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JESSE H. JONES, Secretary
COAST AND GEODETIC SURVEY
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DEFLECTIONS OF THE VERTICAL IN THE UNITED STATES

(1927 DATUM)

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BY
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PREFACE

In 1909, this Bureau published "The Figure of the Earth and Isostasy from Measurements in the United States." In this publication were given 265 deflections in the meridian as obtained from latitude observations and 242 deflections in the prime vertical as obtained from longitude and azimuth observations. These deflections of the vertical were corrected for the effect of topography and compensation. The following year, this Bureau published "Supplementary Investigations in 1909 of the Figure of the Earth and Isostasy," which added 116 deflections in the meridian and 142 deflections in the prime vertical to the previously published data.

Fifteen years later, in 1925, "Astronomic Determinations by U. S. Coast and Geodetic Survey and Other Organizations," Special Publication No. 110, was published by this Bureau. This publication contains the results of all the astronomical observations of acceptable accuracy determined by this Bureau up to about 1921. It also contains many astronomical observational data of acceptable accuracy by other governmental and private organizations. These observations were referred to the North American Datum based on the Clarke Spheroid of 1866.

The purpose of the present publication is to give the deflections of the vertical at all latitude and longitude stations of first- and second-order accuracy in the United States, for which the geodetic positions are now available on the North American Datum of 1927. There are 654 deflections in the meridian and 462 deflections in the prime vertical listed in this publication. No deflections based on azimuth observations are included, since deflections obtained from azimuth observations are indirectly dependent on the deflections obtained from longitude observations in the same vicinity.

The author is indebted to Mr. W. D. Lambert for his expert advice and criticism, and to Messrs. F. W. Darling and C. A. Whitten, for their help in the computation and assembling of the data for this publication.

EXPLANATION OF DEFLECTIONS OF THE VERTICAL

Any self-attracting fluid mass, sufficiently far away from other attracting masses, will assume the shape of a spheroid of revolution, if it rotates about an axis through its center of gravity. If the density of the fluid mass is uniform throughout, the spheroid of revolution will be an exact ellipsoid, as has been known for about 200 years.[1] However, if the density of the fluid mass is not uniform throughout, but decreases from the center outward, the spheroid will not be an exact ellipsoid, as has been shown by Wiechert and Darwin.

In the case of the earth, the density varies from about 10 at the center to 2½ at the surface. In their investigations, Wiechert [2] and Darwin [3] have shown, that if the earth is treated as a fluid with its proper dimensions and variation of density, the surface of the spheroid of equilibrium and the surface of an ellipsoid having its major and minor axes exactly equal to those of the spheroid will at the maximum be about three meters apart. This maximum deviation will occur at latitude 45°.

The outermost surface of such a spheroid is an equipotential surface and it is everywhere perpendicular to the direction of gravity. The equipotential surfaces within the rotating fluid spheroid are also surfaces of equal density; the ellipticity of the equipotential surfaces decreases toward the center but not indefinitely. For a fluid earth the limiting ellipticity [4] at the center would be about 1/400.

[1] I. Todhunter: A History of the Mathematical Theories of Attraction and the Figure of the Earth. Vol. I, pp. 134–136, 203.
C. Maclaurin: Treatise of Fluxions, article 637.
A. C. Clairaut: Figure de la Terre, p. 171.
[2] E. Wiechert: Über die Massenverteilung im Innern der Erde. Nachr. K. Gesell. Wiss. Göttingen, Math.-phys. Kl., 1897, p. 243.
[3] G. H. Darwin: Scientific Papers, Vol. III, p. 102.
[4] W. D. Lambert: Density, Gravity, Pressure, and Ellipticity. National Research Council Series: Physics of the Earth—VII, Internal Constitution of the Earth, p. 341.

There is strong geophysical evidence that the interior of the earth behaves very nearly like a fluid. The outer portions of the crust are solid and the physical surface of the solid crust is rather rough. It is by no means an equipotential surface. About three-fourths of the earth's physical surface is covered by water. The mean surface of the water of the oceans is obviously a surface of equilibrium, and this surface is called the geoid. The continuation of this equipotential surface under the continents forms the remainder of the geoid. Physically, the geoid under the continents may be conceived in this manner. Very narrow canals may be imagined, cut through the continents from ocean to ocean. The geoid will then be the surface of the water in these canals. In other words, the geoid is the equipotential surface of the earth which coincides with mean sea level.

The level surfaces above the geoid, but close to it, are partly in air and partly under land. In empty space the gravity potential satisfies Laplace's partial differential equation; however, in attracting matter, the potential satisfies Poisson's equation. Consequently, when the equipotential surface passes from empty space into attracting matter, there is a discontinuity in the mathematical expression for the potential function, but the two expressions yield identical values at the bounding surface, and thus it is evident that the equipotential surface is still continuous at the line where it passes from empty space into solid matter.

The geoid has been chosen as the surface of reference for elevations. The ellipsoid most nearly coinciding with the geoid has been chosen as the surface of reference for the horizontal geodetic measurements.

In the ideal case, all geodetic measurements, bases, and angles should be reduced directly to the ellipsoid. Actually this is impossible in practice because the relation between the geoid and the ellipsoid is not known to begin with. So for the first approximation, the geodetic measurements are referred to the geoid. Then after sufficiently extensive geodetic measurements have been made in an area, the relation between the geoid and the ellipsoid becomes approximately known and a second approximation becomes possible. In practice, this second approximation is seldom attempted.

The physical surface of the earth is rather rough, mountain ranges rising to several miles above and a great part of the ocean bottom extending several miles below mean sea level. The level surface of the geoid is much smoother than the physical surface. This would be true, even if the irregularities on the surface of the earth were extra loads and deficiencies. If the irregularities of the earth are conceived as spherical harmonics,[5] in the form

$$H=\Sigma H_n U_n$$

where the U_n's are spherical harmonics of degree n, then it can easily be shown [6] that the irregularities of the geoid will be expressed as

$$H_T=3\frac{\sigma}{\rho}\Sigma H_n\frac{U_n}{2n+1}$$

where H_T is the elevation of the geoid.

σ is the density of the surface irregularities.

and ρ is the mean density of the earth.

To represent even such large broad irregularities as the continents and the principal oceans requires harmonics of a high degree. However, the factor, $\frac{1}{2n+1}$ in the expression for the geoid becomes small for all terms of high degree; consequently the undulations of the geoid are very greatly reduced in comparison to those of the physical surface. The same general conclusion may be drawn without the use of spherical harmonics by considering the potential of a spherical cap of continental size, as has been done by Helmert.[7]

Moreover, gravity and astronomical observations have shown that the irregularities on the earth's surface are not extra loads and deficiencies, as assumed in the previous paragraph, but that they are largely compensated by irregularities of the opposite nature below the surface, and thus the crust of the earth is in fairly complete isostatic equilibrium. This approximate equilibrium of the earth's crust reduces the undulations of the geoid to a small fraction of what they would be, if the irregularities on the earth's surface were extra loads and deficiencies.

The effect of any topographic or subsurface crustal feature on the warping of the geoid can easily be evaluated with the aid of fundamental tables which Lambert and Darling[8] published in 1936.

[5] Adalbert Prey: Darstellung der Höhen-und Tiefenverhältnisse der Erde. K. Gesell. Wiss. Göttingen, Math.-phys. Kl., Neue Folge, Band XI, 1, 1922.

Prey, using spherical harmonics to the sixteenth degree, developed expressions that represent roughly the general relations of height and depth on the earth's surface.

[6] G. G. Stokes: Mathematical and Physical Papers, Vol. II, pp. 152, 153.

[7] F. R. Helmert: Höhere Geodäsie, Vol. II, Chap. IV.

[8] W. D. Lambert and F. W. Darling: Tables for Determining the Form of the Geoid and its Indirect Effect on Gravity. U. S. Coast and Geodetic Survey, Special Publication No. 199.

The geoid is then much smoother than the physical surface and it does not deviate greatly from the surface of a fluid equilibrium, which in turn is practically an ellipsoid of revolution. An ellipsoid of revolution is therefore taken as the surface of reference in geodetic calculations.

Three ellipsoids have come into rather wide use for geodetic operations in different countries. The Bessel Spheroid of 1841 is the reference ellipsoid for a large part of the European triangulation. The Clarke Spheroid of 1866 is the basis for all of the North American triangulation. The Hayford Spheroid [9] of 1909 is probably the most accurate one now available, since it is based on the largest amount of observational data and since the astronomical observations, used in determining it, were corrected for the effect of topography and isostatic compensation. The Hayford Spheroid of 1909, with slight modification, was adopted by the Section of Geodesy of the International Union of Geodesy and Geophysics at the meeting in Madrid in 1924 as the International Ellipsoid.[10]

DIMENSIONS OF SPHEROIDS

Author	Date	Reciprocal of flattening	Equatorial radius	Polar semi-diameter
			Meters	*Meters*
Bessel	1841	299.2	6,377,397	6,356,079
Clarke	1866	295.0	6,378,206	6,356,584
International	1924	297.0	6,378,388	6,356,912

The deflections of the vertical listed in this publication are referred to geodetic positions on the North American Datum of 1927, based on the Clarke Spheroid of 1866. The North American Datum of 1927 is based on the following latitude and longitude for the triangulation station Meades Ranch in Kansas:

Latitude =39° 13′ 26″.686
Longitude=98° 32′ 30″.506

The preceding North American datum was also based on this same geodetic position for Meades Ranch, but the new datum, that of 1927, represents a readjustment of all the first-order triangulation net of the United States according to the Bowie method as perfected by Dr. O. S. Adams. The largest change in position between the North American Datum and the North American Datum of 1927 occurs in the State of Washington, where the change in each coordinate, latitude and longitude, is slightly larger than 1″. Hence the deflections of the vertical in the meridian and in the prime vertical based on the new datum will differ at the most by slightly more than one second of arc from those based on the North American Datum, as given in Special Publication No. 110.

The geodetic position of a triangulation or traverse station is referred to a point on the celestial sphere defined by the normal to the ellipsoid of reference, while the astronomical position is referred to the point on the celestial sphere defined by the plumb line at sea level at the station or by the normal to the geoid at the station. The deflection of the vertical is the angle between the normal to the ellipsoid and the plumb line or normal to the geoid. This deflection is determined and defined by its two components, one in the meridian and the other in the prime vertical. The difference between the geodetic and the astronomical latitudes of a station is the deflection in the meridian, and the difference between the geodetic and astronomical longitudes multiplied by the cosine of the latitude is the deflection in the prime vertical.

EXPLANATION OF TABLE OF DEFLECTIONS

The first two columns give the number and name of the geodetic station to which the astronomical observations have been reduced. The stations are arranged alphabetically by States and alphabetically within each State. In no case is the astronomical station more than 1,000 feet from the geodetic station to which it has been reduced. Whenever the geodetic connection was more than 1,000 feet, a geodetic position was computed for the astronomical position, and thus the deflection was obtained at the astronomical station, as it should be. The third column is the date on which the astronomical latitude was determined. The fourth column is the observed astronomical latitude reduced to the geodetic station and to sea level. It is based on the star positions given in the Preliminary General Catalogue by Lewis Boss and in earlier catalogues. For many stations before 1914, the astronomical latitude has also been corrected for variation of the pole. The correction for the variation of pole has not been applied to any stations established after 1914. The fifth column gives the seconds of the geodetic latitude. The sixth column headed "A–G in meridian" is the difference between the astronomical and the geodetic latitudes or the meridian component of the deflection of the vertical. The next four columns contain data for the longitude of the station similar to columns 2 to 5 for the latitude.

[9] J. F. Hayford: Supplementary Investigations in 1909 of the Figure of the Earth and Isostasy, p. 77.
[10] Bulletin Géodésique, No. 7, juillet-aout-septembre 1925, pp. 540–551.

The eleventh column headed "A–G in the prime vertical" is the difference between the astronomical and geodetic longitudes multiplied by the cosine of the latitude in order to reduce the deflection on the parallel to that on the great circle or prime vertical. The last column is the name of the astronomical station itself wherever the name differs from the name of the geodetic station to which it has been reduced.

All latitudes are of first-order accuracy excepting where otherwise indicated by a footnote. A first-order latitude depends on the observations of at least 10 pairs of stars and has a probable error not exceeding ±0″.20. The large majority of first-order latitudes have a probable error of about ±0″.1. A second-order latitude depends on the observations of at least 7 pairs of stars and has a probable error not exceeding ±0″.45. The astronomical longitudes have approximately the same order of accuracy. For the large majority of longitudes, the computed probable error is about ±0″.1 along the parallel.

EXPLANATION OF SKETCHES

The sketches at the end of this publication show the locations of the deflection stations and the magnitudes and directions of the deflections in one or both coordinates. The stations are designated by numbers corresponding to those in the table. The magnitudes and directions of the deflections are shown by solid lines originating at the stations. East-west lines indicate deflections in the prime vertical and north-south lines deflections in the meridian. The length of each line is proportional to the magnitude of the deflection, except for deflections less than 0″.9. In order to show, positively, where deflections have been observed in either coordinate, all deflections less than 0″.9 have been indicated by a line equivalent to 0″.9. The scale used for the deflections is shown on each sketch.

DEFLECTIONS OF THE VERTICAL

ALABAMA

Geodetic station		Latitude					A–G in meridian	Longitude					A–G in prime vertical	Astronomical station
No.	Name	Year	Astronomical			Geodetic		Year	Astronomical			Geodetic	A–G		
			°	′	″	″	″		°	′	″	″	″	″	
1	Aurora	1877	34	08	47.89	47.267	+0.62		86	11		01.038			
2	Coon	1898	31	14	47.71	50.082	−2.37		88	05		43.783			
3	Fort Morgan	1847	30	13	47.88	42.022	+5.86	1907	88	01	25.86	23.698	+2.16	+1.87	
4	Green	1939	33	28	28.77	33.634	−4.86	1939	87	41	10.10	10.146	−.05	−.04	
5	Kahatchee	1898	33	13	40.13	38.048	+2.08		86	21		36.912			
6	Lower Peach Tree telegraphic longitude.	1857	31	50	21.00	20.25	+.75	1857–8	87	32	40.95	43.31	−2.36	−2.00	Lower Peach Tree.
7	Madison	1914	34	42	08.92	10.999	−2.08	1914	86	44	32.75	42.149	−9.40	−7.73	
8	Mobile transit pier	1856–7	30	41	33.52	30.667	+2.85	1857–8	88	02	37.38	33.867	+3.51	+3.02	Mobile.
9	Montgomery Capitol	1856	32	22	45.46	39.324	+6.14	1856–7	86	18	00.29	01.922	−1.63	−1.38	Montgomery.
10	Perry	1907	32	45	34.67	32.937	+1.73	1930	86	57	24.64	21.468	+3.17	+2.67	
11	Smithers	1907	34	48	54.73	58.708	−3.98		86	36		58.670			
12	Tanyard	1878	34	39	13.59	11.137	+2.45		87	23		01.490			

ARIZONA

13	Ehrenburg (U. S. G. S.)	1914, 1935	33	36	11.22	11.942	−0.72	1935	114	29	34.98	23.535	+11.44	+9.53	
14	Harquahalla	1914	33	48	37.90	42.226	−4.33	1924	113	20	55.52	46.130	+9.39	+7.80	
15	Kofa	1914	33	21	26.95	33.146	−6.20		114	04		55.583			
16	Maricopa East Pier longitude station.	1899	33	03	28.91	33.463	−4.55	1899	112	02	64.23	59.671	+4.56	+3.82	
17	Mohawk	1914	32	35	17.21	22.230	−5.02		113	38		49.403			
18	Nogales astronomical station.	1892	31	20	04.20	01.47	+2.73	1892	110	56	28.68	21.17	+7.51	+6.41	Nogales.
19	Pine	1914	34	45	58.03	68.017	−9.99		113	51		10.926			
20	Puertecito (U. S. A.)	1935	31	36	59.97	60.125	−.16	1935	111	29	34.41	27.829	+6.58	+5.60	
21	Pusch (U. S. G. S.)	1914	32	22	15.95	18.960	−3.01		110	56		18.413			
22	Vail	1935	32	02	51.02	51.065	−.04	1935	110	45	18.70	02.709	+15.99	+13.55	
23	Whitetank	1914	33	33	56.91	61.652	−4.74		112	33		27.501			
24	Williams Laplace	1920	35	15	06.73	08.015	−1.28	1920	112	11	36.33	24.483	+11.85	+9.68	
25	Yuma latitude station	1892	32	43	34.68	37.255	−2.58	1892	114	37	24.18	19.477	+4.70	+3.95	Yuma.

