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R. P. LAMONT, Secretary

COAST AND GEODETIC SURVEY

R. S. PATTON, Director

Special Publication No. 175

29

FIRST AND SECOND ORDER TRIANGULATION IN OREGON

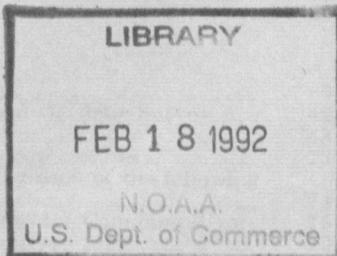
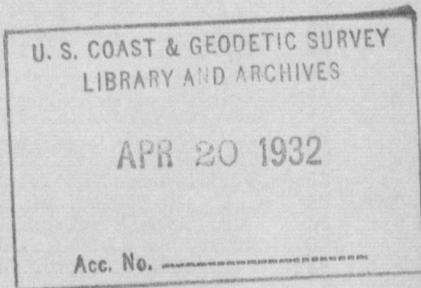
[1927 DATUM]

BY

CLARENCE H. SWICK

Senior Mathematician

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FIRST AND SECOND ORDER TRIANGULATION IN OREGON (1927 DATUM)

READJUSTMENT OF TRIANGULATION, WESTERN UNITED STATES

This volume contains the results of all first and second order triangulation in Oregon that has been executed by the Coast and Geodetic Survey. The geographic positions contained herein are on a new datum and supersede the positions in Oregon which appeared in Special Publications Nos. 13, 74, and 84. They also supersede the second-order positions in Special Publication No. 31.

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

It then became necessary, in order to secure what may be called standard or final geographic positions to the westward of the ninety-eighth meridian, to make an adjustment of the net as a whole. This was done by a method devised at the office of the Coast and Geodetic Survey,¹ and the resulting geographic positions for all of the western first-order triangulation are now available to surveyors and other engineers who may wish to have final geographic positions for their operations.

An adjustment of the eastern half of the main first-order net of the country is also being made. The field work for this part of the net was completed in June, 1931, and the computations involved in the adjustment were well advanced at that time. The final geographic positions along many of the eastern arcs will be available early in 1932.

This volume is the third of a series of publications, each of which will contain the geographic positions on the new datum, and the descriptions and other data, for all first-order triangulation of a State or occasionally of two States. The first volume of the series is *Triangulation in Colorado (1927 Datum)*, Special Publication No. 160, which was published in 1930. The second volume is *First-Order Triangulation in Southeast Alaska*, Special Publication No. 164, also published in 1930.

It may be of interest to the reader to know the approximate amounts of the changes in geographic positions of stations in Oregon caused by the readjustment described above. At the junction figure on the Idaho boundary (see fig. 4) the change is $-1''.126$ in latitude and $-1''.001$ in longitude; at the junction figure near Portland the change is $-1''.046$ in latitude and $-1''.340$ in longitude,

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

and at the junction figure just south of the California boundary the change is $-1''.060$ in latitude and $-1''.192$ in longitude. The minus sign indicates that the readjusted values are smaller than the old values.

COMPUTATIONS

The adjustments of the first-order arcs included in this publication form part of the general adjustment of the first-order triangulation in the western part of the United States.² This general adjustment was made under the direction of Dr. O. S. Adams, who was assisted by W. F. Reynolds, H. C. Mitchell, H. S. Rappleye, G. L. Fentress, H. P. Kaufman, and other members of the division of geodesy of this bureau. The adjustment on the 1927 datum of the second-order arcs included in this publication was made by O. P. Sutherland and other members of the division. The sketches at the back of the publication were prepared by F. F. Claffin.

Valuable assistance in the preparation of this publication has been given by Lewis A. McArthur, vice president and general manager of the Pacific Power & Light Co., Portland, Oreg. He has personally visited many of the stations and has had extensive correspondence with many engineers in the State. His aid has been especially valuable in the careful checking of geographic names.

NORTH AMERICAN DATUM OF 1927

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

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

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

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

² See Oscar S. Adams, *The Bowie Method of Triangulation Adjustment as Applied to the First-Order Net in the Western Part of the United States*, Coast and Geodetic Survey Special Publication No. 159.

ARCS INCLUDED IN THIS PUBLICATION

The triangulation included in this publication consists of three first-order arcs, each extending across the State, and of two short second-order arcs, which start from the first-order triangulation and extend along parts of the coast to serve as control for the third-order surveys along the coast. A general idea of the location of the first-order arcs in Oregon and of how these arcs are joined to the first-order net of the country may be obtained by referring to Figure 4 near the back of this publication. Detailed sketches of both first and second order triangulation in Oregon are shown in Figures 6 to 15, inclusive, and the location of the triangulation included in each sketch is shown on the index sketch, Figure 5.

The third-order triangulation along the coast and along the Columbia River will be included in a future publication. It has already been partly adjusted to the 1927 datum.

All of the triangulation in this publication has been previously published, but the results were based on the old North American datum in use before 1927. The first-order arc which starts near the middle of the eastern boundary of Oregon and extends northwest to the Columbia River and thence down that river to Portland is part of the Utah-Washington arc, the data for which on the old datum are given in Special Publication No. 74. The first-order arc which starts at the same place on the eastern boundary of Oregon and extends southwest across the boundary into California to a junction with the north-and-south arc near the coast is the California-Oregon arc, the data for which on the old datum are given in Special Publication No. 84. The remaining first-order arc, the one which extends parallel to the coast, is a part of the California-Washington arc, the data for which on the old datum are given in Special Publication No. 13. Both of the second-order arcs were previously published in Special Publication No. 31, entitled "Triangulation Along the Columbia River and the Coasts of Oregon and Northern California."

Triangulation just over the boundary in adjoining States has been included in this publication in order that all data required for surveys in Oregon, even near the boundaries, might be available in the one volume. The overlapping is especially large in California for both first and second order triangulation. The first-order arcs in Oregon form almost a complete loop, but two of the arcs extend short distances into California before reaching the junction figure. It seemed advisable to include these extensions, and also the junction figure, in this volume and thus complete the loop. The second-order arc which overlaps into California is a comparatively small spur from one of the first-order arcs in Oregon. The California end of this spur would be left rather unsupported if included by itself in a forthcoming California publication.

Discussions of the Laplace azimuths and bases which control the azimuths and lengths of the triangulation contained in this volume are given in the publications mentioned on page 1 and are not repeated here. See discussion under heading "Characteristics of First-Order Triangulation" on page 6.

GENERAL DESCRIPTION OF TABLES AND SKETCHES

The tables of geographic positions, on pages 15 to 36, also contain the distances between contiguous triangulation stations in meters and feet, the logarithms of the distances in meters, and the azimuths of the lines joining these stations. The distances are corrected for elevation above mean sea level, and the azimuths are referred to the true south. Anyone who wishes to obtain the actual distances between the triangulation stations should use the formula given on page 14, by which the true distance at the mean elevation of the stations can be derived from the distance at sea level. The descriptions of the stations, given on pages 43 to 72, are designed to enable the engineer to recover and identify the station mark after he has visited the general locality of the station. There will be times when the description, so far as witness and other marks are concerned, will have become out of date from changes by nature or by the work of man. Any engineer who may visit a station and find that the description does not truly represent the present conditions, or who finds the mark destroyed or mutilated, should report the facts to the Director of the Coast and Geodetic Survey, at Washington, D. C., in order that the files of this office may be kept up to date. The engineer should realize that the triangulation extended over the country by the Coast and Geodetic Survey is a public survey, made for the use of the people. The stations really belong to the States in which they are located, and the engineer who is so fortunate as to find one of these stations located near his work should help to perpetuate the monuments in order that they may be of continuous service and value to his locality. The Coast and Geodetic Survey officials will, from time to time, visit the stations established and will re-mark and re-describe them if necessary.

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

Near the back of this publication will be found a number of sketches which show graphically the approximate locations of the stations, especially with reference to State and county boundaries, and the lines over which the main-scheme observations were made. It is suggested that if one should wish to learn whether there are triangulation stations in the vicinity of his work he should first consult the sketches. He can obtain from them the names of the stations that may be of help to him; then he should turn to the index on page 85 of this volume, from which he can find the pages upon which the descriptions and geographic positions of the stations appear.

