude, $37^{\circ} 52' 48''$.4. Longitude, $112^{\circ} 36' 43''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Brian | 41 08 37 | 221 00 32 | 4.4684356 |
| Belknap | 196 14 25 | 16 21 54 | 4.7942160 |
| Adams | 260 47 05 | 81 02 03 | 4.5584322 |
| Table Cliff | 288 49 18 | 109 15 24 | 4.8203700 |

BRIAN.

The highest point of the Markagunt Plateau, in Iron Co., Utah, 14 miles east from Cedar, 12 miles south from Parowan, and 25 miles west-southwest from Panguitch.

Permanent mark: A cairn of stone 9 feet in diameter and 12 feet high.

[Latitude, $37^{\circ} 40' 49''$.3. Longitude, $112^{\circ} 49' 53''$.1.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Belknap | 204 01 55 | 24 17 27 | 4.9532313 |
| Little Creek | 221 00 32 | 41 08 37 | 4.4684356 |
| Adams | 242 57 38 | 63 20 41 | 4.7905702 |
| Table Cliff | 269 17 57 | 89 52 00 | 4.9134971 |
| Pink Cliff | 302 49 51 | 123 08 24 | 4.7291831 |
| Navajo Well | 324 25 48 | 144 45 56 | 4.9265047 |
| Three Trees | 351 08 54 | 171 13 45 | 4.8888201 |

TABLE CLIFF.

The extreme southward salient of a high plateau in Garfield Co., Utah, separating Panguitch Hayfields from Potato Valley. The only approach is from the north.

Permanent mark: A triangular crib of logs, 15 feet on a side and 8 feet high.

[Latitude, $37^{\circ} 41' 08''$.7. Longitude, $111^{\circ} 54' 08''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Duffer | 6 54 44 | 186 50 41 | 4.9166919 |
| Mollie | 16 22 23 | 196 16 48 | 4.6818306 |
| Navajo Well | 25 47 14 | 205 33 25 | 4.8866122 |
| Three Trees | 42 39 56 | 222 10 56 | 5.0188786 |
| Pink Cliff | 51 23 29 | 231 08 05 | 4.6775175 |
| Brian | 89 52 00 | 269 17 57 | 4.9134971 |
| Little Creek | 109 15 24 | 288 49 18 | 4.8203700 |
| Adams | 135 41 50 | 315 30 43 | 4.5819377 |
| Paria Station | 347 57 47 | 168 05 52 | 4.9783859 |

PINK CLIFF.

On the south edge of the Pownsagunt Plateau, in Kane Co., Utah, 11 miles north from Skumpah or Clarkston, and 8 miles southeast from Upper Kanab.

Permanent mark: A triangular crib of logs, 15 feet on a side and 8 feet high.

[Latitude, $37^{\circ} 25' 02''$.7. Longitude, $112^{\circ} 19' 21''$.1.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Three Trees | 35 | 14 | 27 | 215 | 00 | 50 | 4.7623467 |
| Brian | 123 | 08 | 24 | 302 | 49 | 51 | 4.7201831 |
| Table Cliff..... | 231 | 08 | 05 | 51 | 23 | 29 | 4.6775175 |
| Mollie | 304 | 31 | 41 | 124 | 41 | 27 | 4.4591229 |
| Duffer | 332 | 11 | 51 | 152 | 23 | 04 | 4.7703329 |
| Navajo Well..... | 354 | 26 | 26 | 174 | 28 | 02 | 4.6001607 |

MOLLIE.

An outlier of the white cliff sandstone standing near the west fork of Paria Creek, in Kane Co., Utah, about 7 miles northwest from Paria Settlement. It is an acute butte.

[Latitude, $37^{\circ} 16' 12''$.3. Longitude, $112^{\circ} 03' 18''$.6.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|---------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Three Trees | 61 | 42 | 36 | 241 | 19 | 15 | 4.8125077 |
| Pink Cliff..... | 124 | 41 | 27 | 304 | 31 | 41 | 4.4591229 |
| Table Cliff..... | 196 | 16 | 48 | 16 | 22 | 23 | 4.6818306 |
| Paria Station | 324 | 28 | 49 | 144 | 42 | 23 | 4.7604373 |
| Duffer | 354 | 08 | 47 | 174 | 10 | 17 | 4.5564336 |

TITHING YARD.