ARKANSAS

26	Ashdown southeast base [1]	1931	33	35	10.42	08.656	+1.76	1931	94	02	40.78	39.328	+1.45	+1.21	
27	Connerly	1931	33	08	43.96	45.743	−1.78	1931	91	15	59.20	60.588	−1.39	−1.16	
28	Fort Smith longitude		35	23		17.64		1885	94	25	55.76	51.16	+4.60	+3.75	Fort Smith.
29	Fountain	1939	33	23	08.85	08.608	+.24	1939	91	51	05.84	02.383	+3.46	+2.89	
30	Furgeson	1934	35	34	03.32	03.666	−.35	1934	91	47	09.72	07.665	+2.06	+1.68	
31	Hartford	1920	35	01	11.18	14.405	−3.22	1920	94	23	16.98	12.439	+4.54	+3.72	
32	Helena longitude	1878	34	31	50.83	49.99	+.84	1878	90	35	25.10	24.62	+.48	+.40	Helena.
33	Little Rock northwest base		34	45		27.625		1931	92	13	45.28	44.114	+1.17	+.96	
34	School	1930	35	56	44.22	39.824	+4.40	1930	89	43	61.11	57.990	+3.12	+2.53	

[1] The latitude at this station is of second-order accuracy.

DEFLECTIONS OF THE VERTICAL—Continued

CALIFORNIA

Geodetic station		Latitude					A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical			Geodetic		Year	Astronomical			Geodetic	A-G		
			°	′	″	″	″		°	′	″	″	″	″	
35	Antonio	1923	34	14	30.33	54.531	−24.20		117	40		27.266			
36	Arguello	1876	34	34	53.76	58.026	−4.27		120	33		37.639			
37	Armada	1931	33	52	12.41	14.880	−2.47	1931	117	12	16.27	05.557	+10.71	+8.89	
38	Bridge	1935	34	43	36.48	40.758	−4.28	1935	115	15	36.15	29.492	+6.66	+5.47	
39	Buenavista		34	03		17.866		1870	118	14	41.26	33.115	+8.14	+6.74	
40	Butte	1914	33	33	38.49	40.951	−2.46		115	20		38.305			
41	Castle Mount	1885	35	56	19.57	20.348	−.78		120	20		21.674			
42	Corning Tower	1908	39	55	38.52	39.741	−1.22		122	10		42.875			Corning.
43	Cuyamaca	1914	32	56	44.55	48.099	−3.55		116	36		21.134			
44	Dimas	1923	34	06	33.14	49.802	−16.66		117	49		03.195			
45	Dominguez Hill	1870	33	51	55.19	54.927	+.26		118	14		10.343			
46	Gaviota	1875	34	29	54.87	66.542	−11.67		120	11		52.053			
47	Gazelle astronomical station.	1908	41	31	41.11	35.191	+5.92	1908	122	30	57.76	67.114	−9.35	−7.00	Gazelle.
48	Harbor	1908	32	59	57.66	54.099	+3.56		118	33		39.378			
49	Hepsedam	1885	36	18	42.16	52.548	−10.39		120	49		25.097			
50	Independence southeast base.	1935	36	42	30.42	29.692	+.73	1935	118	07	34.53	47.151	−12.62	−10.12	
51	Lard (M. W. D. of S. C.)	1932	33	56	26.41	40.816	−14.41	1932	116	48	31.72	24.606	+7.11	+5.90	
52	Los Angeles Normal School.	1892	34	02	44.30	61.527	−17.23	1892	118	15	21.62	13.423	+8.20	+6.79	Los Angeles.
53	Los Angeles northwest base.		33	55		04.951		1924	118	03	34.53	22.498	+12.03	+9.98	
54	Lospe	1883	34	53	32.81	37.534	−4.72	1924	120	36	25.35	18.604	+6.75	+5.54	
55	Lucerne south base	1931	34	26	28.71	22.171	+6.54	1931	116	52	56.78	51.844	+4.94	+4.07	
56	Mocho	1887	37	28	36.71	38.609	−1.90		121	33		17.529			
57	Monticello	1880	38	39	45.95	49.550	−3.60		122	11		21.118			
58	Monument No. 41, California-Nevada boundary.	1914	38	16	24.76	22.992	+1.77		118	57		19.570			
59	Monument No. 120, California-Nevada boundary.	1914	35	47	07.07	16.969	−9.90		115	37		13.191			
60	Mount Conness	1890	37	57	59.32	61.597	−2.28		119	19		13.072			
61	Mount Diablo	1876	37	52	49.63	54.387	−4.76		121	54		47.107			
62	Mount Hamilton astronomical station.	1888	37	20	28.85	33.71	−4.86	1888	121	38	27.15	13.26	+13.89	+11.04	Mount Hamilton.
63	Mount Helena	1876	38	40	01.55	09.971	−8.42		122	37		56.604			
64	Mount Lola	1879	39	25	57.15	59.008	−1.86		120	21		50.481			
65	Mount Tamalpais	1882	37	55	19.14	26.381	−7.24		122	35		43.976			
66	Mount Toro	1885	36	31	39.88	33.661	+6.22	1924	121	36	36.52	31.019	+5.50	+4.42	
67	Needles longitude station	1889, 1895	34	50	18.26	15.550	+2.71	1889	114	36	12.54	14.648	−2.11	−1.73	Needles.
68	New San Miguel	1873	34	02	21.71	22.854	−1.14		120	23		08.029			
69	Pasadena east base 2	1923	34	06	53.70	74.102	−20.40		117	41		16.258			
70	Pasadena west base	1923	34	06	31.00	49.835	−18.84		118	03		08.501			
71	Pine Hill	1908	38	43	04.57	10.063	−5.49		120	59		21.774			
72	Point Arena latitude station.	1870	38	55	10.16	17.901	−7.74		123	43		35.719			Point Arena.
73	Point Arena longitude station.		38	54		35.139		1889	123	41	46.26	23.251	+23.01	+17.90	Point Arena.
74	Point Pinos latitude station.	1851	36	37	59.48	58.18	+1.30		121	55		30.35			Point Pinos.
75	Redding astronomical station.	1908	40	34	08.00	18.302	−10.30		122	23		37.495			Redding.
76	Rocky Butte 2	1885	35	39	43.95	55.019	−11.07		121	03		30.792			Rocky Butte.
77	Ross Mountain	1859–60	38	30	09.96	19.432	−9.47		123	07		07.981			
78	Round Top	1879	38	39	46.28	49.291	−3.01		119	59		59.989			
79	Sacramento, State Capitol dome.		38	34		36.261		1888	121	29	39.84	33.359	+6.48	+5.07	Sacramento.
80	San Buenaventura	1870	34	15	43.87	53.980	−10.11		119	15		55.824			
81	San Jacinto	1914	33	48	65.40	52.906	+12.49		116	40		42.915			
82	San Pedro latitude station.	1852	33	43	18.80	20.329	−1.53		118	17		00.844			San Pedro.
83	Santa Ana	1885	36	54	15.43	18.287	−2.86		121	13		56.474			
84	Santa Barbara	1869	34	23	59.22	76.722	−17.50		119	42		51.740			
85	Santa Catalina Island latitude station [1]	1852	33	26	35.19	29.17	+6.02		118	29		48.88			Santa Catalina Island.
86	Santa Cruz West	1874	34	04	27.91	23.161	+4.75		119	55		01.354			
87	Santa Lucia	1885	36	08	37.51	44.299	−6.79		121	25		04.676			
88	Searles (B. M. M 48)	1926	35	30	24.72	27.903	−3.18	1926	117	39	16.16	15.978	+.18	+.15	Searles Laplace.
89	Soledad	1899	32	50	21.33	23.322	−1.99		117	15		05.811			
90	Sulphur Peak	1859	38	45	44.43	53.154	−8.72		122	50		39.006			
91	Tepusquet	1882	34	54	26.10	36.522	−10.42		120	11		08.335			
92	Traver	1931	36	27	04.35	12.248	−7.90	1931	119	29	26.64	12.732	+13.91	+11.19	
93	Vaca	1880	38	22	23.64	32.717	−9.08	1924	122	04	59.27	60.764	−1.49	−1.17	
94	Von Schmidts east latitude post.	1893	35	00	15.02	21.76	−6.74		114	39		26.92			
95	Wells	1935	32	44	40.66	37.481	+3.18	1935	115	57	47.75	49.866	−2.12	−1.78	
96	Wilson Peak astronomical station.	1905	34	12	54.81	80.58	−25.77	1905	118	03	31.95	25.08	+6.87	+5.68	Wilson Peak.
97	Yolo northwest base	1880	38	40	37.12	43.723	−6.60		121	51		27.351			
98	Yolo southeast base	1880	38	31	34.10	41.104	−7.00		121	47		57.307			

[1] The latitude at this station is of second-order accuracy.

DEFLECTIONS OF THE VERTICAL—Continued

COLORADO

Geodetic station		Latitude				A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical			Geodetic		Year	Astronomical		Geodetic	A-G		
			° ′ ″		″	″			° ′ ″		″	″	″	
99	Adobe	1881	38 40	37.43	40.553	−3.12			103 33		16.320			
100	Brighton bench mark eccentric.	1913	40 00	03.40	01.244	+2.16			104 48		58.178			Brighton.
101	Colorado Springs astronomical (U. S. E.) [2]	1873	38 49	41.36	43.540	−2.18			104 49		45.384			Colorado Springs (U. S. E.).
102	Colorado Springs latitude and longitude.	1873	38 49	59.98	62.870	−2.89		1885	104 49	11.11	35.061	−23.95	−18.66	Colorado Springs.
103	Dewey (U. S. G. S.)	1913	40 30	19.53	25.498	−5.97			104 33		16.163			
104	Elbert	1913	39 14	02.40	02.580	−.18			104 34		33.150			
105	El Paso east base	1879	38 57	16.65	21.989	−5.34			104 27		41.915			
106	Grand Junction telegraph longitude station.	1886	39 03	59.04	54.613	+4.43		1886	108 33	54.02	52.920	+1.10	+.85	Grand Junction.
107	Gunnison azimuth	1893	38 32	43.94	46.141	−2.20		1886	106 55	30.68	26.360	+4.32	+3.38	Gunnison.
108	Huey	1922	38 02	22.93	20.583	+2.35		1922	103 14	52.34	55.251	−2.91	−2.29	
109	Laird		40 02		48.073			1933	102 03	13.49	19.033	−5.54	−4.24	
110	Long	1922	37 31	09.43	06.427	+3.00			103 19		46.553			
111	Loveland tall white chimney.	1913	40 24	04.62	10.40	−5.78			105 03		35.91			Loveland.
112	Messex	1935	40 26	48.01	50.753	−2.74		1935	103 28	29.38	31.414	−2.03	−1.54	
113	Morrison (U. S. G. S.)	1913	39 40	11.77	09.273	+2.50			105 13		09.104			
114	Mount Ouray	1894	38 25	17.34	21.777	−4.44			106 13		27.018			
115	Overland	1924	39 02	14.13	20.055	−5.92		1924	103 10	09.63	15.628	−6.00	−4.66	
116	Pikes Peak	1895	38 50	27.28	25.926	+1.35			105 02		37.191			
117	Tavaputs	1891	39 32	16.50	23.278	−6.78			109 00		18.715			
118	Treasury Mountain	1893	39 00	48.10	51.430	−3.33			107 05		54.435			
119	Uncompahgre	1895	38 04	16.03	17.953	−1.92			107 27		41.309			
120	Watkins astronomic		39 44		43.434			1912	104 36	13.79	18.928	−5.14	−3.95	Watkins.

CONNECTICUT

121	Sandford	1862	41 27	40.18	42.348	−2.17			72 56		59.398			

DELAWARE

122	Cape Henlopen lighthouse	1897	38 46	39.51	41.186	−1.68			75 05		03.132			Cape Henlopen.

DISTRICT OF COLUMBIA

123	Four-and-one-half Street	1852	38 53	30.70	33.79	−3.09			77 01		02.50			Washington, Four-and one-half Street.
124	Old Naval Observatory dome, pipe.	1861, 1893	38 53	38.79	41.925	−3.14		Various	77 03	02.30	06.276	−3.98	−3.10	U. S. Naval Observatory dome (old site).

FLORIDA

125	Athena	1933	29 57	51.51	51.441	+0.07		1933	83 28	21.45	22.357	−0.91	−0.79	
126	Bethel	1933	30 16	31.49	30.950	+.54		1933	81 46	11.47	14.276	−2.81	−2.43	
127	Buie	1933	29 05	12.36	10.269	+2.09		1933	82 33	04.41	07.764	−3.35	−2.93	
128	Burbank	1933	29 16	53.89	53.459	+.43		1933	82 00	02.32	05.169	−2.85	−2.49	
129	Cape Sable latitude station.	1886	25 06	61.58	58.735	+2.84			81 05		13.277			Cape Sable.
130	Daytona		29 12		35.391			1907	81 00	57.81	59.336	−1.53	−1.34	
131	Delray south base	1935	26 26	50.65	48.543	+2.11		1935	80 04	12.49	21.755	−9.26	−8.29	
132	Evergreen [1]	1933	30 41	46.58	45.583	+1.00		1933	81 43	59.56	60.740	−1.18	−1.01	
133	Fernandina, Nassau County courthouse, spire.		30 40		14.319			1907	81 27	40.12	42.091	−1.97	−1.69	Fernandina courthouse spire.
134	Florosa	1934	30 24	40.23	38.772	+1.46		1934	86 41	49.83	49.399	+.43	+.37	
135	Hastings [1]	1933	29 42	50.36	51.059	−.70		1933	81 31	41.56	45.201	−3.64	−3.16	
136	Joe [1]	1934	29 49	21.58	18.455	+3.12		1934	85 18	29.87	28.552	+1.32	+1.15	
137	Jordan	1935	27 55	16.07	12.034	+4.04		1935	82 41	31.60	35.293	−3.69	−3.26	
138	Jupiter Inlet lighthouse	1906	26 56	62.37	53.733	+8.64		1907	80 04	43.85	56.200	−12.35	−11.01	Jupiter Inlet.
139	Key Biscayne south base	1849	25 39	52.31	54.567	−2.26			80 09		21.927			Cape Florida.
140	Lake Wales southeast base	1935	27 53	36.10	29.386	+6.71		1935	81 38	53.42	59.077	−5.66	−5.00	
141	Lancaster 2 (U. S. E.) [1]	1918	30 18	39.59	37.119	+2.47		1917	81 40	35.24	38.298	−3.06	−2.64	
142	Live Oak east base [1]	1933	30 19	11.19	09.798	+1.39		1933	83 02	13.31	13.404	−.09	−.08	
143	Miami longitude station		25 46		28.329			1907	80 11	33.34	42.946	−9.61	−8.65	Miami.
144	Okeechobee west base	1935	27 14	38.96	35.806	+3.15		1935	80 58	13.19	20.256	−7.07	−6.29	
145	Pierce	1935	27 28	14.38	11.727	+2.65		1935	80 17	22.62	28.213	−5.59	−4.96	
146	Rack	1935	24 52	53.67	49.148	+4.52		1935	80 41	33.78	38.401	−4.62	−4.19	
147	Rocks	1935	27 14	34.25	30.011	+4.24		1935	82 31	58.17	59.645	−1.48	−1.32	
148	Rose	1935	26 16	10.16	05.272	+4.89		1935	81 47	26.72	30.759	−4.04	−3.62	
149	St. Augustine lighthouse	1906	29 53	05.92	06.715	−.80			81 17		19.449			St. Augustine.
150	Sand Key	1849	24 27	09.27	12.06	−2.79			81 52		39.71			
151	Sebastian 2	1906	27 49	05.05	00.766	+4.28		1907	80 28	07.30	13.214	−5.91	−5.23	Sebastian.
152	Tallahassee [1]	1933	30 27	22.22	21.968	+.25		1933	84 16	59.28	59.454	−.17	−.15	
153	Tamiami west base	1935	25 45	40.69	38.173	+2.52		1935	80 36	54.40	57.980	−3.58	−3.22	
154	Tifts observatory	1896	24 33	32.10	33.66	−1.56		1896	81 48	25.01	27.46	−2.45	−2.23	Key West.
155	Titusville southeast base	1935	28 37	27.90	27.134	+.77		1935	80 49	21.82	23.157	−1.34	−1.18	
156	West Martello Tower	1935	24 32	45.73	47.758	−2.03		1935	81 47	09.19	10.319	−1.13	−1.03	
157	Wilber	1935	29 07	37.64	35.520	+2.12		1935	80 57	17.54	18.209	−.67	−.59	

[1] The latitude at this station is of second-order accuracy.
[2] Latitude determination by the United States Engineers.