OTHER PUBLICATIONS OF VALUE TO THE ENGINEER

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

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

There are occasions, especially in cities, when the engineer wishes to use plane coordinates for his triangulation stations rather than spherical coordinates. In such cases he should procure from the Superintendent of Documents Special Publication No. 71, entitled "Relation between Plane Rectangular Coordinates and Geographic Positions," which costs 10 cents. This publication also describes the methods of transforming plane coordinates to spherical ones.

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

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

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

CLASSIFICATION OF TRIANGULATION

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

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

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

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

CHARACTERISTICS OF FIRST-ORDER TRIANGULATION

Except for the two small sections of second-order triangulation along the coast (see p. 3) the triangulation contained in this volume is of the first order. First-order triangulation is done with such accuracy that the average closing errors of the triangles is of the order of 1 second. In order that the angles may have this high degree of accuracy, large theodolites are used. The theodolite, as is well known, is similar in its appearance to the surveyor's transit. The main differences are in the excellence of the workmanship, the accuracy of graduation of the circle, in having micrometer microscopes for reading this circle, and in having a telescope with a high resolving power. Observations are made either on heliotropes, by which the light of the sun is reflected toward the observer, or on acetylene or electric signal lamps. The heliotrope, or lamp, and the theodolite must be centered directly over the station marks.

At certain intervals, depending upon the shape of the triangles, base lines are measured. A base is necessarily a side of one of the triangles. The ends of the base must be intervisible from the ground or from towers that may be erected over them. In the early years of the Coast and Geodetic Survey's existence the base lines were measured with metal bars, but near the beginning of the present century steel tape lines began to be used in the measurements. Since 1907 all of the bases of the survey have been measured with invar tapes. The probable error of a measured base is about 1 part in 1,000,000 of its length. This accuracy meets all the requirements of engineering and science.

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

at which the observations are made. The probable error of a Laplace azimuth is about ± 0.3 second.

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

SECONDARY STATIONS

In addition to the stations which form the main network of triangles in Oregon, a number of objects, such as mountain peaks, church spires, and schoolhouse cupolas, were observed upon from stations of the main scheme. The geographic positions of these secondary stations have been computed and the data are included in the tables on pages 15 to 36. These stations are shown on the sketches and in the index, but only a few of them are given in the descriptions of stations, as in most cases the name of the object is all the description that is available. Ordinarily the name of the secondary station is sufficient for its accurate identification by the engineer who may wish to use it.

In the readjustment of the triangulation of the western part of the United States (see p. 1) each of the unoccupied or intersection stations was computed by means of a single triangle, even though several additional lines to the station had been observed. If the lengths and azimuths of any of these additional lines are needed at any time, the data may be obtained by writing to the Director, Coast and Geodetic Survey, Washington, D. C.

In the list of geographic positions will be found a table of positions of mountain peaks. These positions were obtained by applying mean corrections to the old positions that had been based on the North American datum in use previously to 1927. The mean corrections were obtained for each peak by noting how much change had been made by the change of datum in the positions of the main-scheme stations from which the peak was determined.

Usually a mountain peak is rather an indefinite object on which to point, and therefore the geographic position obtained for it is somewhat uncertain. It should not be used as a basis for local surveys except as a last resort. For this reason it seemed to be unnecessary to go to the trouble and expense of computing the lengths and azimuths of the lines to the mountain peaks. If for any special reason the data for any of these lines should be needed, they may be obtained in the manner noted in the second paragraph above.

USE OF HORIZONTAL CONTROL DATA

The plan or map for any extensive engineering project, whether or not map construction is the primary object, should have all of its parts properly correlated and should be on the same datum as adjacent surveys. Federal and State mapping organizations have long been aware of the necessity for having all surveys based upon a common datum, but local engineers and surveyors in this country have too often in the past been content, and in many cases compelled to use a local datum for their surveys. The future economic disadvantage of

such a system is now becoming recognized, with the result that city and county surveys are being more generally placed upon a permanent basis by connecting them to stations on the North American datum.

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

The difficulties of accurately locating and permanently defining the boundaries of a farmer's plantation on land, even with the aid of monuments, public roads, streams of water, and other points of reference, are often great, judging from the disputes frequently arising in connection with boundaries. * * *

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

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

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

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

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

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

surveys rather than a point, since a line gives the three essentials of position, length, and direction.

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

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

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

EXPLANATION OF TABLE FOR POLYCONIC MAP PROJECTION

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

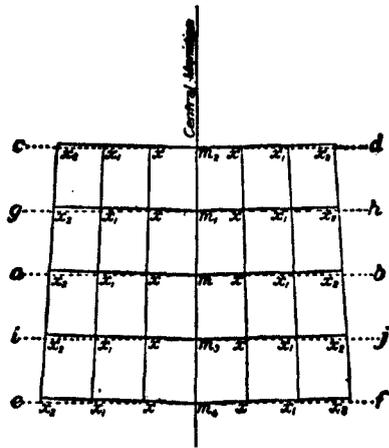


FIGURE 1.—Sketch showing construction of polyconic projection

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

least possible difficulty, the following table, reprinted in an abbreviated form from Coast and Geodetic Survey Special Publication No. 5, has been inserted. This table may also be used to interpret in terms of degrees, minutes, and seconds of arc any relatively short distance measured along a meridian or parallel. The method of using the table is described below.

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

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

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

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

Polyconic map projection table

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 41°
	1"	1'	1"	1'		
° /	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	° /	<i>Meters</i>
41 00	23.372	1,402.3	30.848	1,850.87	0 01	0.1
05	23.342	1,400.5	30.848	1,850.90	03	1.2
10	23.313	1,398.8	30.849	1,850.92	05	3.3
15	23.283	1,397.0	30.849	1,850.95	07	6.6
20	23.253	1,395.2	30.850	1,850.98	10	13.4
25	23.224	1,393.4	30.850	1,851.01	15	30.1
30	23.194	1,391.6	30.851	1,851.03	20	53.5
35	23.164	1,389.9	30.851	1,851.06	25	83.6
40	23.134	1,388.1	30.851	1,851.09	30	120.4
45	23.105	1,386.3	30.852	1,851.11	40	214.1
50	23.075	1,384.5	30.852	1,851.14	50	334.5
55	23.045	1,382.7	30.853	1,851.17	1 00	481.7

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 42°
	1"	1'	1"	1'		
° /	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	° /	<i>Meters</i>
42 00	23.015	1,380.9	30.853	1,851.20	0 01	0.1
05	22.985	1,379.1	30.854	1,851.22	03	1.2
10	22.955	1,377.3	30.854	1,851.25	05	3.4
15	22.924	1,375.5	30.855	1,851.28	07	6.6
20	22.894	1,373.7	30.855	1,851.30	10	13.4
25	22.864	1,371.8	30.856	1,851.33	15	30.2
30	22.834	1,370.0	30.856	1,851.36	20	53.8
35	22.803	1,368.2	30.856	1,851.39	25	84.0
40	22.773	1,366.4	30.857	1,851.41	30	120.9
45	22.742	1,364.5	30.857	1,851.44	40	215.0
50	22.712	1,362.7	30.858	1,851.47	50	336.0
55	22.681	1,360.9	30.858	1,851.50	1 00	483.8

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 43°
	1"	1'	1"	1'		
° /	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	° /	<i>Meters</i>
43 00	22.651	1,359.1	30.859	1,851.52	0 01	0.1
05	22.620	1,357.2	30.859	1,851.55	03	1.2
10	22.590	1,355.4	30.860	1,851.58	05	3.4
15	22.559	1,353.5	30.860	1,851.61	07	6.6
20	22.528	1,351.7	30.861	1,851.63	10	13.5
25	22.497	1,349.8	30.861	1,851.66	15	30.3
30	22.466	1,348.0	30.861	1,851.69	20	53.9
35	22.435	1,346.1	30.862	1,851.72	25	84.3
40	22.404	1,344.3	30.862	1,851.74	30	121.3
45	22.373	1,342.4	30.863	1,851.77	40	215.7
50	22.342	1,340.5	30.863	1,851.80	50	337.0
55	22.311	1,338.7	30.864	1,851.82	1 00	485.3