In the northwest corner of the public square at Kanab, in Kane Co., Utah, is the Tithing Office Yard, inclosed by a stone wall. In the northwest corner of this inclosure, close to the wall, stands a low monument of sandstone, square at top and marked 76 ft. east of B. L. This is not a station of the triangulation, but marks the "Street" station, which was 76 feet west of it.

[Latitude, $37^{\circ} 02' 55''$.9. Longitude, $112^{\circ} 31' 50''$.]

STREET.

This station marks the position of the astronomical pier from which was determined the latitudes and longitudes depending upon the Kanab Base, and is in its meridian. It was originally located in the northwest corner of the public square of the village of Kanab, but owing to a change in the boundaries of the square which threw the location into a

street, no permanent mark was set to indicate its exact position. A stone witness post was set firmly in the ground in the Tithing Office Square exactly seventy-six feet due east of the observing pier. This stone is marked 76 feet east of B. L.

[Latitude, $37^{\circ} 02' 55''$.85. Longitude, $112^{\circ} 31' 50''$.83.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kanab South | 000 00 08 | 180 00 08 | 4.2146235 |
| John | 274 30 32 | 94 31 05 | 3.1275988 |

JOHN.

On a salient of the Vermilion Cliff, at the eastern edge of the town of Kanab, in Kane Co., Utah.

Permanent mark: A cairn of stone $4\frac{1}{2}$ feet high.

[Latitude, $37^{\circ} 02' 52''$.5. Longitude, $112^{\circ} 30' 56''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kanab South | 4 42 18 | 184 41 46 | 4.2132806 |
| Street | 94 31 05 | 274 30 32 | 3.1275988 |
| Shinarump | 325 54 54 | 145 57 25 | 4.0457313 |

MANSARD.

A white, conspicuous sandstone knob on the Vermilion Cliff, in Kane Co., Utah, $5\frac{1}{2}$ miles east of Kanab and $3\frac{1}{2}$ miles southwest of Johnson. The station overlooks the road from Kanab to Johnson, but can not be approached with horses from that side.

Permanent mark: A conoid boss of eroded sandstone.

[Latitude, $37^{\circ} 02' 52''$.3. Longitude, $112^{\circ} 25' 22''$.0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Shinarump | 12 34 34 | 192 33 45 | 3.9742210 |
| New | 48 08 23 | 228 02 06 | 4.3099047 |
| Pipe | 61 20 27 | 241 06 20 | 4.5952529 |
| Three Trees | 75 36 47 | 255 26 53 | 4.4023059 |
| Navajo Well | 263 49 48 | 83 55 03 | 4.1087869 |
| Brow | 357 36 37 | 177 37 21 | 4.7060202 |

NAVAJO WELL.

A southward salient of the Vermilion Cliff, in Kane Co., Utah, overlooking Navajo Well. The station is on the highest point of a peninsular mass, the flat top of which slopes gently to the northwest and is an acre in extent. It can be reached only from the north.

Permanent mark: A cairn of stone and wood, 10 feet in diameter.

[Latitude, 37° 03' 36" 7. Longitude, 112° 16' 45."]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Shinarump | 54 | 34 | 34 | 234 | 28 | 29 | 4·2603437 |
| New | 61 | 52 | 57 | 241 | 41 | 32 | 4·5017003 |
| Three Trees | 78 | 28 | 11 | 258 | 13 | 03 | 4·5799215 |
| Mansard | 83 | 55 | 03 | 263 | 49 | 48 | 4·1087869 |
| Brian | 144 | 45 | 56 | 324 | 25 | 48 | 4·0265047 |
| Pink Cliff | 174 | 28 | 02 | 354 | 26 | 26 | 4·0001607 |
| Table Cliff | 205 | 33 | 25 | 25 | 47 | 14 | 4·8886122 |
| Duffer | 297 | 53 | 05 | 118 | 02 | 45 | 4·4269204 |

THREE TREES.