DEFLECTIONS OF THE VERTICAL—Continued

GEORGIA

Geodetic station		Latitude					A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical			Geodetic		Year	Astronomical			Geodetic	A-G		
			°	′	″	″	″		°	′	″	″	″	″	
158	Albany	1936	31	34	18.08	20.067	−1.99	1936	84	07	23.09	23.512	−0.42	−0.36	
159	Atlanta, city hall spire	1880	33	44	58.93	57.469	+1.46	1879	84	23	18.92	18.073	+.85	+.71	Atlanta.
160	Atlanta middle base	1872	33	54	22.06	21.259	+.80	1907	84	16	38.48	37.986	+.49	+.41	
161	Augusta longitude	1890	33	28	20.78	23.726	−2.95	1890	81	57	57.14	69.738	−12.60	−10.51	Augusta.
162	Brunswick southeast base	1917	31	09	34.68	26.182	+8.50	1917	81	29	52.17	55.342	−3.17	−2.71	
163	Butler	1918	32	33	29.33	23.830	+5.50	1918	84	13	52.24	50.153	+2.09	+1.76	
164	Claxton	1935	32	09	42.36	42.267	+.09	1935	81	53	15.91	21.495	−5.58	−4.72	
165	Cochran	1917	32	23	21.16	19.565	+1.60	1917	83	21	30.87	34.664	−3.79	−3.20	
166	Columbus E	1918	32	27	62.82	54.914	+7.91	1918	84	58	62.12	56.390	+5.73	+4.83	
167	Crescent [1]	1933	31	30	36.71	32.552	+4.16	1933	81	22	08.58	13.977	−5.40	−4.60	
168	Currahee	1874	34	31	43.94	44.694	−.75	.....	83	22	.....	33.584	.....	.....	
169	Darien longitude pier	.....	31	22	.....	05.498	.....	1907	81	25	52.79	57.747	−4.96	−4.24	Darien.
170	Davis	1933	31	43	21.55	23.176	−1.63	1933	84	49	59.30	60.370	−1.07	−.91	
171	Folkston	.....	30	50	.....	17.524	.....	1918	82	00	35.12	37.793	−2.67	−2.29	
172	Hamilton east base	1930	32	44	24.41	19.161	+5.25	1930	84	52	16.92	09.360	+7.56	+6.36	
173	Harmon	1918	32	33	27.25	21.771	+5.48	1918	84	13	21.81	18.442	+3.37	+2.84	
174	Hump	.....	32	47	.....	34.633	.....	1917	83	38	34.97	36.987	−2.02	−1.70	
175	Jesup	.....	31	36	.....	27.868	.....	1917	81	52	34.49	42.650	−8.16	−6.95	
176	Joint	1917	31	52	09.95	05.743	+4.21	1917	82	35	55.41	58.788	−3.38	−2.87	
177	Jones	1918	31	30	49.77	49.181	+.59	1918	83	44	16.98	16.212	+.77	+.66	
178	Jonesboro	1930	33	31	61.35	58.510	+2.84	1930	84	18	13.27	10.836	+2.43	+2.03	
179	Kimbrough	1918	32	00	13.59	13.611	−.02	1918	84	39	00.76	02.345	−1.58	−1.34	
180	Lavender	1874	34	19	16.99	19.037	−2.05	.....	85	17	.....	18.624	.....	.....	
181	McKinnon	1935	31	25	38.43	39.404	−.97	1935	82	54	06.69	10.319	−3.63	−3.10	
182	Mercer U	1935	32	49	45.34	46.136	−.80	1935	83	39	05.28	07.887	−2.61	−2.19	
183	Mud	.....	32	11	.....	15.396	.....	1917	83	10	14.25	17.743	−3.49	−2.95	
184	Norris	1918	32	30	31.82	31.569	+.25	1918	82	30	05.34	10.454	−5.11	−4.31	
185	Otter	1935	31	19	31.34	28,795	+2.54	1935	82	08	00.12	03.740	−3.62	−3.09	
186	Penia	1935	31	57	53.83	53.438	+.39	1935	83	41	19.32	19.443	−.12	−.10	
187	Riley	1918	32	33	25.45	18.369	+7.08	1918	84	12	04.83	00.963	+3.87	+3.26	
188	Rose Hill	1907	34	05	06.76	01.213	+5.55	.....	82	45	.....	33.706	.....	.....	
189	Salem	1935	33	43	05.13	01.785	+3.34	1935	83	23	38.38	36.776	+1.60	+1.33	
190	Sawnee	1873	34	14	10.92	11.646	−.73	.....	84	09	.....	39.063	.....	.....	
191	Scarboro	1935	32	46	24.13	24.124	+.01	1935	82	41	00.39	03.693	−3.30	−2.77	
192	Sylvester D [1]	1918	31	32	48.37	48.892	−.52	1918	83	54	15.90	14.341	+1.56	+1.33	
193	Turner [1]	1918	32	26	20.48	20.053	+.43	1918	81	46	58.96	64.574	−5.61	−4.73	
194	Valdosta	.....	30	49	.....	47.854	.....	1918	83	16	40.01	40.076	−.07	−.06	
195	Valley	1918	32	32	61.34	57.462	+3.88	1917	83	53	16.72	21.341	−4.62	−3.89	
196	Waresboro	.....	31	14	.....	55.740	.....	1918	82	28	40.55	42.063	−1.51	−1.29	
197	Willacoochee	.....	31	20	.....	30.410	.....	1918	83	03	02.28	05.131	−2.85	−2.43	

IDAHO

198	Blackfoot longitude	1916	43	10	58.49	58.694	−0.20	1916	112	21	11.37	00.921	+10.45	+7.62	Blackfoot.
199	Mountain Home	1916	43	07	41.91	43.341	−1.43	1916	115	41	40.00	35.235	+4.76	+3.47	

ILLINOIS

200	Belleville east base [1]	1930	38	31	59.87	57.875	+2.00	1930	89	48	23.64	21.731	+1.91	+1.49	
201	Bording	1882	38	36	50.93	45.224	+5.71	.....	89	20	.....	25.708	.....	.....	
202	Cherry [1]	1930	41	25	14.83	17.606	−2.78	1930	89	11	19.74	17.848	+1.89	+1.42	
203	Defiance (Cairo) (U. S. L. S.).[3]	1876	36	59	47.97	47.927	+.04	1876	89	09	30.45	30.283	+.17	+.14	Cairo (U. S. L. S.).
204	Fairmount (U. S. L. S.) [3]	1880	40	01	36.67	35.598	+1.07	.....	87	50	.....	48.266	.....	.....	
205	Jose	1934	40	17	20.26	20.133	+.13	1934	89	37	36.87	34.384	+2.49	+1.90	
206	Newton	1883	38	55	31.10	28.468	+2.63	.....	88	09	.....	50.463	.....	.....	
207	Olney west base (U. S. L. S.).[3]	1880	38	51	41.27	38.448	+2.82	.....	88	06	.....	08.520	.....	.....	
208	Parkersburg (U. S. L. S.) [3]	1879	38	34	53.10	51.400	+1.70	.....	88	01	.....	49.141	.....	.....	
209	Parkersburg longitude (U. S. L. S.).[3]	.....	38	41	.....	40.39	.....	1879	88	05	10.22	10.93	−.71	−.56	
210	Rice	1934	39	42	56.72	54.523	+2.20	1934	89	55	26.74	25.581	+1.16	+.89	
211	Rock Island astronomical post (U. S. L. S.).[3]	1878	41	31	03.38	04.110	−.73	1878	90	33	39.39	37.776	+1.61	+1.21	
212	St. Anne (U. S. L. S.)	1908	41	01	20.18	19.266	+.91	.....	87	43	.....	15.506	.....	.....	
213	Schlosser	1939	40	52	15.82	14.842	+.98	1939	88	59	22.90	18.432	+4.47	+3.38	
214	Spring Creek (U. S. L. S.)	.....	40	39	.....	59.969	.....	1929	87	59	24.52	29.598	−5.08	−3.85	
215	Voght	.....	42	29	.....	22.299	.....	1935	89	33	21.90	19.092	+2.81	+2.07	
216	Willow Springs (U. S. L. S.).[3]	1874	41	43	38.59	36.785	+1.80	.....	87	51	.....	05.795	.....	.....	
217	Willow Springs longitude (U. S. L. S.).[3]	.....	41	44	.....	21.19	.....	1876	87	51	52.66	52.37	+.29	+.22	

[1] The latitude at this station is of second-order accuracy.
[3] Astronomical determinations by the United States Lake Survey.

DEFLECTIONS OF THE VERTICAL—Continued

INDIANA

Geodetic station		Latitude				A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical		Geodetic		Year	Astronomical		Geodetic	A-G		
			° ′ ″		″	″		° ′ ″		″	″	″	
218	Baugh	1934	40 18	57.94	56.490	+1.45	1934	86 56	26.21	29.927	−3.72	−2.84	
219	Boston	1933	39 42	42.58	40.492	+2.09	1933	84 51	11.76	06.751	+5.01	+3.85	
220	Carlisle (U. S. L. S.) latitude station.	1908	41 40	04.04	04.596	−.56		86 29		37.190			Carlisle (U. S. L. S.).
221	Cox 2	1934	40 14	50.94	49.412	+1.53	1934	86 01	49.15	47.305	+1.84	+1.40	
221a	Kinnick	1939	39 37	30.03	25.575	+4.46	1939	86 03	03.04	07.550	−4.51	−3.47	
222	O. & M	1915	38 29	01.93	00.151	+1.78	1915	85 40	11.69	11.676	+.01	+.01	
223	Reizin	1889	39 02	53.78	53.689	+.09		85 08		24.258			
224	Vincennes, courthouse, center cupola.	1881	38 40	36.32	35.105	+1.22	1881	87 31	32.44	37.494	−5.05	−3.94	Vincennes.
225	Weed Patch	1889	39 10	00.68	00.489	+.19		86 13		00.926			

IOWA

226	Burgus	1931	40 57	10.65	12.571	−1.92	1931	91 02	54.54	55.656	−1.12	−0.85	
227	Cellman [1]	1930	41 39	28.49	32.456	−3.97	1930	91 48	12.20	14.478	−2.28	−1.70	
228	Corydon south base	1930	40 42	33.43	34.377	−.95	1930	93 21	43.50	44.591	−1.09	−.83	
229	Davis	1934	40 49	39.86	41.035	−1.18	1934	92 23	12.12	13.844	−1.72	−1.30	
230	Fair	1930	41 32	07.36	10.414	−3.05	1930	90 37	20.82	20.747	+.07	+.05	
231	McCleary	1928	41 40	59.50	63.100	−3.60	1928	93 25	49.62	53.702	−4.08	−3.05	
232	Patten [1]	1930	41 45	03.38	00.523	+2.86	1930	95 23	18.18	15.498	+2.68	+2.00	
233	Sherrills Mound	1880	42 36	15.37	14.629	+.74		90 47		37.394			
233a	Tjebben	1935	42 30	09.59	09.805	−.22	1935	94 36	27.58	26.730	+.85	+.63	
233b	Westgate	1934	42 47	16.13	17.063	−.93	1934	91 56	59.93	56.277	+3.65	+2.68	

KANSAS

234	Adams	1888	39 02	41.74	41.078	+0.66		96 04		24.342			
235	Brown	1906	39 46	35.11	37.140	−2.03		98 42		16.701			
236	Bullard (U. S. G. S.)		37 52		35.327		1933	100 52	52.34	51.147	+1.19	+0.94	
237	Dirks	1935	37 25	35.49	39.507	−4.02	1935	99 16	19.90	21.388	−1.49	−1.18	
238	Ellsworth astronomical station.	1885	38 43	47.49	48.78	−1.29	1885	98 13	36.36	44.92	−8.56	−6.68	Ellsworth
239	Panther	1935	37 04	39.10	38.447	+.65	1935	96 53	25.84	27.459	−1.62	−1.29	
240	Quarry	1906	37 14	27.98	28.375	−.40		97 58		19.634			
241	Russell southeast base	1893	38 51	22.73	22.284	+.45		98 47		08.039			
242	Salina west base	1896	38 51	03.52	07.736	−4.22	1907	97 36	09.36	10.799	−1.44	−1.12	
243	Simmons	1930	38 47	04.22	04.765	−.54	1930	95 26	02.57	04.122	−1.55	−1.21	
244	Smoky Hill	1924	38 43	35.47	35.020	+.45	1924	99 32	52.42	53.625	−1.20	−.94	
245	Sunflower	1906	37 51	37.82	40.332	−2.51		97 51		27.894			
246	Wallace latitude station	1885	38 54	44.25	44.133	+.12	1885	101 35	25.96	31.495	−5.54	−4.31	Wallace.