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 44°
	1"	1'	1"	1'		
° /	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	° /	<i>Meters</i>
44 00	22.280	1,336.8	30.864	1,851.85	0 01	0.1
05	22.249	1,334.9	30.865	1,851.88	03	1.2
10	22.218	1,333.1	30.865	1,851.91	05	3.4
15	22.186	1,331.2	30.866	1,851.93	07	6.6
20	22.155	1,329.3	30.866	1,851.96	10	13.5
25	22.124	1,327.4	30.866	1,851.99	15	30.4
30	22.092	1,325.5	30.867	1,852.02	20	54.0
35	22.061	1,323.6	30.867	1,852.04	25	84.4
40	22.029	1,321.7	30.868	1,852.07	30	121.5
45	21.998	1,319.9	30.868	1,852.10	40	216.1
50	21.966	1,318.0	30.869	1,852.13	50	337.7
55	21.934	1,316.1	30.869	1,852.15	1 00	486.2

Polyconic map projection table—Continued

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 45°
	1"	1'	1"	1'		
° /	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	° /	<i>Meters</i>
45 00	21. 903	1, 314. 2	30. 870	1, 852. 18	0 01	0. 1
05	21. 871	1, 312. 2	30. 870	1, 852. 21	03	1. 2
10	21. 839	1, 310. 3	30. 871	1, 852. 24	05	3. 4
15	21. 807	1, 308. 4	30. 871	1, 852. 26	07	6. 6
20	21. 775	1, 306. 5	30. 872	1, 852. 29	10	13. 5
25	21. 743	1, 304. 6	30. 872	1, 852. 32	15	30. 4
30	21. 711	1, 302. 7	30. 872	1, 852. 35	20	54. 1
35	21. 679	1, 300. 7	30. 873	1, 852. 37	25	84. 5
40	21. 647	1, 298. 8	30. 873	1, 852. 40	30	121. 6
45	21. 615	1, 296. 9	30. 874	1, 852. 43	40	216. 2
50	21. 583	1, 295. 0	30. 874	1, 852. 46	50	337. 9
55	21. 550	1, 293. 0	30. 875	1, 852. 48	1 00	486. 5

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature	
	1"	1'	1"	1'		Lat. 46°	Lat. 47°
° /	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	<i>Meters</i>	° /	<i>Meters</i>	<i>Meters</i>
46 00	21. 518	1, 291. 1	30. 875	1, 852. 51	0 01	0. 1	0. 1
05	21. 486	1, 289. 2	30. 876	1, 852. 54	03	1. 2	1. 2
10	21. 454	1, 287. 2	30. 876	1, 852. 57	05	3. 4	3. 4
15	21. 421	1, 285. 3	30. 877	1, 852. 59	07	6. 6	6. 6
20	21. 389	1, 283. 3	30. 877	1, 852. 62	10	13. 5	13. 5
25	21. 356	1, 281. 4	30. 877	1, 852. 65	15	30. 4	30. 3
30	21. 324	1, 279. 4	30. 878	1, 852. 68	20	54. 0	53. 9
35	21. 291	1, 277. 5	30. 878	1, 852. 70	25	84. 4	84. 3
40	21. 258	1, 275. 5	30. 879	1, 852. 73	30	121. 6	121. 4
45	21. 226	1, 273. 5	30. 879	1, 852. 76	40	216. 1	215. 7
50	21. 193	1, 271. 6	30. 880	1, 852. 78	50	337. 7	337. 1
55	21. 160	1, 269. 6	30. 880	1, 852. 81	1 00	486. 3	485. 4
60	21. 127	1, 267. 6	30. 881	1, 852. 84			

CONVERSION TABLE

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

Meters	Feet	Feet	Meters
1	3. 280833	1	0. 3048006
2	6. 561667	2	0. 6096012
3	9. 842500	3	0. 9144018
4	13. 123333	4	1. 2192024
5	16. 404167	5	1. 5240030
6	19. 685000	6	1. 8288037
7	22. 965833	7	2. 1336043
8	26. 246667	8	2. 4384049
9	29. 527500	9	2. 7432055
10	32. 808333	10	3. 0480061

EXPLANATION OF TABLES OF POSITIONS

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

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

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

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

It will be noted in the following tables of geographic positions that some of the stations, especially mountain peaks, have two names, the second one being in parentheses. The first name in each case is the name given to the station when it was established. This name may now be wrong, because the observer did not identify the peak correctly or because the name of the geographic feature has since been changed. The name in parentheses is considered at the present time to be the correct one. The original name has been retained, however, in order to prevent confusion if at any time it should become necessary to look up the station in the old field records.

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

EXPLANATION OF LENGTHS

The lengths as given in the tables are all reduced to sea level. If the actual length of a line on the ground reduced only to the horizontal is desired—that is, its length in its actual elevation on the

surface of the earth—it may be obtained by adding to the sea-level length as given in meters the following correction,

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

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

AZIMUTH AND BACK AZIMUTH

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

Because of the convergence of the meridians, the azimuth and the back azimuth of a line do not differ by exactly 180° , the amount of the divergence varying with the latitude and the difference of longitude of the two ends of the line. To illustrate from the tables on page 17, the azimuth from Lookout to John is $264^\circ 29' 17''.37$, while the back azimuth, or the azimuth from John to Lookout, is $85^\circ 08' 36''.86$.

The azimuths of the triangulation lines offer a very convenient and accurate means of testing the deflection of the magnetic needle on a surveyor's transit, and even the azimuth over such short distances as those between a station mark and its reference mark may be used for this purpose with fair accuracy provided the distance is greater than 100 feet.

GEOGRAPHIC POSITIONS

Idaho-Washington arc

Station	Latitude and longitude			Azimuth			Back azimuth			To station			Distance			
													Logarithm (meters)	Meters	Feet	
<i>Principal points</i>																
	°	'	"	°	'	"	°	'	"							
Silver (Idaho), 1915.....	42	58	50.368													
Shafer (Idaho), 1915.....	116	39	23.577													
Squaw (Idaho), 1915.....	44	01	58.287	27	51	58.00	207	28	32.07	Silver.....	4.9966637	99,234.73	325,572.6			
Nyssa (Idaho), 1915.....	116	05	16.535													
	44	01	58.287	318	04	36.43	138	18	02.84	Shafer.....	4.5902587	38,927.70	127,715.3			
	116	24	39.443	9	43	37.12	189	33	28.42	Silver.....	5.0739962	118,575.85	389,027.6			
	43	52	24.843	248	36	42.41	69	00	23.42	Squaw.....	4.6898580	48,961.88	160,635.8			
	117	58	46.799	278	39	18.33	99	16	21.23	Shafer.....	4.8610831	72,624.49	238,268.8			
				345	06	47.99	165	20	07.64	Silver.....	5.0111236	102,594.39	336,595.1			
Iron (Idaho), 1915.....	44	33	02.464	319	14	37.18	139	40	27.30	Squaw.....	4.8791802	75,714.70	248,407.3			
	117	01	39.220	357	04	14.85	177	06	15.09	Nyssa.....	4.8769990	75,335.38	247,162.8			
Dry, 1916.....	44	10	08.183	229	45	07.03	50	11	41.57	Iron.....	4.8192455	65,954.67	216,386.3			
	117	39	39.844	278	09	16.35	99	01	28.35	Squaw.....	5.0053266	101,234.06	332,132.1			
				300	45	22.70	121	13	47.40	Nyssa.....	4.8043705	63,733.90	209,100.3			
Beaver, 1916.....	44	35	58.376	274	54	16.73	95	26	05.79	Iron.....	4.7800258	80,259.54	197,701.5			
	117	46	59.268	348	27	58.92	168	33	06.28	Dry.....	4.6886638	48,827.43	160,194.7			
Maxwell, 1916.....	44	51	42.489	291	58	43.43	112	43	30.23	Iron.....	4.9586022	90,908.02	298,254.1			
	118	05	18.497	320	12	00.61	140	24	54.22	Beaver.....	4.5783343	37,873.40	124,256.3			
				336	02	01.85	156	20	00.62	Dry.....	4.9250947	84,157.87	276,107.9			
Medical, 1916.....	45	04	47.766	21	40	44.60	201	29	26.55	Beaver.....	4.7589877	57,410.03	188,352.7			
	117	30	57.677	61	58	35.01	241	34	18.53	Maxwell.....	4.7097337	51,254.70	168,158.1			
				326	31	28.21	146	52	07.63	Iron.....	4.8473889	70,370.21	230,872.9			
Fanny, 1916.....	45	18	28.845	3	07	28.82	183	05	11.14	Beaver.....	4.8967869	78,847.31	258,684.9			
	117	43	44.398	29	50	33.33	209	35	16.91	Maxwell.....	4.7566095	57,096.50	187,324.1			
				326	29	18.08	146	33	22.07	Medical.....	4.4825050	30,374.21	99,652.7			
Powder, 1916.....	44	55	46.604	218	39	11.72	38	57	28.03	Fanny.....	4.7321007	53,963.58	177,045.5			
	118	09	31.612	323	35	02.96	143	38	01.61	Maxwell.....	3.9713300	9,361.17	30,712.4			
Emily, 1916.....	45	26	05.729	5	13	27.06	185	10	40.98	Powder.....	4.7512007	56,389.82	185,005.6			
	118	05	37.479	296	08	33.60	116	24	08.08	Fanny.....	4.5033144	31,865.04	104,543.9			
				359	37	30.40	179	37	43.86	Maxwell.....	4.8041027	63,694.62	208,971.4			
La Grande, 1916.....	45	19	48.309	180	05	15.4	0	05	15.9	Emily.....	4.0663869	11,651.64	38,227.1			
	118	05	38.298	274	46	11.3	95	01	45.5	Fanny.....	4.4582228	28,722.54	94,233.9			
Birch, 1916.....	45	24	12.085	264	56	52.34	85	19	22.79	Emily.....	4.6167084	41,372.18	135,735.2			
	118	37	13.473	325	15	21.23	145	34	59.77	Powder.....	4.8058149	63,946.22	209,796.9			