A high point on the Vermilion Cliff, in Coconino Co., Ariz., three miles west from Wolf Spring. It can be approached on horseback only from the north. The eminence is sandy and was covered with pine. All but three of the trees were felled and from those the lower branches were cut so as to leave tall shafts, with tufts of foliage at the top. The one used as the monument is the most northerly of the three and stands on higher ground than the others. The others were merely to aid in the identification of the station. To an observer standing at New, Brink, Brow, or Brian the monument appears as the middle tree. From Pipe and Emma it appears at the left of the others. From Kanab South, Shinarump, Navajo Well, Mansard, Table Cliff, and Pink Cliff it appears at the right.

[Latitude, 36° 59' 27" 6. Longitude, 112° 41' 51" 3.]

| To station. | Azimuth. | | | Back azimuth. | | | Log. dist. |
|-------------------|----------|----|----|---------------|----|----|------------|
| | ° | ' | " | ° | ' | " | Meters. |
| Emma | 27 | 50 | 01 | 207 | 32 | 50 | 4·9598813 |
| Pipe | 38 | 30 | 31 | 218 | 26 | 14 | 4·2082578 |
| Brian | 171 | 13 | 45 | 351 | 08 | 54 | 4·8888201 |
| Pink Cliff | 215 | 00 | 50 | 35 | 14 | 27 | 4·7823467 |
| Table Cliff | 222 | 10 | 56 | 42 | 39 | 56 | 5·0188786 |
| Mollie | 241 | 19 | 15 | 61 | 42 | 36 | 4·8125077 |
| Mansard | 255 | 26 | 53 | 75 | 36 | 47 | 4·4023059 |
| Navajo Well | 258 | 13 | 03 | 78 | 28 | 11 | 4·5799215 |
| Shinarump | 277 | 16 | 03 | 97 | 25 | 08 | 4·3540809 |
| New | 308 | 17 | 12 | 128 | 20 | 45 | 4·0725590 |
| Brow | 328 | 59 | 15 | 149 | 09 | 46 | 4·7146050 |
| Brink | 338 | 03 | 28 | 158 | 13 | 12 | 4·8236043 |

KANAB-NORTH.

The north end of the Kanab base line, in Coconino Co., Ariz., about six miles south of Kanab. Its position is a few rods to the left of the road leading from Kanab to Demotte Park and is on a low knoll of sand.

Permanent mark: A monument of basalt firmly bedded and engraved, with a + on its upper surface.

[Latitude, $36^{\circ} 57' 46''$.5. Longitude, $112^{\circ} 31' 21''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kanab-South | 6 03 55 | 186 03 37 | 3-8384985 |
| New | 56 16 56 | 236 14 20 | 3-8800354 |
| Shinarump | 268 05 09 | 88 07 54 | 3-8351940 |

KANAB-SOUTH.

The south end of the Kanab base line, in Coconino Co., Ariz. The station is about 10 miles south of Kanab and is approximately in the meridian of the Street station. It stands at the crest of a low cliff, facing southward, and is about midway between the Kanab Wash and the road to Demotte Park. It is marked, like Kanab-North, by a monument of basalt and a target of wood. Touching the monument is a bedded block of conglomerate, on which is scratched the meridian mark of the astronomical station, Street.

[Latitude, $36^{\circ} 54' 04''$.1. Longitude, $112^{\circ} 31' 50''$.9.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| New | 115 20 45 | 295 18 30 | 3-7907466 |
| Street | 180 00 08 | 000 00 08 | 4-2146235 |
| John | 184 41 46 | 4 42 18 | 4-2132806 |
| Kanab-North | 186 03 37 | 6 03 55 | 3-8384985 |
| Shinarump | 226 52 50 | 46 55 54 | 4-0155937 |

NEW.

On a salient of the Shinarump Cliff, in Coconino Co., Ariz., 9 miles in a southwest direction from Kanab. The station overlooks the lower road from Kanab to Pike Spring, near the point where it is joined by the road from Johnson. The conglomerate capping the salient is severed by erosion from the main mass at the north and is not easily scaled, except at a point near the saddle.

Permanent mark: A + engraved on the bare conglomerate.