KENTUCKY

247	Boyd		37 51		22.544		1935	87 26	00.40	00.007	+0.39	+0.31	
248	Cash [1]	1934	37 33	08.68	06.669	+2.01	1934	86 04	43.66	50.630	−6.97	−5.53	
249	Ferriel		37 37		25.319		1929	85 26	15.31	16.572	−1.26	−1.00	
250	Gaither	1930	36 57	20.01	19.853	+.16	1930	87 31	19.20	21.257	−2.06	−1.65	
251	Henderson astronomical station.	1882	37 50	24.30	19.49	+4.81	1882	87 35	27.99	29.85	−1.86	−1.47	Henderson.
252	Louisville longitude station.	1879	38 14	57.78	53.98	+3.80	1879	85 45	54.54	53.62	+.92	+.72	Louisville.
253	Minerva	1887	38 42	30.89	30.955	−.06		83 55		06.839			
254	Raccoon		37 09		03.149		1929	83 59	26.49	31.161	−4.67	−3.72	

LOUISIANA

255	Alberta		29 22		21.958		1934	89 34	25.08	23.621	+1.46	+1.27	
256	Alexandria south base	1935	31 10	29.35	32.448	−3.10	1935	92 25	05.66	06.032	−.37	−.32	
257	Alsatia	1931	32 36	42.85	45.038	−2.19	1931	91 12	43.16	46.538	−3.38	−2.85	
258	Avery [1]	1931	29 54	20.50	13.918	+6.58	1931	91 54	09.99	08.182	+1.81	+1.57	
259	Avoca	1931	29 38	16.11	10.814	+5.30	1931	91 06	51.07	49.327	+1.74	+1.51	
260	Baton Rouge astronomical station.	1880	30 27	13.07	13.71	−.64	1880	91 11	18.72	18.78	−.06	−.05	Baton Rouge.
261	Boyce	1920	31 22	49.95	52.723	−2.77	1920	92 39	10.84	09.674	+1.17	+1.00	
262	Brooks	1931	32 25	10.09	09.372	+.72	1931	92 07	01.27	01.083	+.19	+.16	
263	Burns	1931	32 35	29.74	28.114	+1.63	1931	93 14	22.65	19.697	+2.95	+2.49	
264	Burrwood latitude station.	1921	28 57	57.37	56.364	+1.01		89 22		51.376			Burrwood.
265	Callman	1931	32 19	28.92	28.973	−.05	1931	91 05	03.78	04.713	−.93	−.79	
266	Chandeleur lighthouse	1921	30 02	60.10	52.272	+7.83		88 52		18.293			Chandeleur Island.
267	Deer Island	1888	29 28	53.13	48.937	+4.19		91 16		02.227			
268	Donaldsonville	1931	30 06	30.55	26.446	+4.10	1931	90 59	21.46	18.768	+2.69	+2.33	
269	Fort St. Philip, flagstaff	1921	29 21	51.69	46.511	+5.18		89 27		54.184			Fort St. Philip.
270	Harvey [1]	1930	29 54	33.64	28.877	+4.76	1930	90 05	03.68	02.505	+1.18	+1.02	
271	Head of Passes astronomical station.	1858	29 08	33.09	31.341	+1.75		89 15		06.476			Head of Passes.
272	Homewood	1931	30 07	39.50	36.439	+3.06	1931	93 04	51.03	49.862	+1.17	+1.01	
273	Man	1920	32 01	18.46	18.763	−.30	1920	93 43	01.02	01.474	−.45	−.38	
274	Morgan City, Methodist Church, spire.	1921	29 41	49.94	44.705	+5.24		91 12		20.326			Morgan City.
275	New Roads west base [1]	1931	30 42	53.26	54.584	−1.32	1931	91 33	11.24	10.030	+1.21	+1.04	
276	Point a la Hache	1921	29 34	47.60	40.95	+6.65		89 47		43.74			
277	Port Eads, wireless pole	1921	29 00	58.15	58.135	+.02		89 09		47.774			Port Eads.
278	Shreveport north base [1]	1931	32 24	19.85	18.247	+1.60	1931	93 47	39.06	37.980	+1.08	+.91	
279	Tangi	1939	30 52	10.84	12.332	−1.49	1939	90 27	43.41	42.689	+.72	+.62	
280	Torras	1920	30 59	20.48	22.898	−2.42	1920	91 40	46.03	45.170	+.86	+.74	
281	Willetts	1931	31 29	59.93	62.744	−2.81	1931	91 31	49.80	50.185	−.38	−.32	

[1] The latitude at this station is of second-order accuracy.

DEFLECTIONS OF THE VERTICAL—Continued

MAINE

Geodetic station		Latitude					A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical			Geodetic		Year	Astronomical			Geodetic	A-G		
			°	′	″	″	″		°	′	″	″	″	″	
282	Agamenticus	1847	43	13	24.92	24.048	+0.87		70	41		32.854			
283	Bigelow	1930	44	42	46.46	47.402	−.94	1930	69	43	43.74	39.476	+4.26	+3.03	
284	Cooper	1859	44	59	12.53	12.728	−.20		67	28		02.131			
285	Graffte	1930	45	40	58.34	59.829	−1.49	1930	70	16	55.16	50.322	+4.84	+3.38	
286	Howard	1859	44	37	48.61	45.837	+2.77		67	23		45.268			
287	Humpback	1858	44	51	46.94	49.972	−3.03		68	06		37.642			
288	Isle of Shoals	1847	42	59	12.87	14.273	−1.40		70	36		50.258			
289	Mount Desert	1856	44	21	04.64	04.531	+.11		68	13		37.540			
290	Mount Harris	1855	44	39	54.89	54.202	+.69		69	08		54.474			
291	Mount Independence	1849	43	45	34.53	33.155	+1.38		70	19		14.231			
292	Mount Pleasant	1851, 1930	44	01	36.13	36.123	+.01		70	49		21.796			
293	Ragged Mountain	1854	44	12	43.33	44.715	−1.38		69	09		05.189			
294	Sebattus	1853	44	08	37.52	37.219	+.30		70	04		43.589			

MARYLAND

295	Buckler		38	33		32.665		1934	76	31	03.62	13.320	−9.70	−7.59	
296	Calvert	1871	38	21	31.69	33.931	−2.24		76	23		35.163			
297	Gantt	1908	38	20	26.13	28.743	−2.61		75	06		25.430			
298	Hill	1850	38	53	52.89	54.570	−1.68	1930	76	52	41.66	49.935	−8.28	−6.44	
299	Holt	1933	38	03	40.53	42.709	−2.18	1933	75	33	01.96	03.300	−1.34	−1.05	
300	Marriott	1849	38	52	24.78	27.213	−2.43		76	36		35.326			
301	Maryland Heights	1870	39	20	31.45	27.388	+4.06		77	43		00.077			
302	Pooles Island	1847	39	17	09.68	07.462	+2.22		76	15		49.530			
303	Principio	1866	39	35	32.75	36.312	−3.56		76	00		16.563			
304	Soper	1850	39	05	10.51	11.507	−1.00		76	57		00.887			
305	Sugar Loaf	1879	39	15	48.30	44.232	+4.07		77	23		37.050			
306	Taylor	1847	38	59	45.97	48.034	−2.06		76	27		56.076			
307	Webb	1850	39	05	25.60	26.209	−.61		76	40		30.327			

MASSACHUSETTS

308	Cambridge Observatory	1844–5	42	22	48.04	52.934	−4.89	1848	71	07	45.69	43.917	+1.77	+1.31	Cambridge, Harvard College.
309	Cloverden Observatory	1855	42	22	40.96	45.73	−4.77		71	07		17.64			
310	Folger	1866	41	17	14.06	16.396	−2.34		70	06		16.714			Nantucket.
311	Manomet	1867	41	55	35.41	38.112	−2.70		70	35		28.212			
312	Mount Tom	1862, 1930	42	14	27.93	30.320	−2.39	1930	72	38	55.39	55.105	+.28	+.21	
313	Provincetown Universalist Church.	1901	42	02	56.98	61.495	−4.52	1901	70	11	18.40	20.047	−1.65	−1.23	Provincetown.
314	Thompson	1846	42	36	38.23	41.345	−3.12		70	43		49.176			
315	Wachusett	1860	42	29	16.97	20.272	−3.30		71	53		14.002			

MICHIGAN

316	A Mackinac west base (U. S. L. S.).	1929	45	47	13.67	13.732	−0.06	1929	84	46	18.76	22.462	−3.70	−2.58	
317	Barry	1933	42	45	16.49	15.917	+.57	1933	85	24	03.32	05.383	−2.06	−1.51	
318	Beaver Island Lighthouse (U. S. L. S.).[3]	1863	45	34	28.78	32.30	−3.52		85	34		24.49			Beaver Island (U. S. L. S.).
319	Borm [1]	1932	43	24	05.46	02.114	+3.35	1932	84	04	10.46	16.747	−6.29	−4.57	
320	Bunday (U. S. L. S.)	1908	42	03	16.79	15.965	+.82	1908	84	27	35.02	41.535	−6.52	−4.84	
321	Burnt Bluff (U. S. L. S.)		45	41		09.597		1929	86	42	43.98	39.112	+4.87	+3.40	
322	Cedar River (U. S. L. S.)[3]	1865	45	25	43.10	48.522	−5.42		87	19		34.384			
323	Copper Harbor astronomical station (U. S. L. S.).[3]	1864	47	28	05.43	03.74	+1.69		87	51		56.98			Copper Harbor (U. S. L. S.).
324	Crebassa latitude post (U. S. L. S.).[3]	1871	46	58	40.98	40.94	+.04		88	24		53.09			Crebassa.
325	Ford River (U. S. L. S.)[3]	1874	45	41	05.24	12.062	−6.82	1865	87	06	00.73	08.691	−7.96	−5.56	
326	Greenbush (U. S. L. S.)	1929	44	35	31.67	28.164	+3.51	1929	83	20	38.54	41.321	−2.78	−1.98	
327	Hamilton	1932	42	27	37.73	38.840	−1.11	1932	83	32	34.02	40.176	−6.16	−4.54	
328	Hamlin	1933	44	04	03.48	02.414	+1.07	1933	86	25	26.14	17.589	+8.55	+6.14	
329	Huron Mountains (U. S. L. S.) latitude station.[3]	1866	46	52	52.22	41.589	+10.63		87	55		17.874			Huron Mountains (U. S. L. S.).
330	Indian	1932	44	17	59.59	58.478	+1.11	1932	84	23	37.02	43.543	−6.52	−4.67	
331	Iroquois Lighthouse (old) (U. S. L. S.).[3]	1867	46	29	04.81	02.91	+1.90		84	37		54.41			Iroquois Point (U. S. L. S.).
332	Isle Royale East (U. S. L. S.) latitude station.[3]	1866	48	07	55.19	43.653	+11.54		88	33		36.069			Isle Royale (U. S. L. S.).
333	Johnston	1933	42	36	14.43	13.653	+.78	1933	86	12	45.97	42.153	+3.82	+2.81	
334	Keweenaw Point south base (U. S. L. S.).[3a]	1873	46	52	22.31	17.821	+4.49	1929	88	29	03.55	16.231	−12.68	−8.67	
335	Le Roy		44	01		45.010		1932	85	22	49.10	45.440	+3.66	+2.63	
336	Mount Houghton (U. S. L. S.).[3]	1865	47	24	15.75	26.08	−10.33		87	56		29.03			
337	Observatory post, east pier (U. S. L. S.).[3]	1872	42	19	58.62	60.70	−2.08	1891	83	03	02.94	06.87	−3.93	−2.91	Detroit (U. S. L. S.).
338	Porcupine Mountains (U. S. L. S.) latitude station.[3]	1870	46	47	04.14	01.571	+2.57		89	43		50.055			
339	Round Island astronomical station (U. S. L. S.).[3]	1853	45	50	05.87	06.76	−.89		84	36		44.73			
340	Sault Ste. Marie Observatory, west pier (U. S. L. S.).[3]	1893	46	30	06.24	05.04	+1.20	1893	84	20	49.36	56.39	−7.03	−4.84	Sault Ste. Marie (U. S. L. S.).
341	Sherman (U. S. L. S.) latitude station.	1908	41	50	46.30	47.465	−1.16		85	27		11.084			
342	Teichman	1932	42	53	47.72	46.243	+1.48	1932	84	04	58.62	64.285	−5.66	−4.15	
343	Thones Hill, Observatory Post (U. S. L. S.).[3]	1865	46	31	60.50	53.92	+6.58	1865	87	26	49.34	63.68	−14.34	−9.86	Thones Hill, Marquette.
344	Vulcan (U. S. L. S.)[3]	1867	47	26	44.51	46.729	−2.22		87	47		37.619			
345	Wheal Kate (U. S. L. S.) latitude station.[3]	1866	47	04	18.36	20.652	−2.29		88	39		43.325			Wheal Kate (U. S. L. S.).
346	Whitefish Point latitude post (U. S. L. S.).[3]	1867	46	46	07.17	06.10	+1.07		84	57		26.46			Whitefish Point (U. S. L. S.).

[1] The latitude at this station is of second-order accuracy.
[3] Astronomical determinations by the United States Lake Survey.
[3a] Latitude determination by the United States Lake Survey.

DEFLECTIONS OF THE VERTICAL—Continued

MINNESOTA

Geodetic station		Latitude				A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical		Geodetic		Year	Astronomical		Geodetic	A-G		
			° ′ ″		″	″		° ′ ″		″	″	″	
347	Alberta	1928	45 48	12.35	14.562	−2.21	1928	94 06	48.50	50.559	−2.06	−1.44	
348	Buchanan (U. S. L. S.) latitude station.[1 2]	1871	46 56	22.11	25.84	−3.73		91 47		36.11			
349	Buck (Buck Hill, 1889)	1928	44 43	18.62	23.817	−5.20	1928	93 17	03.66	13.615	−9.96	−7.08	
350	Dalton astronomical station.	1906	46 10	27.22	23.438	+3.78	1907-8	95 54	59.85	59.223	+.63	+.44	Dalton.
351	Douglas	1905	46 36	47.96	45.286	+2.67		93 08		18.024			
352	East Sawteeth latitude station (U. S. L. S.).[2]	1870	47 23	09.37	19.52	−10.15		91 10		15.50			East Sawteeth (U. S. L. S.).
353	Farquhars Knob latitude station (U. S. L. S.).[2]	1869	47 52	35.12	40.19	−5.07		89 59		22.84			Farquhars Knob (U. S. L. S.).
354	Johnson		44 51		44.807		1935	96 17	18.12	20.489	−2.37	−1.68	
355	Jones	1905	46 23	53.67	48.978	+4.69		94 04		11.935			
356	Kiester	1928	43 34	53.67	55.042	−1.37	1928	93 42	10.08	14.557	−4.48	−3.25	
357	Luverne	1928	43 37	08.21	10.691	−2.48	1928	96 17	52.07	52.320	−.25	−.18	
358	Minnesota Point north base (U. S. L. S.)[2]	1871	46 45	28.28	27.966	+.31	1871	92 04	32.39	42.683	−10.29	−7.05	
359	Minnesota Point south base (U. S. L. S.).[2]	1871	46 42	51.39	49.509	+1.88		92 01		54.555			
360	Morken	1906	47 02	06.15	06.210	−.06		96 36		21.602			
361	Osakis	1906	45 49	27.75	27.136	+.61		95 07		51.698			
362	Red Wing astronomical post (M. R. C.).	1878	44 33	44.16	44.17	−.01	1878	92 31	58.59	58.12	+.47	+.33	Red Wing (U. S. L. S.)
363	Royalton south base	1905	45 44	06.68	08.073	−1.39		94 12		04.784			
364	Stephen west base	1905	48 27	22.00	22.884	−.88	1907-8	96 51	17.67	20.715	−3.04	−2.02	
365	Tilden	1905	47 42	16.22	13.150	+3.07		96 19		48.512			
366	Warner	1934	44 47	17.34	22.946	−5.61	1934	95 11	15.28	15.831	−.55	−.39	
367	Warroad south base (I. B. C.).[4]	1915	48 55	22.83	19.862	+2.97	1915	95 19	32.67	33.829	−1.16	−.76	

MISSISSIPPI

368	Bogue	1931	33 43	04.89	05.398	−0.51	1931	90 53	18.60	17.212	+1.39	+1.16	
369	Fort	1878	32 20	30.11	28.139	+1.97	1878	90 53	03.81	02.851	+.96	+.81	Vicksburg (Fort).
370	Fox	1935	31 29	48.98	52.046	−3.07	1935	89 14	32.20	32.504	−.30	−.26	
370a	Greene	1935	33 26	12.68	13.172	−.49	1935	89 36	52.33	57.160	−4.83	−4.03	
371	Greenville, Episcopal Church, spire.	1878	33 24	44.59	42.213	+2.38	1878	91 03	53.40	55.072	−1.67	−1.39	Greenville.
372	Harvey [1]	1930	32 28	57.87	56.428	+1.44	1930	88 41	17.20	19.038	−1.84	−1.55	
373	Legion [1]	1931	32 16	19.32	19.099	+.22	1931	90 06	03.88	07.171	−3.29	−2.78	
374	McNeese	1935	31 25	58.04	62.090	−4.05	1935	89 48	57.02	55.875	+1.14	+.97	
375	Natchez, Saint Patrick's Church, spire.	1878	31 33	28.92	30.732	−1.81	1878	91 24	06.39	04.861	+1.53	+1.30	Natchez.
376	Pass Christian west base	1931	30 18	40.05	34.156	+5.89	1931	89 16	28.61	31.010	−2.40	−2.07	
377	Stovall northeast base	1931	34 18	05.85	02.765	+3.08	1931	90 38	37.71	35.676	+2.03	+1.68	
378	Strickland	1914	34 51	39.94	38.078	+1.86	1914	88 25	46.82	44.857	+1.96	+1.61	
379	University	1935	34 22	02.25	02.028	+.22	1935	89 32	27.23	27.636	−.41	−.34	

MISSOURI

380	Arnold	1934	39 47	31.12	31.500	−0.38	1934	92 05	40.54	41.439	−0.90	−0.69	
381	Banner	1930	36 52	62.49	57.969	+4.52	1930	91 25	28.10	35.345	−7.24	−5.79	
382	Berger	1906	38 35	61.09	58.107	+2.98	1907	91 17	30.54	27.984	+2.56	+2.00	
383	Big Lake	1930	36 59	01.12	01.276	−.16	1930	89 15	28.67	25.093	+3.58	+2.86	
384	Hannibal	1931	39 43	17.73	17.612	+.12	1931	91 22	41.01	41.707	−.70	−.54	
385	Hunter latitude	1880	38 25	48.00	45.313	+2.69		92 46		24.681			Hunter.
386	Jefferson City astronomical.	1879	38 33	43.95	41.22	+2.73		92 09		45.57			Jefferson City.
387	Kansas City astronomical station.	1882	39 05	51.12	50.54	+.58	1882-3	94 35	21.06	22.16	−1.10	−.85	Kansas City.
388	Knob Noster	1930	38 46	35.31	35.585	−.28	1907	93 33	07.47	07.116	+.35	+.27	
389	Meadville	1930	39 46	36.21	38.872	−2.66	1930	93 17	25.37	21.686	+3.68	+2.83	
390	Poor	1930	36 51	53.08	53.686	−.61	1930	89 55	62.82	53.476	+9.34	+7.47	
391	Ravenwood	1935	40 20	22.71	25.322	−2.61	1935	94 38	25.47	27.195	−1.72	−1.31	
392	Rogersville west base	1930	37 07	20.19	19.815	+.38	1930	93 04	49.82	46.655	+3.16	+2.52	
393	Saint Louis, Second Presbyterian Church, spire.	1870, 1881	38 37	60.59	56.114	+4.48	1882	90 12	15.94	14.586	+1.35	+1.05	St. Louis.