TRIANGULATION IN OREGON

GEOGRAPHIC POSITIONS—Continued

Idaho-California arc

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
											Logarithm (meters)	Meters	Feet
<i>Principal points</i>													
Vale, 1920.....	43 58 14.130	121 00 38.74	300 41 25.57	Dry.....	4.6332393	42,977.32	141,001.4						
Freezeout, 1920.....	117 12 01.881	263 29 28.18	84 02 22.78	Squaw.....	4.8041708	63,704.60	209,004.2						
	43 37 26.969	173 39 41.07	353 36 11.22	Dry.....	4.7846597	60,905.94	199,822.2						
	117 34 37.185	218 04 42.38	38 20 20.41	Vale.....	4.6900684	48,985.60	160,713.6						
		243 45 49.58	64 34 16.60	Squaw.....	5.0179008	104,207.94	341,888.9						
Beulah, 1920.....	43 52 11.960	226 12 20.24	46 30 26.86	Dry.....	4.6824010	48,128.36	157,901.1						
Star, 1920.....	118 05 43.543	303 00 29.19	123 21 59.73	Freezeout.....	4.6980832	49,898.01	163,707.1						
	43 22 31.316	169 29 02.68	349 23 47.46	Beulah.....	4.7474209	55,901.17	183,402.4						
	117 58 06.628	195 34 31.77	15 47 17.46	Dry.....	4.9618003	91,579.94	300,458.5						
		228 44 49.43	49 00 59.63	Freezeout.....	4.6235828	42,032.26	137,900.8						
Crow, 1920.....	43 31 26.112	220 28 49.02	40 45 46.50	Beulah.....	4.7046380	50,656.83	166,196.6						
Riddle, 1920.....	118 30 16.339	290 38 28.42	111 00 35.51	Star.....	4.6667282	46,422.47	152,304.4						
	43 06 01.145	179 21 59.41	359 21 43.52	Crow.....	4.6726893	47,064.05	154,409.3						
	118 29 53.169	200 42 58.25	20 59 35.87	Beulah.....	4.9614480	91,505.67	300,214.8						
		234 25 54.05	54 47 40.09	Star.....	4.7223529	52,765.84	173,115.9						
Burns, 1920.....	43 33 41.401	274 20 44.14	94 47 27.58	Crow.....	4.7195046	52,420.92	171,984.3						
Jack, 1920.....	119 09 03.879	313 49 42.14	134 16 35.24	Riddle.....	4.8673904	73,686.92	241,754.5						
	43 02 31.492	164 23 55.98	344 15 43.43	Burns.....	4.7776689	59,933.40	196,631.5						
	118 57 05.713	213 58 42.59	34 17 05.80	Crow.....	4.8107022	64,669.90	212,171.2						
		259 54 36.20	80 13 11.08	Riddle.....	4.5740099	48,938.16	123,025.2						
Juniper, 1920.....	42 55 47.911	221 51 19.09	42 23 25.85	Burns.....	4.9758488	94,590.78	310,336.6						
	119 55 56.068	260 48 56.33	81 29 03.43	Jack.....	4.9082012	80,947.08	265,573.9						
Wagontire, 1920.....	43 20 57.657	248 15 35.20	68 46 07.01	Burns.....	4.8065506	64,350.33	211,122.7						
	119 53 27.180	293 46 02.96	114 24 37.58	Jack.....	4.9223762	83,632.71	274,385.0						
		4 06 41.89	184 07 00.08	Juniper.....	4.6694225	46,711.35	153,252.2						
Diablo, 1920.....	42 57 56.190	231 52 50.48	52 20 29.08	Wagontire.....	4.8414620	69,416.39	227,743.6						
	120 33 51.988	274 10 18.69	94 36 09.35	Juniper.....	4.7138834	51,746.79	169,772.6						
Grays, 1920.....	42 58 42.745	189 09 38.72	9 13 00.52	Wagontire.....	4.6204523	41,730.38	136,910.4						
	119 58 22.163	328 26 37.98	148 28 17.53	Juniper.....	3.8014328	6,330.42	20,769.1						
		88 29 48.15	268 05 36.37	Diablo.....	4.6838177	48,285.61	158,417.0						
Sharp, 1920.....	42 50 42.041	152 37 17.60	332 33 49.14	Diablo.....	4.1787159	15,090.93	49,510.8						
	120 28 45.778	257 53 24.32	78 15 44.83	Juniper.....	4.6597512	45,682.64	149,877.1						
White, 1920.....	42 40 28.582	157 06 34.66	337 01 45.81	Diablo.....	4.5452600	35,096.19	115,144.7						
	120 23 50.473	160 29 48.30	340 26 27.81	Sharp.....	4.3028823	20,085.48	65,897.1						
		233 08 03.54	53 27 01.25	Juniper.....	4.6763238	47,459.57	155,706.9						
Paisley, north base, 1920.....	42 49 43.178	191 12 29.78	11 14 00.33	Diablo.....	4.1906096	15,509.92	50,885.5						
	120 36 05.010	259 38 19.39	79 43 18.03	Sharp.....	4.0060083	10,139.31	33,265.4						
		315 37 22.48	135 45 41.10	White.....	4.3786669	23,914.81	78,460.5						
Paisley, south base, 1920.....	42 42 14.395	162 25 41.62	342 23 30.51	Paisley, north base.....	4.1621928	14,627.565	47,662.52						
	120 32 51.917	199 38 02.80	19 40 49.96	Sharp.....	4.2209992	16,634.10	54,573.7						
		284 47 08.76	104 53 15.87	White.....	4.1055425	12,750.95	41,833.7						
Round, 1920.....	42 29 35.357	174 49 06.91	354 46 44.42	Diablo.....	4.7218107	52,700.01	172,899.9						
	120 30 21.993	203 51 12.40	23 55 37.33	White.....	4.3433086	22,044.92	72,325.7						
		223 53 58.10	44 17 19.45	Juniper.....	4.8297125	67,563.55	221,664.7						
Hart, 1920.....	42 27 35.342	93 37 26.14	273 06 24.42	Round.....	4.7999076	63,082.31	206,962.5						
	119 44 25.094	130 02 46.50	309 29 13.95	Diablo.....	4.9436688	87,835.24	288,172.8						
		163 18 19.15	343 10 30.60	Juniper.....	4.7367514	54,544.56	178,951.6						
Crane, 1920.....	42 03 46.556	155 23 53.97	335 13 06.92	Round.....	4.7209578	52,596.61	172,560.7						
	120 14 23.155	222 54 12.26	43 14 21.49	Hart.....	4.7806624	60,347.93	197,991.5						
Drake, 1920.....	42 18 13.572	125 36 21.31	305 21 51.32	Round.....	4.5591816	36,239.45	118,895.6						
	120 08 51.753	242 32 28.38	62 48 57.02	Hart.....	4.5770699	37,765.03	123,900.8						
		15 54 04.06	195 50 21.53	Crane.....	4.4442199	27,811.21	91,243.0						
Yonna, 1920.....	42 19 34.947	253 17 13.44	73 48 03.28	Round.....	4.8155569	65,396.86	214,556.2						
	121 16 04.795	288 39 53.20	109 21 19.46	Crane.....	4.9534258	89,830.92	294,720.3						
Cougar, 1920.....	42 18 25.453	309 59 43.72	130 15 25.21	Crane.....	4.6240457	42,077.09	138,047.9						
	120 37 45.165	92 32 48.05	272 06 59.86	Yonna.....	4.7218566	52,705.58	172,918.2						
		206 04 44.12	26 09 42.95	Round.....	4.3621306	23,021.34	75,528.2						
Hoffman (Calif.), 1920.....	41 36 39.873	196 26 23.18	16 37 48.19	Yonna.....	4.9184289	82,876.02	271,902.4						
	121 33 09.130	224 24 38.62	45 01 41.10	Cougar.....	5.0865930	108,791.00	356,925.1						
		214 50 56.98	65 43 29.38	Crane.....	5.0793156	120,037.13	393,821.8						
Aspen, 1920.....	42 18 56.248	268 42 38.05	89 15 41.85	Yonna.....	4.8291736	67,479.77	221,389.9						
	122 05 11.226	330 19 41.37	150 41 06.62	Hoffman.....	4.9537825	89,904.73	294,962.4						
Gooseneat (Calif.), 1920.....	41 43 11.808	189 31 59.02	9 37 23.83	Aspen.....	4.8267129	67,098.52	220,139.1						
	122 13 16.473	229 12 44.23	49 51 01.56	Yonna.....	5.0161060	103,778.16	340,478.8						
		282 01 37.65	102 28 18.02	Hoffman.....	4.7558053	56,990.87	186,977.5						
Whaleback (Calif.), 1920.....	41 31 42.128	162 16 37.09	342 13 21.66	Gooseneat.....	4.3491028	22,341.01	73,297.1						
	122 08 22.255	259 10 44.74	79 34 06.88	Hoffman.....	4.6973459	49,813.37	163,429.4						
		61 03 26.71	240 38 03.61	Boliver.....	4.7872795	61,274.46	201,031.3						
Grizzly (Calif.), 1920.....	41 08 41.258	162 22 50.51	342 16 24.97	Whaleback.....	4.6503986	44,709.37	146,684.0						
	121 58 38.529	214 19 15.86	34 36 06.85	Hoffman.....	4.7980079	62,806.99	206,059.3						
		43 30 49.31	223 04 25.21	Bally.....	4.9172866	82,658.33	271,188.2						
		100 59 42.10	280 28 00.28	Boliver.....	4.8354792	68,466.67	224,627.7						
Eddy (Calif.), 1920.....	41 19 11.155	205 39 08.38	25 49 20.92	Gooseneat.....	4.6931974	49,339.81	161,875.7						
	122 28 40.512	230 34 20.04	50 47 46.08	Whaleback.....	4.5630683	36,565.23	119,964.4						
		294 40 48.94	115 00 36.66	Grizzly.....	4.6650654	46,247.19	151,729.3						
		10 21 29.71	190 14 44.13	Bally.....	4.9079455	80,899.43	265,417.5						
		75 16 26.58	255 04 30.53	Boliver.....	4.4169610	26,119.27	85,693.0						
<i>Supplementary points</i>													
Lookout Mountain, peak, 1920.....	44 36 32.380	312 30 39.7	133 06 58.4	Squaw.....	4.974034	94,196.3	309,042						
	117 16 37.694	32 09 57.8	211 53 51.0	Dry.....	4.761023	57,679.7	189,237						
Juniper Mountain, peak, 1920.....	44 12 26.962	301 35 11.0	121 33 49.5	Dry.....	3.912269	8,170.9	26,807						
	117 44 53.137	36 42 42.6	216 23 13.4	Beulah.....	4.669367	46,705.4	153,233						
Castle Rock, cairn (U. S. G. S.), 1920.....	44 01 17.298	248 21 57.8	69 43 42.2	Dry.....	4.651293	44,801.5	146,986						
	118 10 54.366	337 35 13.5	157 38 49.1	Beulah.....	4.260135	18,202.7	59,720						