[Latitude, $36^{\circ} 55' 29''$.8. Longitude, $112^{\circ} 35' 36''$.4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Emma | 35 19 46 | 214 59 04 | 4-9532142 |
| Pipe | 74 40 50 | 254 33 00 | 4-3021522 |
| Three Trees | 128 20 45 | 308 17 12 | 4-0725590 |
| Mansard | 228 02 06 | 48 08 23 | 4-3099647 |
| Kanab-North | 236 14 20 | 56 16 56 | 3-8800354 |
| Navajo Well | 241 41 32 | 61 52 57 | 4-5017003 |
| Shinarump | 251 17 56 | 71 23 16 | 4-1423256 |
| Kanab-South | 295 18 30 | 115 20 45 | 3-7907466 |
| Brow | 334 53 45 | 155 00 44 | 4-6126907 |
| Brink | 344 03 38 | 164 09 51 | 4-7533245 |

PIPE.

A salient of the Vermilion Cliff, Coconino Co., Ariz., 4 miles west from Pipe Spring. The only approach for horses is from the north.

Permanent mark: An acute natural boss of sandstone.

[Latitude, 36° 52' 37"·3. Longitude, 112° 48' 37"·4.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Emma | 25 29 12 | 205 16 17 | 4·8771504 |
| Three Trees | 218 26 14 | 38 30 31 | 4·2082578 |
| Mansard | 241 06 20 | 61 20 27 | 4·5952529 |
| New | 254 33 00 | 74· 40 50 | 4·3021522 |
| Brow | 310 46 26 | 131 01 13 | 4·6866137 |
| Brink | 324 30 50 | 144 44 49 | 4·7804136 |

SHINARUMP.

On a salient of the Shinarump Cliff, in Coconino Co., Ariz., 7½ miles southeast from Kanab. The station is in Arizona.

Permanent mark: A cairn of stone 5 feet high.

[Latitude, 36° 57' 53"·9. Longitude, 112° 26' 45"·0.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Kanab-South | 46 55 54 | 226 52 50 | 4·0155937 |
| New | 71 23 16 | 251 17 56 | 4·1423256 |
| Kanab-North | 88 07 54 | 268 05 09 | 3·8351940 |
| Three Trees | 97 25 08 | 277 16 03 | 4·3540809 |
| John | 145 57 25 | 325 54 54 | 4·0457313 |
| Mansard | 192 33 45 | 12 34 34 | 3·9742210 |
| Navajo Well | 234 28 29 | 54 34 34 | 4·2603437 |

DUFFER.

The north part of the Paria Plateau is bounded on the west by a parapet of red sandstone, abounding in craggy points, in Coconino Co., Ariz. The highest of these is the Duffer Station.

Permanent mark: A small cairn perched on a summit naturally acute.

[Latitude, 36° 56' 50"·1. Longitude, 112° 00' 50"·2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Navajo Well | 118 02 45 | 297 53 05 | 4·4269204 |
| Pink Cliff | 152 23 04 | 332 11 51 | 4·7703329 |
| Mollie | 174 10 17 | 354 08 47 | 4·5564336 |
| Table Cliff | 186 50 41 | 6 54 44 | 4·9166919 |
| Paria Needle | 289 54 02 | 110 06 00 | 4·4982456 |
| Paria Station | 290 23 31 | 110 35 33 | 4·5021502 |
| Ellen | | 39 30 25 | 5·2250042 |

PARIA STATION.

The southern edge of the Paria Plateau, in Coconino Co., Ariz., is characterized by a series of sandstone mesas from 100 to 200 feet high.

The one nearest to Lee's Ferry was used as a station. It can be approached only from the north and west.

Permanent mark: A cairn of stone and wood 10 feet high.

[Latitude, $36^{\circ} 50' 49'' \cdot 2$. Longitude, $111^{\circ} 40' 47'' \cdot 7$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Duffer | 110 35 33 | 290 23 31 | 4·5021502 |
| Mollie | 144 42 23 | 324 28 49 | 4·7604373 |
| Paria Needle | 153 59 48 | 333 59 44 | 2·5944976 |
| Table Cliff | 168 05 52 | 347 57 47 | 4·9783859 |
| San Francisco | 359 56 01 | 179 56 05 | 5·2216020 |

PARIA NEEDLE.

Close to Paria Station, in Coconino Co., Ariz., is a butte of sandstone so acute that it can not be scaled by ordinary means. It is a fine natural target and was determined as an accessory to Paria Station, to be used in observations from a great distance.