MONTANA

394	Bozeman southeast base	1925	45 42	31.95	27.051	+4.90	1925	111 02	64.90	53.150	+11.75	+8.21	
395	Chester Laplace	1925	48 30	52.83	54.798	−1.97	1925	110 57	42.73	45.211	−2.48	−1.64	
396	Haley	1925	45 42	36.31	33.342	+2.97	1925	108 08	50.05	55.313	−5.26	−3.67	
397	Havre south base	1925	48 46	24.38	24.197	+.18	1925	109 35	19.51	19.083	+.43	+.28	
398	Mondak	1913	48 00	11.99	09.696	+2.29	1912	104 02	47.10	49.429	−2.33	−1.56	
399	Montana-North Dakota boundary monument, eccentric.	1913	47 12	44.39	41.349	+3.04		104 02		39.894			Montana-North Dakota boundary.
400	Monument 245 (I. B. C.) [4]	1901	48 59	58.42	58.79	−.37		115 09		56.98			Kootenai River E.
401	Monument 247 (I. B. C.) [4]	1901	48 59	55.43	58.77	−3.34		115 03		15.57			Tobacco Plains.
402	Monument 255 (I. B. C.) [4]	1901	48 59	58.16	61.54	−3.38		114 45		30.71			Wigwam.
403	Wigwam 2 [4]	1901	48 59	42.07	44.38	−2.31		114 45		30.06			
404	Wyoming, northeast corner, boundary monument, eccentric.	1913	44 59	60.39	58.571	+1.82		104 03		18.840			

[1] The latitude at this station is of second-order accuracy.
[2] Astronomical determinations by the United States Lake Survey.
[4] Astronomical determinations by the International Boundary Commission.

DEFLECTIONS OF THE VERTICAL—Continued

NEBRASKA

Geodetic station		Latitude				A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical		Geodetic		Year	Astronomical		Geodetic	A-G		
			° ′ ″		″	″		° ′ ″		″	″	″	
405	Crabb		42 57	.....	30.384	.....	1933	100 31	39.86	44.736	−4.88	−3.57	
406	Curtis	1930	41 18	32.00	33.992	−1.99	1930	97 19	48.96	50.679	−1.72	−1.29	
407	Daily	1906	41 35	43.86	45.151	−1.29		98 38	.....	55.401			
408	Hein		41 04	.....	51.045	.....	1933	100 57	31.30	29.775	+1.52	+1.15	
409	Logan [1]	1935	40 11	49.52	51.478	−1.96	1935	100 09	55.90	56.481	−.58	−.44	
410	North		41 59	.....	56.300	.....	1933	103 40	01.44	02.262	−.82	−.61	
411	Oshkosh		41 19	.....	44.040	.....	1933	102 23	07.90	06.434	+1.47	+1.10	
412	Page southwest base	1906	42 25	29.27	25.395	+3.88	1907	98 25	51.72	59.512	−7.79	−5.75	
413	Shelton east base	1906	40 46	35.41	38.341	−2.93	1925	98 44	35.58	39.309	−3.73	−2.82	

NEVADA

414	Austin longitude		39 29	.....	31.61	.....	1889	117 04	27.24	11.23	+16.01	+12.35	Austin.
415	Carson City, capitol dome	1893	39 09	46.40	50.337	−3.94	1889	119 45	51.05	54.402	−3.35	−2.60	Carson City.
416	Carson Sink	1880	39 34	57.20	59.234	−2.03		118 14	.....	04.058			
417	Diamond Peak	1881	39 35	03.37	05.984	−2.61		115 49	.....	04.051			
418	Eureka longitude		39 30	.....	47.415	.....	1889	115 57	37.56	29.721	+7.84	+6.05	Eureka.
419	Genoa, flagstaff		39 00	.....	11.378	.....	1889	119 50	19.93	42.838	−22.91	−17.80	Genoa.
420	Moapa B. M. I 1	1916	36 40	14.55	19.122	−4.57	1916	114 37	29.10	26.650	+2.45	+1.97	Moapa.
421	Mount Callahan	1881	39 42	31.51	34.035	−2.52		116 56	.....	59.676			
422	Pilot Peak	1889	41 01	07.88	16.304	−8.42		114 04	.....	35.565			
423	Pioche	1883	37 59	06.52	10.102	−3.58		114 03	.....	03.921			
424	Toiyabe Dome	1880	38 49	53.22	57.861	−4.64		117 21	.....	07.598			
425	Tonopah astronomical	1902	38 04	01.27	07.615	−6.34	1902	117 13	64.23	54.728	+9.50	+7.48	Tonopah.
426	Verdi east base	1872	39 31	04.29	05.063	−.77	1872	119 57	46.62	50.774	−4.15	−3.20	
427	Verdi longitude		39 31	.....	13.445	.....	1889	119 58	52.90	57.034	−4.13	−3.19	Verdi.
428	Virginia City longitude		39 18	.....	38.622	.....	1889	119 38	42.08	48.930	−6.85	−5.30	Virginia City.
429	Wheeler Monument [2]	1873	39 17	35.60	43.766	−8.17		119 39	.....	13.630			Virginia City (U. S. E.).
430	Wheeler Stone (U. S. E.) [2]	1871	39 29	21.54	20.101	+1.44		117 03	.....	26.568			Austin.

NEW HAMPSHIRE

431	Gunstock	1860	43 31	05.04	03.774	+1.27		71 22	.....	11.293			
432	Unkonoonuc	1848	42 58	59.70	59.334	+ .37		71 35	.....	19.348			

NEW JERSEY

433	Beacon Hill	1875	40 22	27.93	26.154	+1.78		74 13	.....	42.024			
434	Cape May	1932	38 55	56.36	59.578	−2.72	1932	74 57	35.97	38.079	−2.11	−1.64	
435	Christopher 2 [1]	1932	40 04	08.08	10.791	−2.71	1932	74 11	52.49	60.487	−8.00	−6.12	
436	High Point	1908	41 19	11.31	14.871	−3.56		74 39	.....	42.878			
437	Mount Rose	1852	40 22	05.30	03.036	+2.26		74 43	.....	25.892			
438	Ten Mile	1930	40 24	59.90	57.450	+2.45	1930	74 36	20.24	12.657	+7.58	+5.77	

NEW MEXICO

439	Artesia south base	1922	32 50	22.21	23.212	−1.00	1922	104 27	52.39	53.986	−1.60	−1.34	Artesia.
440	Corduna	1914	32 01	29.19	31.147	−1.96		105 30	.....	55.922			
441	Cuevo	1936	32 48	53.17	52.711	+.46	1936	105 08	12.52	16.873	−4.35	−3.66	
442	Culberson	1939	31 22	21.72	23.184	−1.46	1939	108 38	43.52	39.483	+4.04	+3.45	
443	Deming, city waterworks	1914	32 16	07.22	10.287	−3.07		107 46	.....	00.234			Deming.
444	Des Moines	1922	36 45	23.60	22.455	+1.14	1922	103 49	34.17	43.127	−8.96	−7.18	
445	Elkins	1922	33 41	19.15	19.377	−.23		104 03	.....	15.193			
446	Glenrio	1920	35 10	02.93	04.675	−1.74	1920	103 02	29.27	31.152	−1.88	−1.54	Glen Rio.
447	Jarilla	1914	32 23	56.39	59.582	−3.19	1911	106 06	53.32	44.618	+8.70	+7.35	
448	La Lande	1922	34 26	44.11	46.222	−2.11	1922	104 07	61.24	57.253	+3.99	+3.29	
449	Line (U. S. G. S.)	1914	32 50	58.88	66.270	−7.39		108 59	.....	46.855			
450	Los Lunas	1920	34 48	23.76	26.538	−2.78	1920	106 44	12.01	06.339	+5.67	+4.66	
451	Menecke		33 23	.....	55.650	.....	1936	104 54	53.67	59.111	−5.44	−4.54	
452	Merchant	1936	32 22	04.20	12.238	−8.04	1936	103 20	41.50	28.197	+13.30	+11.23	
453	Portales	1936	34 13	23.38	18.365	+5.02	1936	103 17	05.38	07.144	−1.76	−1.46	
454	Solana	1922	35 50	58.09	66.564	−8.47		104 04	.....	06.343			
455	United States and Mexico boundary monument No. 40.	1892	31 46	59.49	60.948	−1.46	1892	108 12	30.21	28.406	+1.80	+1.53	Corner boundary monument No. 40 (United States and Mexico.)

[1] The latitude at this station is of second-order accuracy.
[2] Latitude determination by the United States Engineers.

DEFLECTIONS OF THE VERTICAL—Continued

NEW YORK

Geodetic station		Latitude					A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical			Geodetic		Year	Astronomical			Geodetic	A-G		
			°	′	″	″	″		°	′	″	″	″	″	
456	Cheever	1874	44	04	53.42	53.698	−0.28		73	27		02.679			
457	Forest Park	1932	40	41	42.38	49.518	−7.14	1932	73	51	42.30	43.966	−1.67	−1.27	
458	Gardiners Island	1907	41	06	01.59	05.069	−3.48		72	06		22.480			
459	Howlett	1883	42	59	54.88	52.756	+2.12		76	17		26.707			
460	Lyndon	1930	42	17	17.86	14.712	+3.15	1930	78	20	39.38	37.076	+2.30	+1.70	
461	Mannsville (U. S. L. S.), longitude station.		43	42		46.76		1875	76	03	52.31	39.68	+12.63	+9.13	Mannsville (U. S. L. S.).
462	Mount Merino	1874	42	14	04.78	04.638	+.14		73	49		03.602			
463	Oswego (U. S. L. S.), astronomical station.[3]	1868	43	27	49.02	46.60	+2.42	1868	76	30	23.24	20.20	+3.04	+2.21	Oswego (U. S. L. S.).
464	Prospect Mountain	1878	43	25	12.60	17.564	−4.96		73	46		04.540			Prospect.
465	Pryor		42	23		06.675		1935	76	01	46.97	46.021	+.95	+.70	
466	Raichart	1939	41	57	39.76	44.857	−5.10	1939	74	02	20.33	27.649	−7.32	−5.44	
467	Sandy Creek north base (U. S. L. S.).[3]	1874	43	40	41.49	43.458	−1.97		76	12		00.890			
468	Sturgeon Point (U. S. L. S.).		42	41		24.776		1876	79	02	59.01	53.015	+6.00	+4.41	
469	Tassel Hill	1880	42	56	19.37	15.48	+3.89		75	18		56.90			
470	Tonawanda (U. S. L. S.).[3]	1875	43	00	07.79	03.744	+4.05	1875	78	53	20.50	20.950	−.45	−.33	
471	West Hills	1865	40	48	49.76	54.775	−5.02		73	25		32.525			

NORTH CAROLINA

472	Chapel Hill[1]	1933	35	52	53.42	57.099	−3.68	1933	79	02	50.46	58.712	−8.25	−6.68	
473	Chocowinity	1933	35	25	44.96	46.403	−1.44	1933	77	07	38.40	41.312	−2.91	−2.37	
474	Duck Creek	1933	34	34	59.25	61.282	−2.03	1933	77	17	58.35	56.046	+2.30	+1.89	
475	Dudley	1933	35	15	57.37	61.150	−3.78	1933	78	01	55.70	65.073	−9.37	−7.65	
476	Durant[1]	1933	36	08	08.60	11.117	−2.52	1933	76	17	43.75	53.939	−10.19	−8.23	
477	King latitude station	1876	35	12	13.42	11.41	+2.01		81	18		56.75			King.
478	Lee	1918	35	28	44.77	46.960	−2.19	1918	79	10	28.91	37.433	−8.52	−6.94	
479	Littleton	1918	36	25	50.65	55.321	−4.67	1918	77	54	54.63	63.010	−8.38	−6.74	
480	Moore	1876	36	23	55.01	53.210	+1.80		80	16		59.528			
481	Mount Pleasant[1]	1933	35	24	58.46	56.502	+1.96	1933	76	04	55.74	59.484	−3.74	−3.05	
482	Raleigh longitude		35	46		46.67		1853	78	38	05.31	19.44	−14.13	−11.46	Raleigh.
483	Roan High Bluff	1907	36	05	37.57	35.015	+2.56		82	08		44.479			
484	St. James Church	1854	34	14	00.93	06.650	−5.72	1856	77	56	37.86	46.029	−8.17	−6.75	Wilmington (De Rosset).
485	Sandy[1]	1933	35	00	29.97	32.268	−2.30	1933	79	47	10.96	18.795	−7.84	−6.42	
486	Southport east base[1]	1933	33	57	01.23	06.474	−5.24	1933	78	02	43.52	52.994	−9.47	−7.86	
486a	Statesville longitude		35	46		56.149		1878	80	53	41.31	40.242	+1.07	+.87	Statesville.
487	Vultare[1]	1933	36	31	33.65	36.481	−2.83	1933	77	46	44.62	44.336	+.28	+.23	
488	White Lake	1933	34	39	20.25	22.860	−2.61	1933	78	29	12.84	19.827	−6.99	−5.75	
489	Young	1876	35	44	21.70	14.091	+7.61	1930	80	38	53.29	51.466	+1.82	+1.48	

NORTH DAKOTA

490	Badland	1913	46	41	60.87	59.947	+0.92		103	19		59.595			
491	Beler		46	07		43.330		1935	100	47	06.97	11.167	−4.20	−2.91	
492	Bonetrail	1913	48	24	60.73	59.251	+1.48		103	49		44.816			
493	Bowman longitude	1913	46	10	56.96	56.88	+.08	1912	103	24	06.60	11.48	−4.88	−3.38	Bowman.
494	Dry		48	12		23.759		1935	98	58	33.43	34.116	−.69	−.46	
495	Elden		46	02		39.673		1935	98	37	32.19	39.047	−6.86	−4.76	
496	Hankinson	1906	46	02	16.72	15.554	+1.17		96	57		03.350			
497	Pickell		46	06		02.306		1935	97	56	57.54	56.251	+1.29	+.89	
498	Pingree south base		47	06		00.396		1935	98	51	14.86	19.298	−4.44	−3.02	
499	Rhine		47	55		12.010		1935	101	03	17.01	23.238	−6.23	−4.18	
500	School (Ambrose northeast base).	1913	48	59	26.47	23.575	+2.90		103	29		10.462			Ambrose northeast base.
501	Sheep	1913	47	37	51.93	49.381	+2.55		103	47		40.071			
502	Sorstokke		47	12		19.066		1935	101	06	56.74	61.335	−4.60	−3.13	
503	Stine		45	58		14.294		1935	101	47	05.66	10.695	−5.04	−3.50	

OHIO

504	Barr		39	38		57.468		1929	82	49	12.68	14.003	−1.32	−1.02	
505	Cincinnati Observatory	1881	39	08	19.52	20.603	−1.08	1881	84	25	21.13	21.705	−.58	−.45	Cincinnati.
506	Conley		40	33		15.944		1929	83	08	12.03	08.087	+3.94	+2.99	
507	Danbury (U. S. L. S.)	1929	41	31	12.92	11.900	+1.02	1929	82	50	20.52	19.630	+.89	+.67	
508	Gould	1885	38	38	27.78	27.357	+.42		82	49		56.931			
509	Jutte	1933	40	25	51.33	50.542	+.79	1933	84	48	16.82	13.248	+3.57	+2.72	
510	Mesopotamia (U. S. L. S.)	1929	41	26	60.35	59.884	+.47	1929	80	59	51.80	53.415	−1.62	−1.21	
511	Portsmouth south base		38	37		45.934		1929	82	50	46.47	49.175	−2.70	−2.11	
512	Sandusky west base (U. S. L. S.).[3]	1868	41	29	04.56	02.269	+2.29		82	40		57.754			
513	Toledo stone longitude post (U. S. L. S.).[3]	1868	41	39	03.62	04.50	−.88	1881	83	32	29.94	31.18	−1.24	−.93	Toledo (U. S. L. S.).