GEOGRAPHIC POSITIONS—Continued

Idaho-California arc—Continued

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Strawberry Butte, 1920 ¹	44	18	43.36	314	28	46	134	54	39	Beulah	4.844071	69,834.7	229,116
Burnt River Mountains, summit, 1920 ²	118	42	55.06	329	45	12	150	16	14	Star	5.079745	120,155.9	394,211
Owyhee Mountains, summit (Idaho), 1920 ²	44	14	34.79	325	42	03	147	05	17	Freezeout	4.914256	82,083.5	269,302
Steens Mountain, highest point, 1920 ²	118	03	07.16	352	00	55	172	07	51	Star	4.988248	97,330.3	319,324
Flacidia Butte, summit, 1920 ²	42	58	56.20	112	47	10	291	53	31	Star	5.060230	114,889.4	376,933
Kings Mountain, summit, 1920 ²	116	39	41.41	134	03	37	313	39	56	Freezeout	5.012718	102,971.7	337,833
Burns, bench mark, C 19, 1920	42	44	34.76	184	57	37	4	59	24	Riddle	4.613394	40,775.0	133,776
Beatys Butte, summit, 1920	118	32	29.07	213	03	34	33	27	02	Star	4.930011	85,116.0	279,251
Iron, 1920	43	28	42.03	292	27	41	113	18	03	Riddle	5.033440	108,004.0	354,343
Little Juniper, summit, 1920	119	43	26.96	307	25	30	127	57	16	Jack	4.899123	79,272.6	260,080
Hampton Butte, summit, 1920 ²	43	48	44.36	339	09	09	159	24	24	Riddle	4.927236	84,573.8	277,473
Glass Butte, summit, 1920 ²	118	52	04.10	4	33	42	184	30	15	Jack	4.933700	85,842.0	281,633
Paisley High School flagpole, 1920 ²	43	35	07.408	278	33	46.7	98	56	28.5	Crow	4.652090	44,883.8	147,256
Paisley Methodist Church spire, 1920 ²	119	03	12.685	71	25	07.8	251	21	05.8	Burns	3.919888	8,315.5	27,282
Monument Mountain, cairn (U. S. G. S.), 1920	42	23	09.652	140	59	34.4	320	35	07.6	Juniper	4.892013	77,985.3	255,857
Drake Peak, lookout house, 1920	119	19	51.503	202	58	02.1	23	13	28.6	Jack	4.898888	79,229.7	259,939
Crook Peak, highest point, 1920	43	15	46.834	46	42	43.7	226	23	08.8	Juniper	4.730758	53,797.0	176,499
Gearhart, 1920	119	27	09.146	105	14	37.9	254	56	35.5	Wagontire	4.566280	36,836.6	120,855
Drake Peak, cairn (U. S. G. S.), 1920	43	09	13.034	15	57	53.2	195	54	19.3	Juniper	4.412261	25,838.1	84,770
Peak, first north of station Drake, 1920	119	50	42.677	28	10	09.5	208	04	55.8	Grays	4.343495	22,054.4	72,357
Lakeview, bench mark M 16, 1920	43	46	26.77	343	06	46	163	21	08	Juniper	4.990982	97,944.9	321,341
Dog, 1920	120	16	50.69	344	07	38	164	20	19	Grays	4.963037	91,841.1	301,315
Fishhole Mountain, tallest tree, 1920 ¹	43	33	25.69	350	37	19	170	43	06	Juniper	4.848861	70,609.1	231,657
Grizzly Peak, summit, 1920 ¹	120	04	23.44	352	44	30	172	48	33	Grays	4.811537	64,794.3	212,579
Lakeview courthouse, final, 1920	42	41	36.62	196	51	59	16	54	32	Sharp	4.245232	17,588.6	57,705
Black Fox (Calif.), 1920	120	32	30.51	280	09	26	100	06	19	White	4.080059	12,024.3	39,450
Crater (U. S. G. S.) (Calif.), 1920	42	41	38.31	196	53	43	16	56	16	Sharp	4.243957	17,537.1	57,536
Boliver, lookout house (Calif.), 1920	120	32	30.22	280	15	22	100	21	15	White	4.080156	12,027.0	39,459
Bonanza, lookout house (Calif.), 1920	42	28	39.424	178	16	59.9	358	16	48.4	Round	3.237200	1,726.6	5,665
Bonanza, lookout house (Calif.), 1920	120	30	19.728	262	02	43.2	22	07	06.6	White	4.373173	23,614.2	77,474
Bonanza, lookout house (Calif.), 1920	42	18	02.311	126	44	07.1	308	29	58.8	Round	4.554503	35,851.1	117,621
Bonanza, lookout house (Calif.), 1920	120	09	23.841	244	41	46.3	64	42	07.9	Drake	2.010093	313.0	2,667
Bonanza, lookout house (Calif.), 1920	42	21	44.397	252	03	59.6	72	20	34.7	Hart	4.549393	35,431.8	116,246
Bonanza, lookout house (Calif.), 1920	120	09	00.498	358	14	09.5	178	14	15.4	Drake	3.813453	6,508.1	21,352
Bonanza, lookout house (Calif.), 1920	42	29	46.000	270	29	36.1	90	44	36.2	Round	4.483293	30,429.4	99,834
Bonanza, lookout house (Calif.), 1920	120	52	34.456	315	49	58.0	135	59	57.7	Cougar	4.465871	29,232.8	95,908
Drake Peak, first north of station Drake, 1920	42	18	00.778	100	50	50.4	280	49	49.8	Drake	3.322064	2,099.2	6,887
Lakeview, bench mark M 16, 1920	120	07	21.739	240	29	43.6	60	45	11.5	Hart	4.557997	36,140.7	118,572
Dog, 1920	42	19	36.948	246	33	09.2	66	49	59.1	Hart	4.571792	37,307.1	122,398