[Latitude, $36^{\circ} 51' 00'' \cdot 6$. Longitude, $111^{\circ} 40' 54'' \cdot 6$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|---------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Duffer | 110 06 00 | 289 54 02 | 4·4982456 |
| Paria Station | 333 59 44 | 153 59 48 | 2·5944976 |

BROW.

The Kaibab Plateau, in Coconino Co., Ariz., has a broad, flat top covered with timber. Brow Station is on the western edge of a flanking bench, 4 miles east of the large spring in Sawmill Canyon.

Permanent mark: A small tree from which the lower branches are cut so as to leave a tuft at top. About its base is piled a triangular pyramid of stone 8 feet high.

[Latitude, $36^{\circ} 35' 25'' \cdot 0$. Longitude, $112^{\circ} 23' 56'' \cdot 7$.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|-------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Brink | 6 07 44 | 186 06 59 | 4·2421579 |
| Emma | 62 34 54 | 242 07 22 | 4·8930123 |
| Pipe | 130 01 13 | 310 46 26 | 4·6866137 |
| Three Trees | 149 09 46 | 328 59 15 | 4·7146050 |
| New | 155 00 44 | 334 53 45 | 4·6126907 |
| Mansard | 177 37 21 | 357 36 37 | 4·7060202 |

BRINK.

On the western edge of the Kaibab Plateau, at the point where it is cut by the Grand Canyon of the Colorado, in Coconino Co., Ariz. The vicinity of the station was cleared of timber except 2 pines, and those

were deprived of their lower branches. The station is the more easterly tree, and is marked by a target of logs 10 feet long and 10 feet high, facing to the west.

[Latitude, $36^{\circ} 26' 01''$.6. Longitude, $112^{\circ} 25' 11''$.6.]

| To station. | Azimuth. | Back azimuth. | Log. list. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Floyd..... | 13 27 27 | 193 16 44 | 5·0748093 |
| Emma..... | 74 33 45 | 254 07 01 | 4·8453623 |
| Pipe..... | 144 44 49 | 324 30 50 | 4·7804136 |
| Three Trees..... | 158 13 12 | 338 03 28 | 4·8236043 |
| New..... | 164 09 51 | 344 03 38 | 4·7533245 |
| Brow..... | 186 06 59 | 6 07 44 | 4·2421579 |
| San Francisco..... | 330 45 12 | 151 11 19 | 5·1400820 |

EMMA.

The most southerly high summit of the Uinkaret Mountains, in Coconino Co., Ariz. The peak is a symmetric cone of volcanic scoria, covered with bushes, and overlooking the Grand Canyon. The bushes were cut away from the summit and piled in a heap with a packing of earth, to form a target. The target is 12 feet in diameter at base and 12 feet high, with a staff at top.

[Latitude, $36^{\circ} 15' 48''$.1. Longitude, $113^{\circ} 10' 16''$.7.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Pipe..... | 205 16 17 | 25 29 12 | 4·8771504 |
| Three Trees..... | 207 32 50 | 27 50 01 | 4·9598813 |
| New..... | 214 59 04 | 35 19 46 | 4·9532142 |
| Brow..... | 242 07 22 | 62 34 54 | 4·8930123 |
| Brink..... | 254 07 01 | 74 33 45 | 4·8453623 |
| San Francisco..... | 306 35 21 | 127 27 47 | 5·2280572 |
| Floyd..... | 337 11 31 | 157 27 13 | 5·0200243 |

FLOYD.

A well-known trachytic peak standing on the Colorado Plateau, in Yavapai Co., Ariz.

Permanent mark: A cairn 12 feet high.

[Latitude, $35^{\circ} 23' 31''$.2. Longitude, $112^{\circ} 43' 27''$.2.]

| To station. | Azimuth. | Back azimuth. | Log. dist. |
|--------------------|-----------|---------------|------------|
| | ° ' " | ° ' " | Meters. |
| Emma..... | 157 27 13 | 337 11 31 | 5·0200243 |
| Brink..... | 193 16 44 | 13 27 27 | 5·0748098 |
| San Francisco..... | 272 47 34 | 93 23 54 | 4·9787442 |

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