[1] The latitude at this station is of second-order accuracy.
[3] Astronomical determinations by the United States Lake Survey.

DEFLECTIONS OF THE VERTICAL—Continued

OKLAHOMA

Geodetic station		Latitude				A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical		Geodetic		Year	Astronomical		Geodetic	A-G		
			° ′ ″		″	″		° ′ ″		″	″	″	
514	Allen	1920	34 53	29.56	26.662	+2.90	1920	96 24	54.98	63.973	−8.99	−7.37	
515	Campbell	1935	36 26	20.10	17.484	+2.62	1935	98 51	18.65	15.050	+3.60	+2.90	
516	Carson	1908	35 16	26.63	24.922	+1.71	1924	97 57	35.32	32.416	+2.90	+2.37	
517	Catesby south base	1928	36 25	14.31	16.582	−2.27	1928	99 56	30.11	30.109	.00	.00	
518	Cobb	1934	36 41	04.64	02.837	+1.80	1934	95 42	50.90	51.439	−.54	−.43	
519	Dill	1920	35 17	28.36	24.427	+3.93	1920	99 07	42.49	40.122	+2.37	+1.93	
520	Lux	1934	35 44	05.54	06.988	−1.45	1934	95 23	27.45	25.956	+1.49	+1.21	
521	Marlow longitude station	1899	34 38	52.60	50.62	+1.98	1899	97 57	40.48	38.05	+2.43	+2.00	Marlow.
522	Pond Creek astronomical station.	1906	36 40	07.84	07.64	+.20	1907	97 47	48.82	51.33	−2.51	−2.01	Pond creek.
523	Twin	1935	36 06	57.68	57.429	+.25	1935	96 46	40.33	40.199	+.13	+.11	
524	Wingard	1908	35 56	49.40	47.517	+1.88		97 29		19.825			

OREGON

525	Balch	1886	45 31	56.12	53,471	+2.65		122 42		29.505			
526	Central Point astronomical station.	1908	42 23	50.74	50.509	+.23		122 56		22.267			Central Point.
527	Echo	1916	45 44	38.89	37.228	+1.66	1916	119 11	29.30	19.111	+10.19	+7.11	
528	Eugene astronomical station.[5]	1894	44 03	28.25	29.216	−.97	1894	123 05	29.62	27.222	+2.40	+1.72	Eugene (U. S. G. S.).
529	Fort Stevens longitude station.		46 12		26.465		1911	123 57	65.04	38.398	+26.64	+18.43	Fort Stevens.
530	La Grande astronomical	1916	45 19	55.46	50.78	+4.68	1916	118 05	37.32	40.15	−2.83	−1.99	
531	Lakeview, bench mark M 16.		42 11		35.939		1926	20 21	60.11	38.767	+21.34	+15.81	Lakeview.
532	Pilot Butte	1935	44 03	42.46	38.529	+3.93	1935	121 16	61.04	55.541	+5.50	+3.95	
533	Portland longitude station.	1887	45 31	08.27	07.72	+.55	1887	122 40	42.57	38.49	+4.08	+2.86	Portland.
534	Port Orford astronomical	1851	42 44	21.79	27.849	−6.06		124 30		03.998			Port Orford.
535	Rainier	1886	46 05	07.93	10.871	−2.94		122 55		27.074			
536	Roseburg latitude station	1908	43 12	35.71	39.680	−3.97		123 21		12.640			Roseburg.
537	Yam	1908	45 03	38.56	43.895	−5.34		123 08		33.042			
538	Yaquina Head Lighthouse.	1895	44 40	35.14	36.898	−1.76		124 04		41.572			Yaquina Point.

PENNSYLVANIA

539	Bloom	1930	41 55	04.98	05.365	−0.38	1930	77 22	29.24	34.292	−5.05	−3.76	
540	Broad	1930	40 53	33.87	43.876	−10.01	1930	75 49	40.83	45.195	−4.36	−3.30	
541	Clinton		40 03		17.275		1929	79 29	10.16	03.053	+7.11	+5.44	
542	Corson	1930	41 36	55.76	53.020	+2.74	1930	76 29	59.56	58.285	+1.28	+.96	
543	Keyler (U. S. G. S.)	1934	40 57	35.98	37.289	−1.31	1934	78 19	49.20	51.624	−2.42	−1.83	
544	Quaker Hill (U. S. G. S.)[1]	1936	41 52	20.97	18.522	+2.45	1936	79 06	50.24	43.355	+6.88	+5.12	
545	Timber	1936	40 01	38.30	37.981	+.32	1936	77 32	07.90	05.460	+2.44	+1.87	
546	Trevorton		40 45		45.373		1935	76 43	12.55	08.136	+4.41	+3.34	
547	Union		40 26		34.871		1929	80 08	61.41	59.425	+1.98	+1.51	
548	Yard	1854	39 58	29.39	24.404	+4.99		75 23		13.950			

SOUTH CAROLINA

549	Allendale latitude station	1907	33 00	29.02	31.307	−2.29	1907	81 18	34.09	40.927	−6.84	−5.74	Allendale.
550	Bethune I	1918	34 28	02.96	07.014	−4.05	1918	80 15	23.82	29.806	−5.99	−4.94	
551	Campfield		33 29		12.037		1933	79 16	20.11	27.238	−7.13	−5.95	
552	Carson	1935	33 41	02.79	02.206	+.58	1935	80 13	38.43	41.416	−2.99	−2.49	
553	Church	1935	34 15	05.94	03.819	+2.12	1935	81 34	13.59	16.220	−2.63	−2.17	
554	Citadel [1]	1933	32 47	46.13	47.735	−1.60	1933	79 57	39.15	45.332	−6.18	−5.19	
555	Edisto Island east base latitude station.	1850	32 33	17.66	16.40	+1.26		80 13		50.37			Edisto Island east base.
556	Kemper		34 19		34.338		1933	79 11	50.07	56.643	−6.57	−5.43	
557	McBee	1935	34 28	15.84	19.041	−3.20	1935	80 15	00.36	04.999	−4.64	−3.83	
558	Nob	1935	34 03	12.53	17.653	−5.12	1935	80 58	48.44	51.318	−2.88	−2.39	
559	Observatory	1936	33 59	47.41	51.394	−3.98	1936	81 01	33.32	36.129	−2.81	−2.33	
560	OR 546 (S. C. Geod. S.) eccentric.	1935	33 23	01.96	01.904	+.06	1935	80 50	16.34	16.425	−.08	−.07	OR 546 eccentric.
561	Paris	1875	34 56	31.18	28.858	+2.32		82 24		40.346			
562	Port Royal	1859	32 17	44.85	45.270	−.42		80 38		36.429			
563	Switzerland	1933	32 25	42.07	41.274	+.80	1933	81 00	27.94	30.718	−2.78	−2.35	
564	Varnville [1]	1933	32 52	29.43	29.995	−.56	1933	81 02	24.53	28.386	−3.86	−3.24	
565	Wade	1935	34 43	32.37	29.487	+2.88	1935	81 16	03.43	00.047	+3.38	+2.78	

[1] The latitude at this station is of second-order accuracy.
[5] Astronomical determinations by the United States Geological Survey.

DEFLECTIONS OF THE VERTICAL—Continued

SOUTH DAKOTA

Geodetic station		Latitude					A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical			Geodetic		Year	Astronomical			Geodetic	A-G		
			°	′	″	″	″		°	′	″	″	″	″	
566	Franklin	1906, 1925	44	53	53.17	52.386	+0.78	1925	96	56	17.33	18.234	−0.90	−0.64	
567	Freeman	1906	43	18	48.47	47.515	+.96	.....	97	27	.....	06.497	.....	.....	
568	Harding	1913	45	22	12.95	13.731	−.78	.....	103	53	.....	09.965	.....	.....	
569	Howard astronomical station.	1906	44	00	51.86	54.79	−2.93	1907	97	31	35.79	36.04	−.25	−.18	Howard.
570	Omaha	1925	43	43	24.16	25.591	−1.43	1925	97	40	35.72	34.439	+1.28	+.93	
571	Preacher Hill	1906	45	28	15.74	14.685	+1.06	.....	97	06	.....	18.023	.....	.....	
572	Presho	1925	43	59	27.95	38.570	−10.62	1925	100	00	20.30	19.173	+1.13	+.81	
573	Provo astronomical	1913	43	11	40.07	43.757	−3.69	1912	103	49	37.68	41.356	−3.68	−2.68	Provo.
574	Reva	1913	45	34	49.54	50.467	−.93	.....	103	12	.....	44.609	.....	.....	
575	Wall south base	1925	44	04	22.86	22.958	−.10	1925	102	11	22.82	32.872	−10.05	−7.22	

TENNESSEE

576	Bean	1907	35	11	36.99	31.276	+5.71	.....	84	33	.....	30.021	.....	.....	
577	Duren	1930	36	25	07.90	08.327	−.43	1930	86	15	35.42	37.748	−2.33	−1.87	
578	Hollow	1934	36	02	28.98	29.258	−.28	1934	88	15	56.30	55.500	+.80	+.65	
579	Knoxville latitude and longitude station.	1907	35	57	26.14	24.582	+1.56	1907	83	55	34.30	33.513	+.79	+.64	Knoxville.
580	Lebanon north base	1878	36	12	49.64	46.624	+3.02	.....	86	18	.....	24.979	.....	.....	
581	Luper	1907	35	57	11.91	15.862	−3.95	.....	84	47	.....	20.525	.....	.....	
582	Martin	1914	35	04	39.76	40.863	−1.10	1914	89	47	51.28	52.395	−1.12	−.92	
583	Memphis astronomical station.	1877	35	08	44.59	45.158	−.57	1877	90	03	17.14	17.583	−.44	−.36	Memphis.
584	Memphis (M. R. C.)[3]	1877	35	08	39.84	39.470	+.37	1877	90	03	19.64	19.838	−.20	−.16	Memphis (U. S. L. S.).
585	Mount Lore	1907	35	54	57.32	54.199	+3.12	.....	85	32	.....	27.258	.....	.....	
586	Nashville latitude and longitude station.	1877	36	09	61.35	57.27	+4.08	1877	86	47	01.24	00.67	+.57	+.46	Nashville.
587	Polk	1934	35	33	15.59	13.821	+1.77	1934	87	09	27.98	24.490	+3.49	+2.84	

TEXAS

588	Alice	1905	27	44	34.56	33.124	+1.44	1904	98	04	28.34	29.951	−1.61	−1.42	
589	Allamore latitude station	1914	31	04	36.13	39.47	−3.34	.....	105	00	.....	08.17	.....	.....	Allamore.
590	Anderson	1936	30	29	56.60	58.988	−2.39	1936	95	59	28.12	28.366	−.25	−.22	
591	Appelt	1936	30	15	56.53	56.026	+.50	1936	100	27	30.76	25.153	+5.61	+4.85	
592	Austin latitude station	1872	30	16	21.34	22.45	−1.11	.....	97	44	.....	19.16	.....	.....	Austin.
593	Austin longitude station	.....	30	16	.....	26.24	.....	1872	97	44	15.38	19.16	−3.80	−3.28	Austin.
594	Bachelor latitude station	1906	30	59	46.06	40.02	+6.04	.....	98	05	.....	52.04	.....	.....	
595	Baird latitude station	1912	32	23	48.30	40.65	+7.65	.....	99	23	.....	39.30	.....	.....	Baird.
596	Barstow latitude station	1914	31	27	45.99	41.34	+4.65	.....	103	23	.....	36.41	.....	.....	Barstow.
597	Barta	.....	29	38	.....	48.748	.....	1936	96	05	52.44	51.461	+.98	+.85	
598	Bartley	.....	33	12	.....	08.318	.....	1933	101	40	42.14	44.216	−2.08	−1.74	
599	Beaumont (U. S. E.)	1921	30	04	35.46	33.141	+2.32	.....	94	04	.....	26.126	.....	.....	
600	Black	1914	31	34	24.06	21.594	+2.47	.....	105	08	.....	51.285	.....	.....	
601	Boracho	1914	31	04	35.31	33.923	+1.39	1911	104	23	26.72	23.706	+3.01	+2.58	
602	Bowie northwest base	1906	33	37	20.54	21.820	−1.28	1907	98	00	19.94	14.007	+5.93	+4.94	
603	Brownsville longitude station.	.....	25	53	.....	54.647	.....	1885	97	29	33.72	27.919	+5.80	+5.22	
604	Bynum	1912	32	19	20.98	15.696	+5.28	.....	101	00	.....	00.213	.....	.....	
605	Chamliss	1906	31	39	25.61	23.415	+2.20	.....	98	07	.....	28.565	.....	.....	
606	China	1931	30	02	45.68	44.662	+1.02	1931	94	20	55.66	54.629	+1.03	+.89	
607	Cisco astronomical station (U. S. G. S.).[3]	1889	32	23	31.38	24.817	+6.56	1889	98	58	56.96	58.956	−2.00	−1.69	Cisco (U. S. G S.)
608	Cleary	1936	31	12	58.72	55.530	+3.19	1936	102	01	04.32	04.921	−.60	−.51	
609	Commerce	1936	33	15	10.10	08.668	+1.43	1936	95	54	19.49	20.754	−1.26	−1.05	
610	Conway latitude and longitude station.	1920	35	12	26.25	26.37	−.12	1920	101	22	55.74	55.55	+.19	+.16	Conway.
611	Cozby	1936	32	44	08.09	05.483	+2.61	1936	97	25	06.60	01.921	+4.68	+3.94	
612	Donna longitude station	.....	26	09	.....	40.60	.....	1913	98	02	50.44	45.61	+4.83	+4.34	Donna.
613	Dryden east base	1919	30	02	41.25	39.683	+1.57	1919	102	05	50.96	54.464	−3.50	−3.03	
614	Duval[1]	1936	27	45	09.19	08.207	+.98	1936	98	37	23.57	25.581	−2.01	−1.78	
615	Elliot	.....	36	27	.....	30.613	.....	1933	101	53	58.74	63.415	−4.68	−3.76	
616	El Paso longitude station	1892	31	45	32.10	35.51	−3.41	1895	106	29	20.79	26.33	−5.54	−4.71	El Paso.
617	Estes	1914	31	29	49.10	50.115	−1.02	.....	102	57	.....	43.663	.....	.....	
618	Finney	1935	33	44	20.50	18.462	+2.04	1935	100	20	24.63	29.034	−4.40	−3.66	
619	Fronton	.....	26	04	.....	41.228	.....	1906	97	12	26.43	24.574	+1.86	+1.67	Point Isabel.
620	Gilbert[1]	1906	32	48	10.19	11.103	−.91	.....	97	53	.....	38.384	.....	.....	
621	Hansford	1936	33	48	52.40	49.374	+3.03	1936	102	56	32.10	34.237	−2.14	−1.78	
622	Holmes	.....	33	55	.....	43.205	.....	1933	101	52	10.87	13.769	−2.90	−2.41	
623	Jacksonville (east)	1890	31	57	49.20	50.68	−1.48	.....	95	16	.....	20.71	.....	.....	
624	Jacksonville latitude and longitude station.	1919	31	57	53.14	54.92	−1.78	1919	95	16	50.72	50.10	+.62	+.53	Jacksonville.
625	Jacobs	1936	31	07	18.48	11.424	+7.06	1936	100	30	36.09	33.637	+2.45	+2.10	
626	Johnstone latitude and longitude station.	1919	29	22	39.11	38.31	+.80	1919	100	46	10.80	11.00	−.20	−.17	Johnstone
627	Karnes latitude station	1906	28	52	38.15	38.74	−.59	.....	97	54	.....	47.05	.....	.....	Karnes.