Fishhole Mountain, tallest tree, 1920 ¹	120	09	23.089	344	24	36.7	145	24	57.9	Drake	3.426637	2,670.8	8,762
Grizzly Peak, summit, 1920 ¹	42	11	35.939	325	19	12.26	164	24	04.46	Crane	4.2455720	17,602.40	57,750.5
Lakeview courthouse, final, 1920	120	21	38.767	119	47	17.31	299	36	27.53	Cougar	4.4066084	25,504.01	83,674.4
Black Fox (Calif.), 1920	42	07	07.338	199	07	00.13	19	10	32.91	Cougar	4.345342	22,147.98	72,663.8
Crater (U. S. G. S.) (Calif.), 1920	120	43	01.851	254	10	02.14	74	24	23.29	Lakeview, bench mark	4.4857378	30,601.15	100,397.3
Fishhole Mountain, tallest tree, 1920 ¹				278	45	12.03	99	04	24.09	Crane	4.6018625	39,981.81	131,173.7
Grizzly Peak, summit, 1920 ¹	42	15	14.48	246	42	43	66	49	26	Cougar	4.174309	14,938.6	49,011
Lakeview courthouse, final, 1920	120	47	44.26	336	38	58	156	42	08	Dog	4.213992	16,367.9	53,700
Klamath Falls, bench mark A 15, 1920	42	15	09.64	23	42	59	203	39	48	Dog	4.210658	16,250.5	53,315
Mount McLoughlin (Mount Pitt), lookout house, 1920	120	38	17.32	186	57	03	6	57	25	Cougar	3.784366	6,086.5	19,969
Weed Lumber Co., east chimney (Calif.), 1920 ²	42	11	21.117	108	41	21.3	288	40	41.7	Lakeview, bench mark	3.142615	1,427.6	4,684
Weed Lumber Co., west chimney (Calif.), 1920 ²	120	20	39.817	119	12	48.0	299	01	18.6	Cougar	4.429854	26,906.3	88,275
Soldier (Calif.), 1920	42	12	16.226	348	37	14.9	168	43	37.4	Hoffman	4.827508	67,221.5	220,543
Black Fox (Calif.), 1920	121	42	41.924	111	52	55.9	291	37	48.5	Aspen	4.522430	33,298.9	109,248
Crater (U. S. G. S.) (Calif.), 1920	42	26	40.715	278	18	43.5	99	01	03.8	Yonna	4.940504	87,197.5	286,080
Crater (U. S. G. S.) (Calif.), 1920	122	18	53.173	307	14	08.6	127	23	22.6	Aspen	4.373695	23,642.6	77,567
Crater (U. S. G. S.) (Calif.), 1920	41	26	06.10	34	11	42	214	07	35	Eddy	4.189494	15,470.1	50,755
Crater (U. S. G. S.) (Calif.), 1920	122	22	26.69	201	53	22	21	59	27	Goosenest	4.532944	34,114.9	111,925
Crater (U. S. G. S.) (Calif.), 1920	41	26	06.40	34	09	23	214	05	16	Eddy	4.189604	15,474.0	50,768
Crater (U. S. G. S.) (Calif.), 1920	122	22	26.96	201	54	18	22	00	23	Goosenest	4.532866	34,108.8	111,905
Crater (U. S. G. S.) (Calif.), 1920	41	04	27.792	102	45	58.2	282	29	34.9	Grizzly	4.553405	35,760.6	117,325
Crater (U. S. G. S.) (Calif.), 1920	121	33	42.975	180	45	11.8	00	45	34.1	Hoffman	4.775314	59,609.3	195,568
Crater (U. S. G. S.) (Calif.), 1920	41	20	47.580	223	43	21.7	43	56	46.8	Hoffman	4.609887	40,727.4	133,620
Crater (U. S. G. S.) (Calif.), 1920	121	53	24.864	18	04	56.7	198	01	29.9	Grizzly	4.372300	23,566.8	77,319
Crater (U. S. G. S.) (Calif.), 1920	41	24	57.300	45	13	40.8	224	55	43.9	Soldier	4.730062	53,713.3	176,224
Crater (U. S. G. S.) (Calif.), 1920	121	06	29.584	120	26	49.0	300	09	08.8	Hoffman	4.633071	42,960.7	140,947
Crater (U. S. G. S.) (Calif.), 1920	40	55	02.454	109	02	12.5	288	27	21.0	Grizzly	4.895379	78,592.1	257,848
Crater (U. S. G. S.) (Calif.), 1920	121	05	32.675	113	58	18.0	293	39	49.1	Soldier	4.635334	43,185.1	141,683
Crater (U. S. G. S.) (Calif.), 1920	43	54	03.223	118	25	07.9	298	01	30.2	Grizzly	4.575794	57,276.2	187,914
Crater (U. S. G. S.) (Calif.), 1920	121	22	38.428	141	10	54.0	321	03	38.1	Soldier	4.393559	24,749.1	81,198
Crater (U. S. G. S.) (Calif.), 1920	40	41	53.626	148	42	43.2	323	28	35.7	Grizzly	4.764200	58,103.2	190,627
Crater (U. S. G. S.) (Calif.), 1920	121	37	04.586	156	25	42.3	6	27	54.3	Soldier	4.623643	42,038.1	137,920
Crater (U. S. G. S.) (Calif.), 1920	40	48	24.29	141	58	09	321	44	22.2	Grizzly	4.678833	47,734.6	156,609
Crater (U. S. G. S.) (Calif.), 1920	121	37	37.46	254	35	04	74	56	03	Dixie	4.669522	46,722.1	153,287
Crater (U. S. G. S.) (Calif.), 1920	40	41	22.61	149	11	57	328	57	50	Grizzly	4.770265	58,920.3	193,308
Crater (U. S. G. S.) (Calif.), 1920	121	37	04.80	240	08	14	60	28	51	Dixie	4.708047	51,056.0	167,506
Crater (U. S. G. S.) (Calif.), 1920	41	15	32.434	212	48	09.1	32	48	10.3	Boliver	1.832600	76.3	250
Crater (U. S. G. S.) (Calif.), 1920	122	46	47.419	254									