[1] The latitude at this station is of second-order accuracy.
[3] Astronomical determinations by the United States Lake Survey.
[5] Astronomical determinations by the United States Geological Survey.

DEFLECTIONS OF THE VERTICAL—Continued

TEXAS—Continued

Geodetic station		Latitude					A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical			Geodetic		Year	Astronomical			Geodetic	A-G		
			°	′	″	″	″		°	′	″	″	″	″	
628	Koekther		30	10		55.689		1936	96	42	21.68	23.338	−1.66	−1.43	
629	Lacasa latitude station	1912	32	39	09.39	05.09	+4.30		98	41		29.65			Lacasa.
630	Laguna Madre north base	1905	27	40	15.58	10.673	+4.91		97	16		19.591			
631	Laplace latitude and longitude station.	1919	28	42	44.11	46.44	−2.33	1919	100	29	32.90	32.86	+.04	+.04	Laplace.
632	Laredo longitude station	1895	27	30	30.09	27.31	+2.78	1895	99	31	02.46	07.59	−5.13	−4.55	Laredo.
633	Matagorda longitude station.		28	41		35.430		1911	95	58	09.64	07.289	+2.35	+2.06	Matagorda
634	Miller	1905	28	18	06.19	06.866	−.68		97	48		21.608			
635	Mission (Mission Hill) (U. S. G. S.).	1906	29	42	48.79	52.843	−4.05	1924	98	09	47.75	52.109	−4.36	−3.79	Mission.
636	Morgan Point 2	1931	29	40	54.53	51.731	+2.80	1931	94	59	10.37	08.942	+1.43	+1.24	
637	Nine	1936	31	03	10.98	05.855	+5.12	1936	99	22	30.26	30.086	+.17	+.15	
638	Pierce	1931	28	48	44.02	41.464	+2.56	1931	95	39	19.08	15.437	+3.64	+3.19	
639	Pilot	1906	32	15	44.91	38.129	+6.78	1924	98	08	19.77	19.428	+.34	+.29	
640	Polk	1936	33	23	01.71	05.049	−3.34	1936	99	05	47.15	46.281	+.87	+.73	
641	Posey	1931	32	56	14.56	13.362	+1.20	1931	94	03	12.76	10.762	+2.00	+1.68	
642	Powell		31	00		28.693		1933	101	34	15.21	14.343	+.87	+.75	
643	Presidio south base	1936	29	39	46.91	52.359	−5.45	1936	104	21	49.29	38.653	+10.64	+9.25	
644	Prosper	1936	33	14	32.48	37.683	−5.20	1936	96	47	11.22	03.978	+7.24	+6.06	
645	Rachel		32	45		32.741		1936	102	50	27.21	29.899	−2.69	−2.26	
646	Red River longitude [6]		34	22		18.267		1902	100	00	18.66	20.879	−2.22	−1.83	Red River (U. S. G. L. O.).
647	Roemer	1931	28	27	60.93	58.159	+2.77	1931	96	41	07.31	03.783	+3.53	+3.10	
648	Round	1914	31	28	61.61	54.319	+7.29	1924	103	53	08.13	10.941	−2.81	−2.40	
649	Sabine latitude station	1921	29	43	19.48	14.56	+4.92		93	52		06.96			Sabine.
650	Sabine longitude station		29	44		09.677		1911	93	53	19.64	21.031	−1.39	−1.21	Sabine Pass.
651	San Vicente [1]	1936	29	09	34.66	34.200	+.46	1936	103	01	29.09	24.348	+4.74	+4.14	
652	Schmidt astronomical station.	1924	29	22	15.54	13.403	+2.14	1924	99	00	10.77	13.094	−2.32	−2.02	Schmidt.
653	Sears latitude station	1912	32	33	38.18	30.65	+7.53		100	02		16.45			Sears.
654	Smith	1912	31	58	36.88	34.969	+1.91		102	27		49.082			
655	Stanton longitude station	1912	32	07	35.73	32.731	+3.00	1911	101	46	20.43	23.951	−3.52	−2.98	Stanton.
656	Tehuacana latitude and longitude station.	1920	31	44	16.44	16.43	+.01	1920	96	32	60.02	56.12	+3.90	+3.32	Tehuacana.
657	Woodville	1931	30	46	29.21	28.983	+.23	1931	94	23	15.20	16.328	−1.13	−.97	

UTAH

658	Antelope	1892	40	57	40.49	43.512	−3.02		112	12		54.937			
659	Beaver flagstaff (U. S. E.) [2]	1872	38	16	22.90	24.850	−1.95		112	38		26.508			Beaver (U. S. E.).
660	Deseret	1892	40	27	31.56	34.448	−2.89		112	37		31.880			
661	Green River longitude	1898	38	59	23.63	29.62	−5.99	1898	110	09	53.08	55.06	−1.98	−1.54	Green River.
662	Gunnison astronomical [2]	1872	39	09	25.46	30.270	−4.81		111	49		12.944			Gunnison (U. S. E.).
663	Ibepah	1889	39	49	38.75	41.587	−2.84		113	55		08.136			
664	Lund [1]	1916	38	00	23.74	30.350	−6.61	1916	113	26	02.98	01.212	+1.77	+1.39	
665	Mount Ellen	1891	38	07	24.65	16.462	+8.19		110	48		49.923			
666	Mount Nebo	1887	39	48	32.90	38.316	−5.42		111	45		56.235			
667	Mount Waas	1893	38	32	29.88	20.856	+9.02		109	13		37.750			
668	Oasis astronomical	1898	39	17	35.29	37.19	−1.90	1898	112	37	55.41	43.62	+11.81	+9.14	Oasis.
669	Ogden longitude [2]	1873–74	41	13	08.33	11.693	−3.36	1886	111	59	55.59	37.406	+18.18	+13.67	Ogden (U. S. E.).
670	Ogden Peak	1888	41	11	59.20	59.906	−.71		111	52		52.490			
671	Patmos Head	1890	39	29	55.05	67.840	−12.79		110	18		57.354			
672	Promontory	1892	41	17	47.78	52.813	−5.03		112	25		08.673			
673	Salt Lake City longitude	1869	40	46	03.36	11.54	−8.18	1869	111	53	47.60	26.69	+20.91	+15.84	Salt Lake City.
674	Waddoup	1892	40	54	23.73	25.154	−1.42		111	53		09.898			
675	Wasatch	1890	39	06	50.77	53.617	−2.85		111	27		11.209			

VERMONT

676	Killington	1907	43	36	18.16	17.071	+1.09		72	49		14.191			

VIRGINIA

677	Big Knob	1907	36	39	48.53	52.480	−3.95		82	30		21.760			
678	Bull Run	1871	38	52	56.09	53.260	+2.83		77	42		12.786			
679	Cahas	1907	37	07	00.29	01.569	−1.28		80	00		56.913			
680	Cape Henry Lighthouse (old).	1866	36	55	30.32	32.330	−2.01		76	00		30.516			Cape Henry.
681	Clark	1871	38	18	39.35	40.763	−1.41		78	00		11.694			
682	Elliott Knob	1878	38	09	56.79	59.020	−2.23	1930	79	18	47.14	51.557	−4.42	−3.48	
683	Long Mount	1875	37	17	28.82	27.270	+1.55		79	05		10.482			Long Mountain.
684	Malvern	1933	37	26	53.77	55.823	−2.05	1933	77	16	21.20	26.131	−4.93	−3.91	
685	McCormick Observatory, latitude and longitude pier.	1882	38	01	61.09	57.719	+3.37	1882	78	31	20.10	20.826	−.73	−.58	Charlottesville.
686	Norfolk east base [1]	1933	36	50	14.20	16.738	−2.54	1933	76	01	09.78	17.660	−7.88	−6.31	
687	Return [1]	1934	38	07	44.26	45.388	−1.13	1934	77	07	47.12	55.468	−8.35	−6.57	
688	Rogers	1907	36	39	38.52	35.816	+2.70		81	32		42.169			
689	Staunton, astronomical latitude and longitude pier.		38	08		46.195		1869	79	04	16.24	19.291	−3.05	−2.40	Staunton.
690	Strasburg astronomical station.	1881	38	59	31.57	29.655	+1.92	1881	78	21	35.70	39.217	−3.52	−2.74	Strasburg.
691	Suffolk	1919	36	44	01.13	00.825	+.30	1919	76	34	29.36	41.546	−12.19	−9.77	
692	White Rock	1907	36	39	49.51	53.999	−4.49		83	27		05.528			

[1] The latitude at this station is of second-order accuracy.
[2] Latitude determination by the United States Engineers.
[6] Astronomical determinations by the United States General Land Office.

DEFLECTIONS OF THE VERTICAL—Continued

WASHINGTON

Geodetic station		Latitude				A-G in meridian	Longitude					A-G in prime vertical	Astronomical station
No.	Name	Year	Astronomical		Geodetic		Year	Astronomical		Geodetic	A-G		
			° ′ ″		″	″		° ′ ″		″	″	″	
693	Alki (Alki southwest base)		47 34		34.502		1923	122 25	07.92	09.152	−1.23	−0.83	Alki Point.
694	Ayocks Point 2		47 30		26.485		1935	123 02	54.80	71.614	−16.81	−11.36	
695	Bungalow	1925	47 16	30.55	32.950	−2.40	1925	118 50	14.80	07.289	+7.51	+5.10	
696	Cape Disappointment latitude station.	1851	46 16	35.36	36.30	−.94		124 02		50.28			
697	King	1935	47 43	08.79	13.165	−4.38	1935	122 44	37.15	50.430	−13.28	−8.93	
698	Miller		48 59		19.366		1908	122 45	10.77	00.940	+9.83	+6.45	Blaine.
699	Osoyoos south base	1925	48 57	01.15	02.889	−1.74	1925	119 26	27.12	26.415	+.70	+.46	
700	O'Toole	1925	48 48	31.89	32.364	−.47	1925	117 52	64.52	58.201	+6.32	+4.16	
701	Port Townsend astronomical.		48 07		03.983		1888	122 45	04.10	13.635	−9.54	−6.37	Port Townsend.
702	Tacoma astronomical station.	1894	47 15	46.96	46.825	+.14	1894	122 26	52.76	50.152	+2.61	+1.77	Tacoma.
703	Union	1935	47 21	26.47	27.370	−.90	1935	123 06	06.29	11.936	−5.65	−3.83	
704	United States-Canada boundary monument 154.[4]	1901	48 59	59.88	60.64	−.76		118 30		13.60			Carson.
705	United States-Canada boundary monument 164.[4]	1901	48 59	59.43	60.62	−1.19		118 13		45.37			Russel.
706	Wash 2	1935	47 21	22.26	29.713	−7.45	1935	122 48	20.99	21.020	−.03	−.02	

WEST VIRGINIA

707	Charleston astronomical	1883	38 21	06.95	02.04	+4.91	1883	81 37	61.95	59.43	+2.52	+1.98	Charleston.
708	Keeney	1880	37 46	22.32	24.561	−2.24		80 42		19.427			
709	Piney	1883	38 26	40.96	39.351	+1.61		82 03		29.224			

WISCONSIN

710	Aminicon (U. S. L. S.)[3]	1871	46 41	36.28	32.207	+4.07		91 51		43.015			
711	Boyers Bluff (U. S. L. S.)[3]	1865	45 25	09.26	12.631	−3.37		86 56		10.791			
712	Brule[3]	1871	46 45	20.07	17.948	+2.12		91 35		18.206			Brule River.
713	Door Bluff latitude station (U. S. L. S.).[3]	1865	45 17	44.92	46.130	−1.21		87 03		54.653			
714	Fort Howard longitude (U. S. L. S.).[3]	1862	44 31	18.47	18.44	+.03	1864	88 00	58.04	58.08	−0.04	−0.03	Fort Howard (U. S. L. S.).
715	Grandfather (M. R. C.)		43 48		42.852		1928	91 12	33.49	41.236	−7.75	−5.59	Grandfather.
716	Gratiots Grove	1880	42 32	32.37	31.972	+.40		90 13		41.410			
717	Green Bay east base		44 31		42.698		1928	88 00	55.56	54.887	+.67	+.48	
718	Menominee astronomical station (U. S. L. S.).[3]	1865	45 05	56.10	56.01	+.09	1865	87 37	20.24	27.05	−6.81	−4.81	Menominee (U. S. L. S.).
719	Minnesota Junction (U. S. L. S.).[3]	1873	43 28	31.77	28.405	+3.36		88 43		46.963			
720	New Berlin (U. S. L. S.)		42 58		17.520		1929	88 10	58.69	61.216	−2.53	−1.85	
721	Outer Island (U. S. L. S.)[3]	1870	47 04	13.77	17.148	−3.38		90 26		26.650			
722	Rupp	1931	42 41	14.05	15.454	−1.40	1931	90 41	29.56	34.035	−4.48	−3.29	
723	Somers (U. S. L. S.)	1908	42 37	11.15	09.972	+1.18		87 52		33.012			
724	Sunny[1]	1930	43 54	07.70	06.600	+1.10	1930	90 27	38.50	48.651	−10.15	−7.31	
725	Westfield	1930	43 52	28.37	28.665	−.30	1930	89 29	23.79	25.399	−2.61	−1.88	

WYOMING

726	Alkali	1913	43 38	07.79	12.510	−4.72		104 29		11.644			
727	Barber	1925	44 21	26.06	24.405	+1.66	1925	105 59	49.06	45.764	+3.30	+2.36	
728	Cambria	1913	44 02	41.76	43.502	−1.74		104 11		37.220			
729	Coleman	1913	42 22	05.98	03.169	+2.81		105 07		14.017			
730	Colorado-Wyoming boundary milepost 44.	1913	40 59	49.74	53.777	−4.04		104 53		33.673			
731	Jireh College, cupola	1913	42 46	32.52	29.43	+3.09		104 42		34.62			Jireh College.
732	Kirtley	1913	42 51	43.70	44.295	−.60		104 06		01.178			
733	Midwest	1935	43 21	57.06	55.429	+1.63	1935	106 14	52.81	56.722	−3.91	−2.84	
734	Sandraw		42 44		50.143		1933	108 01	64.28	59.697	+4.58	+3.36	
735	Sundance	1913, 1925	44 28	45.33	44.202	+1.13	1925	104 27	04.25	03.099	+1.15	+.82	
736	Wheatland standpipe	1913	42 02	42.33	43.430	−1.10	1912	104 57	10.84	27.074	−16.23	−12.05	Wheatland.
737	Whitaker	1913	41 23	53.00	55.980	−2.98		104 59		38.928			

[1] The latitude at this station is of second-order accuracy.
[3] Astronomical determinations by the United States Lake Survey.
[4] Astronomical determinations by the International Boundary Commission.