GEOGRAPHIC POSITIONS—Continued

Washington-California arc—Continued

Station	Latitude and longitude			Azimuth			Back azimuth			To station	Distance		
	°	'	"	°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>													
Harney (Wash.), 1881.....	45	37	20.631	328	15	53.7	148	18	44.6	Rocky Butte.....	3.994164	9,866.5	32,370
Balch, 1881.....	45	31	53.471	210	43	45.2	220	54	20.4	Barnes.....	4.149534	14,110.2	46,293
River, 1903.....	45	34	27.793	261	17	15.9	30	47	03.2	Harney.....	4.070168	11,753.5	38,561
Cem, 1903.....	122	42	12.652	285	42	29.4	81	23	24.6	Rocky Butte.....	4.054398	11,334.4	37,186
Hill, 1903.....	45	31	04.129	123	20	05.6	105	48	26.1	Rocky Butte.....	4.051480	11,258.5	36,937
Fir, 1903.....	122	42	12.652	34	07	14.2	214	05	15.5	Barnes.....	3.807990	6,426.7	21,085
Monument, General Land Office, 1903.....	45	31	04.129	123	20	05.6	303	19	17.3	Barnes.....	3.245153	1,758.5	5,769
Mitchell (Wash.), 1903 ¹	122	43	51.070	198	44	44.1	18	45	54.5	River.....	3.822185	6,640.3	21,786
Vancouver Barracks flagstaff, west (Wash.), 1903 ¹	45	30	38.869	176	26	18.6	356	26	15.0	Barnes.....	3.242892	1,749.4	5,739
Warren schoolhouse cupola, 1903 ¹	122	44	53.765	240	10	43.8	60	11	28.5	Cem.....	3.195468	1,568.4	5,146
Eagle (Old Baldy) cairn, 1903 ¹	45	31	21.954	295	11	02.1	115	11	40.5	Hill.....	3.111594	1,293.0	4,242
Oregonian, 1903.....	122	44	44.980	8	03	30.4	188	09	24.1	Hill.....	3.128313	1,347.7	4,408
Portland latitude station, 1903.....	45	31	10.832	23	58	30.1	203	58	15.6	Hill.....	3.033393	1,079.9	3,543
Portland bench mark (U. S. G. S.), 1903.....	122	44	33.548	144	03	14.6	324	09	06.4	Fir.....	2.626968	423.6	1,390
Portland longitude station, 1903.....	46	01	51.89	37	55	27	217	31	28	Barnes.....	4.850660	70,902.2	232,618
White church spire, west of Brooks, 1903 ¹	122	11	30.68	65	03	29	244	34	19	Warren.....	4.763619	58,025.5	190,372
Chemawa tank, 1903 ¹	45	37	36.81	282	40	00	102	41	13	Harney.....	3.357196	2,276.1	7,468
Salem capitol, dome, 1903 ¹	122	39	34.79	32	13	37	212	09	46	Barnes.....	4.120055	13,184.2	43,255
Lebanon, tall brick chimney, 1903 ¹	45	48	46.43	345	43	10	165	47	37	Barnes.....	4.516405	32,840.1	107,743
Corvallis, closed cupola, 1903 ¹	122	51	12.06	69	43	51	249	43	12	Warren.....	3.195229	1,274.2	4,180
Corvallis, open cupola, 1903 ¹	45	16	24.23	118	29	56	238	01	23	Barnes.....	4.773837	59,406.9	194,904
Albany courthouse cupola, 1903 ¹	122	04	52.95	179	11	19	359	11	06	Larch.....	4.460062	28,844.4	94,634
Russian Church, cross, 1908.....	45	31	12.108	161	11	04.1	341	09	56.3	River.....	3.805009	6,382.8	20,941
Springfield Methodist Church, 1908.....	122	40	37.710	251	11	26.3	71	16	15.1	Rocky Butte.....	3.967252	9,273.7	30,425
Springfield Christian Church, 1908.....	45	31	07.73	187	56	53	7	56	54	Oregonian.....	2.13537	136.6	448
Eugene, Deady Hall, west tower, 1908.....	45	31	07.72	187	40	36	7	40	37	Oregonian.....	2.10969	128.7	422
Eugene, Geary School, spire, 1908.....	122	40	38.58										
Eugene, United Brethren Church, spire, 1908.....	45	07	24.73	314	34	46	134	44	30	Hult.....	4.404325	25,370.3	83,236
Eugene, Patterson School, spire, 1908.....	122	56	28.81	66	46	54	246	38	21	Yam.....	4.236586	17,241.9	56,568
Eugene, Baptist Church, spire, 1908.....	45	00	10.31	119	19	24	299	13	04	Yam.....	4.129850	13,485.0	44,242
Eugene, W. O. W. Hall, spire, 1908.....	122	59	35.66	281	11	16	101	23	11	Hult.....	4.354020	22,595.4	74,132
Rose, 1904.....	44	56	18.37	146	50	54	326	46	03	Yam.....	4.215764	16,434.8	53,920
Burg, 1904.....	123	01	42.26	263	37	33	83	50	57	Hult.....	4.399597	25,095.6	82,334
Roseburg latitude station, 1904.....	44	32	57.34	49	46	04	229	43	21	Peterson.....	3.825683	6,894.0	21,962
Central Point astronomical station, 1904.....	122	54	12.94	84	42	43	284	15	28	Mary.....	4.713697	51,724.6	169,700
Redding courthouse (Calif.), 1906.....	44	33	58.83	284	17	15	104	30	05	Peterson.....	4.398558	25,035.6	82,138
Redding astronomical station (Calif.), 1904.....	123	16	22.69	72	50	40	252	38	57	Mary.....	4.364754	23,160.8	75,987
Hill (Calif.), 1908.....	44	33	54.80	283	44	23	103	57	29	Peterson.....	4.406228	25,481.7	83,601
Redding south base (Calif.), 1908.....	123	16	44.91	72	46	28	252	35	01	Mary.....	4.355167	22,655.2	74,328
Redding north base (Calif.), 1908.....	44	38	04.73	321	24	28	141	30	18	Peterson.....	4.247040	17,662.0	57,946
Willamette south base.....	123	06	23.08	67	54	07	247	35	23	Mary.....	4.581843	38,180.6	125,264
Seavies 2.....	44	03	17.385	148	04	21.0	328	03	51.9	Willamette south base.....	3.245726	1,760.9	5,777
Eugene astronomical station.....	123	10	34.874	247	32	12.4	67	39	28.2	Seavies 2.....	4.178328	15,077.5	49,467
Eugene astronomical station.....	44	02	52.441	101	37	25.8	281	34	33.1	Eugene astronomical station.....	3.751657	5,644.9	18,520
Eugene astronomical station.....	123	01	18.815	193	31	05.1	13	31	54.1	Seavies 2.....	3.826203	6,702.0	21,988
Eugene astronomical station.....	44	02	50.418	101	49	53.2	281	46	44.2	Eugene astronomical station.....	3.767448	5,853.9	19,206
Eugene astronomical station.....	123	01	09.808	191	43	57.4	11	44	40.1	Seavies 2.....	3.827309	6,719.1	22,044
Eugene astronomical station.....	44	02	48.372	135	34	35.9	315	33	57.3	Eugene astronomical station.....	3.246825	1,765.3	5,792
Eugene astronomical station.....	123	04	31.708	221	23	39.9	41	26	43.0	Seavies 2.....	3.947288	8,857.0	29,058
Eugene astronomical station.....	44	03	21.059	355	10	35.5	175	10	56.8	Spencer.....	3.908382	8,098.1	26,569
Eugene astronomical station.....	123	06	10.588	101	29	15.3	281	25	42.4	Willamette south base.....	3.842114	6,952.1	22,809
Eugene astronomical station.....	44	02	52.864	105	07	29.8	285	03	09.0	Willamette south base.....	3.936932	8,648.3	28,374
Eugene astronomical station.....	123	05	01.571	225	03	48.2	45	07	12.2	Seavies 2.....	3.964932	9,211.5	30,221
Eugene astronomical station.....	44	02	46.533	144	44	28.5	324	43	59.5	Eugene astronomical station.....	3.207760	1,613.5	5,294
Eugene astronomical station.....	123	04	45.377	222	35	32.9	42	38	45.6	Seavies 2.....	3.959176	9,102.8	29,865
Eugene astronomical station.....	44	03	04.728	164	30	10.0	344	30	03.5	Eugene astronomical station.....	2.894513	784.4	2,573
Eugene astronomical station.....	123	05	17.807	228	15	29.7	49	19	05.0	Seavies 2.....	3.964877	9,223.1	30,259
Eugene astronomical station.....	44	03	04.450	207	25	30.6	27	25	43.0	Eugene astronomical station.....	2.935107	861.2	2,825
Eugene astronomical station.....	123	05	45.043	230	36	10.6	50	40	04.8	Seavies 2.....	3.986294	9,689.3	31,789
Eugene astronomical station.....	44	03	05.170	172	29	23.7	352	29	20.6	Eugene astronomical station.....	2.874251	748.6	2,456
Eugene astronomical station.....	123	05	22.826	228	46	42.8	48	50	21.5	Seavies 2.....	3.968378	9,297.8	30,505
Eugene astronomical station.....	44	02	55.754	183	46	23.8	03	46	25.9	Eugene astronomical station.....	3.014952	1,035.0	3,396
Eugene astronomical station.....	123	05	30.282	228	07	34.8	48	11	18.7	Seavies 2.....	3.982937	9,614.7	31,544
Eugene astronomical station.....	44	06	30.87	29	01	15	208	57	14	Spencer.....	4.202011	15,922.5	52,239
Eugene astronomical station.....	122	59	53.44	73	39	14	253	31	19	Willamette south base.....	4.199937	15,846.6	51,990
Eugene astronomical station.....	43	14	07.948	233	53	47.4	54	04	24.0	Scott.....	4.412620	25,859.5	84,841
Eugene astronomical station.....	123	19	17.347	298	51	37.3	119	03	17.8	White.....	4.422038	26,426.4	86,701
Eugene astronomical station.....	43	09	41.519	177	54	03.1	357	53	53.9	Rose.....	3.915267	8,227.5	28,993
Eugene astronomical station.....	123	19	03.991	281	13	40.9	101	25	11.8	White.....	4.367132	23,288.0	76,404
Eugene astronomical station.....	43	12	39.680	223	40	39.3	43	41	58.3	Rose.....	3.575997	3,767.0	12,359
Eugene astronomical station.....	123	21	12.640	332	08	07.5	132	09	35.6	Burg.....	3.793677	6,218.4	20,402
Eugene astronomical station.....	42	23	50.509	242	56	30.1	63	20	31.6	Rust.....	4.737138	54,593.1	179,111
Eugene astronomical station.....	122	56	22.267	313	56	46.1	134	15	23.1	Soda.....	4.724810	53,065.2	174,098
Eugene astronomical station.....	42	23	50.440	116	41		296	41		Central Point astronomical station.....	0.6785	4.77	15.6
Eugene astronomical station.....	122	56	22.081										
Eugene astronomical station.....	40	34	57.225	96	06	11.7	275	56	15.6	Bally.....	4.335680	21,661.1	71,066
Eugene astronomical station.....	122	23	43.090	236	07	43.5	56	24	51.9	Round.....	4.648669	44,531.7	146,101
Eugene astronomical station.....	40	34	18.302	99	11	07.1	279	01	07.5	Bally.....	4.341460	21,951.3	72,019
Eugene astronomical station.....	122	23	37.495	234	46	12.3	55	03	17.0	Round.....	4.654217	45,104.2	147,979
Eugene astronomical station.....	40	34	27.394	354	26	25.9	174	26	26.6	Redding astronomical station.....	2.449913	281.8	925
Eugene astronomical station.....													