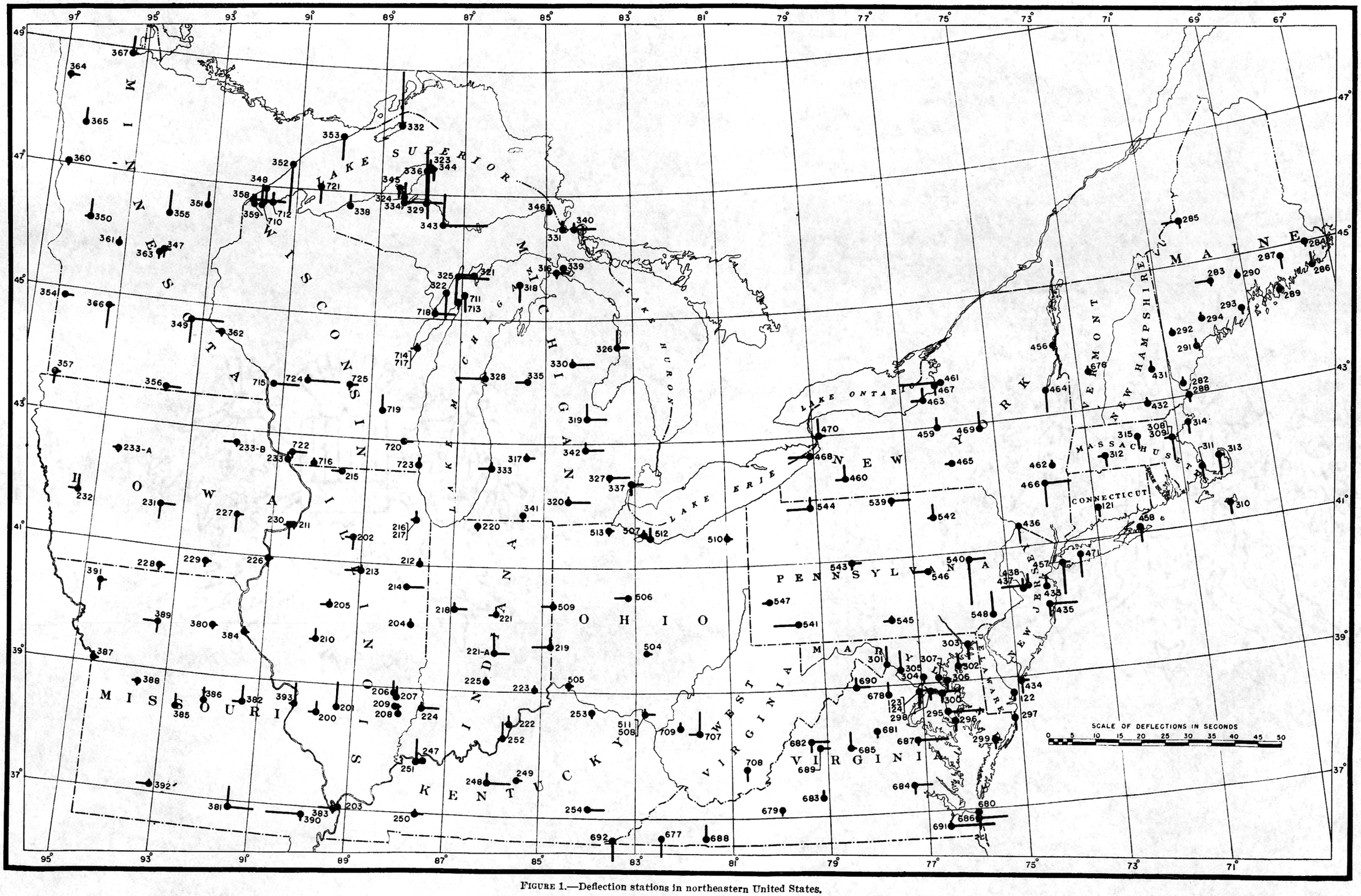

FIGURE 1.—Deflection stations in northeastern United States.

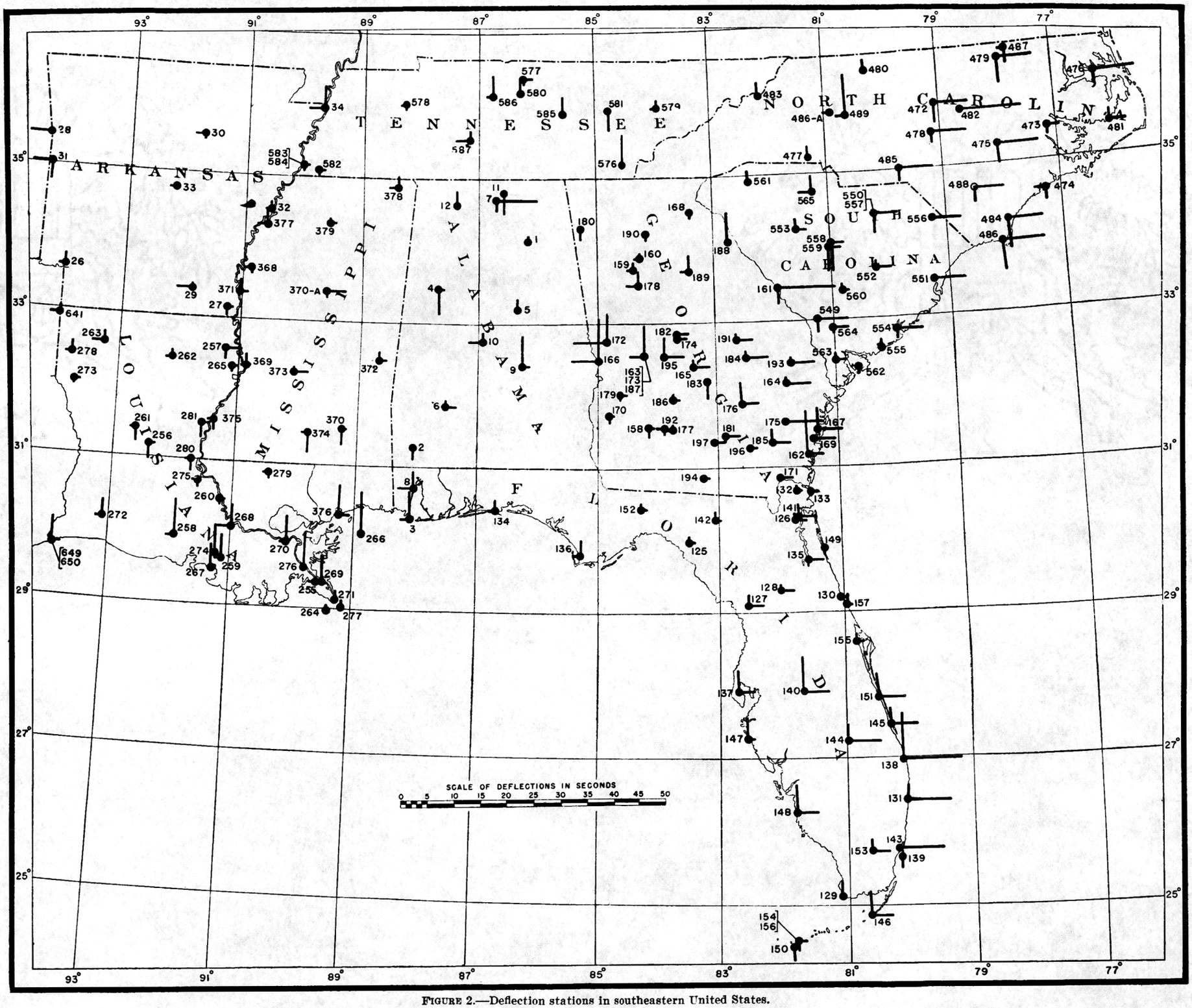

FIGURE 2.—Deflection stations in southeastern United States.

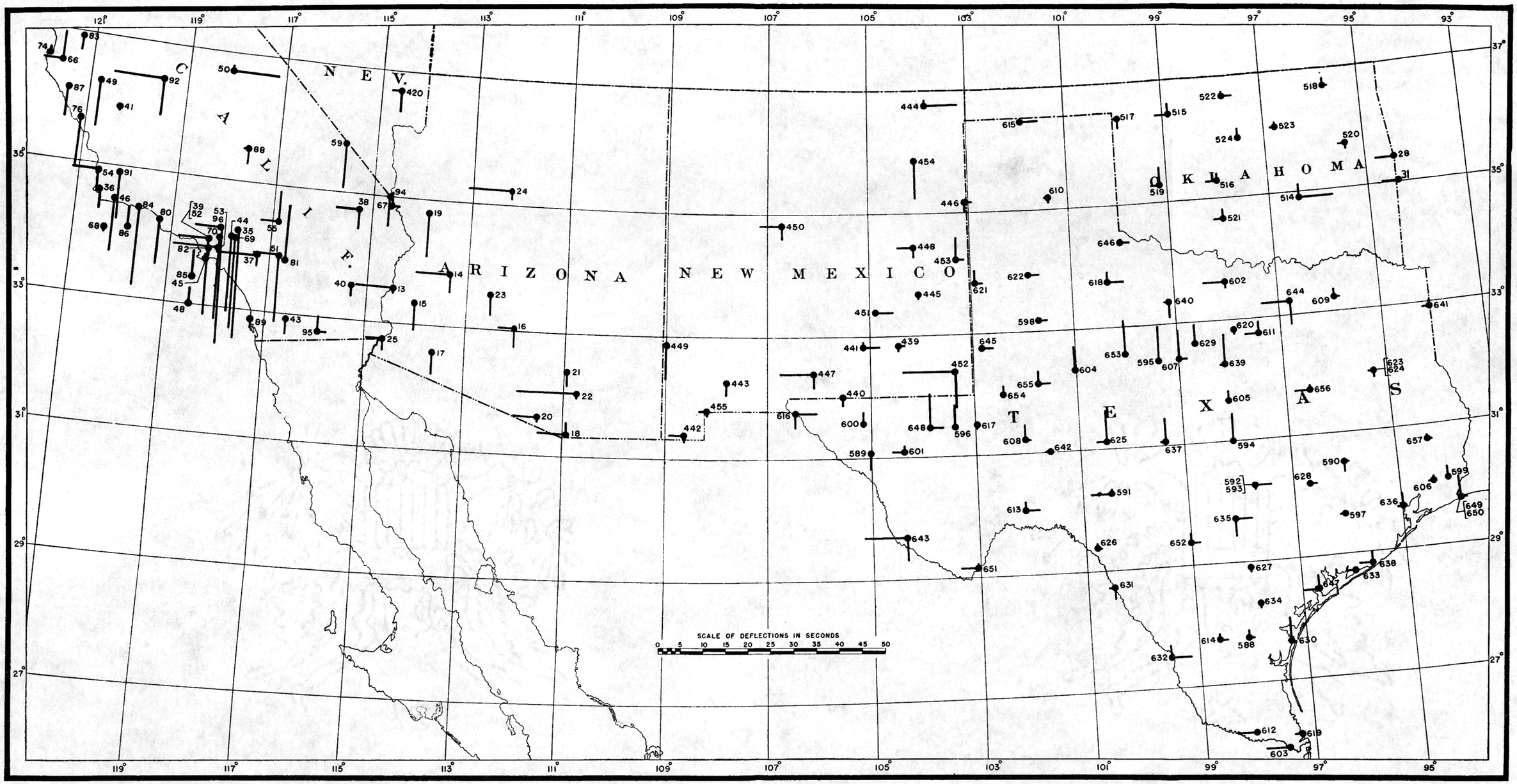

FIGURE 3.—Deflection stations in southwestern United States.

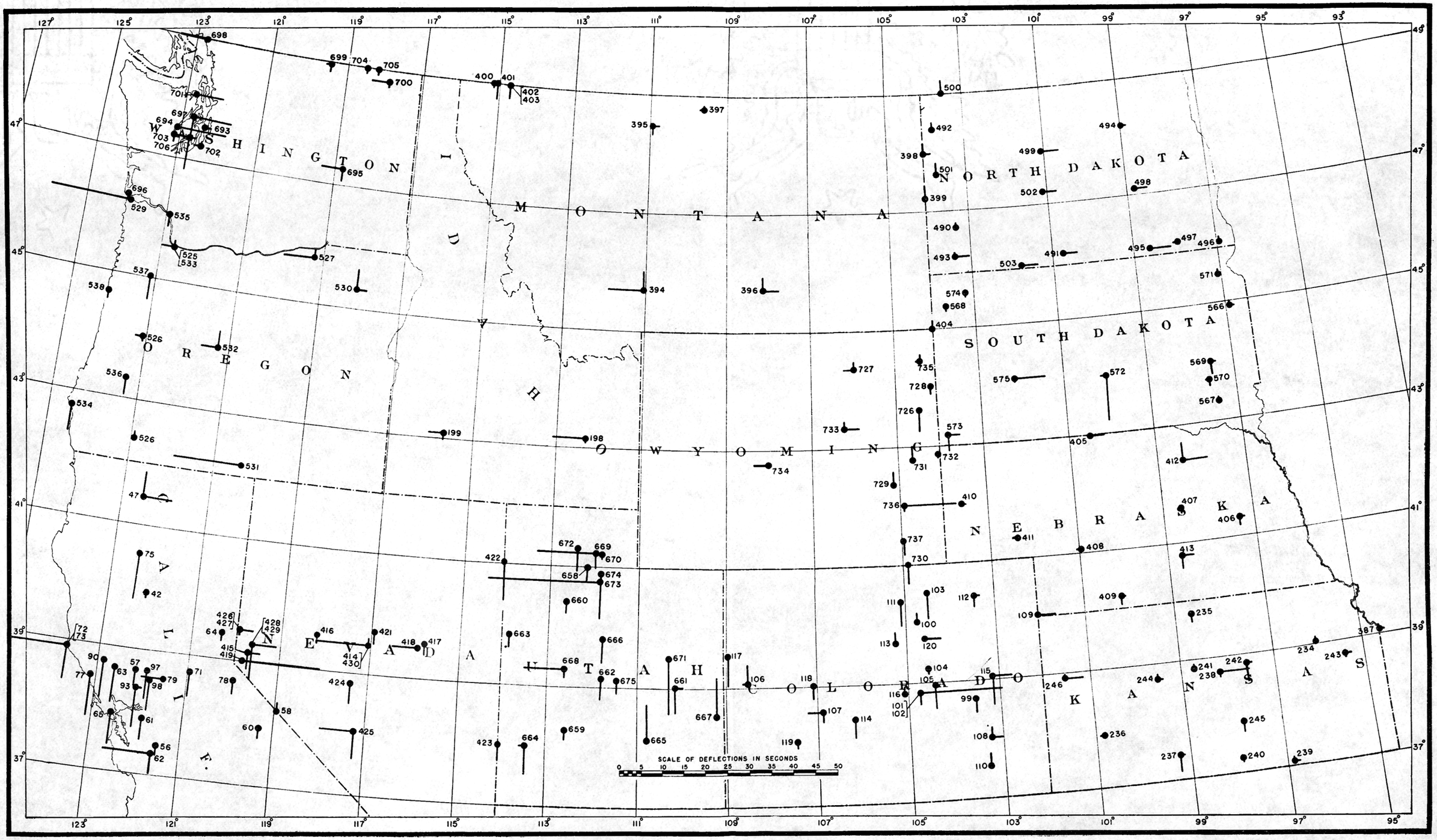

FIGURE 4.—Deflection stations in northwestern United States.