GEOGRAPHIC POSITIONS—Continued¹*Intersection points (mountain peaks)*

Station	Latitude and longitude			Station	Latitude and longitude		
	°	'	"		°	'	"
Sheridan Peak, highest green tree, 1903. ²	45	18	52.54	Walker Peak (Howlock Mountain), 1904. ¹	43	11	32.58
Fairdale Peak, 1903.....	123	26	48.13	Quartz Peak, 1904.....	122	02	17.01
Squaw, cairn, 1903.....	45	15	08.87	Old Bailey (Mount Bailey), 1904.....	43	09	50.68
Arquett (Soosap Peak), cairn, 1903.	123	14	08.81	Dodson (U. S. G. S.) 1904.....	122	40	13.40
Table Rock, cairn, 1903.....	45	13	50.11	High Rock (Highrock Mountain), 1904.....	43	09	18.86
Monmouth Peak (Bald Mountain) 1903.	122	02	23.46	Liao (Liao) Rock, 1904.....	122	13	07.91
Forest Peak, tallest trees, 1903.....	45	04	18.44	Mount Scott, 1904.....	43	07	09.04
Mount Jefferson, 1903.....	122	15	31.06	Union Peak, 1903.....	123	14	33.95
Thomas, cairn, 1903.....	44	58	13.12	Lost Peak (Pelican Butte), 1904 ¹ ..	43	03	01.86
Round Peak, 1903.....	122	18	31.83	Kerby Peak, 1904 ¹	122	29	04.49
Left Nipple, 1903.....	44	47	50.72	Wagner Butte, 1904.....	42	57	07.01
Hayrick (Three Fingered Jack), 1903.	123	32	30.75	Greyback, 1904.....	122	10	05.17
Cannibal Peak, highest wooded peak, 1903. ²	44	40	21.88	Ashland Peak, cairn, 1904.....	42	55	22.93
Alsea Peak (Grass Mountain), partly cleared, wooded summit, 1904.	123	20	51.60	Siskiyou Peak, 1904 ¹	122	00	54.38
Mount Washington, 1903.....	121	47	54.03	Pilot Rock, 1904.....	42	49	52.47
Prairie Peak, west tree, 1903.....	44	38	09.84	Goosenest, tall tree (Calif.), 1904 ² ..	122	13	19.90
North Sister, 1903.....	122	34	18.07	Marble Mountain (Calif.), 1904.....	42	30	49.84
Middle Sister, 1903.....	44	37	51.62	Mount Shasta top (Calif.), 1904.....	122	08	41.72
South Sister, 1903.....	122	34	53.10	China Mountain (not the cairn) (Calif.), 1904.....	42	13	13.73
Nebo, 1903 ²	44	29	48.58	Black Butte, cairn (Calif.), 1904.....	123	27	35.67
Herman Peak, wooded summit, 1903. ²	122	34	32.47	Russian Peak, north point (Calif.), 1904.	42	07	04.66
St. Mary Butte (Broken Top), 1903.....	44	28	44.94	Russian Peak, south point (Calif.), 1904. ¹	122	46	23.11
Ball Butte (Bachelor Butte), 1903.....	121	50	30.52	Sawtooth (Calif.), 1904.....	42	06	36.03
Mount Zion, 1903 ¹	44	28	32.38	Thompson Peak (Calif.), 1904 ²	123	18	40.54
Diamond Peak, 1904.....	44	25	26.72	Crater Peak (Calif.), 1904.....	42	04	51.48
	123	40	21.52		122	42	56.69
	44	19	56.24		42	03	43.04
	121	50	14.44		122	45	47.92
	44	16	41.21		42	01	50.60
	123	36	27.54		122	33	34.93
	44	10	00.36		41	48	57.86
	121	46	15.96		122	14	17.84
	44	08	54.67		41	34	45.57
	121	46	58.53		123	05	26.78
	44	06	13.15		41	24	32.75
	121	46	07.03		122	11	37.31
	44	09	25.95		41	22	40.36
	122	42	03.94		122	34	29.94
	44	07	28.04		41	21	59.25
	124	00	42.47		122	20	48.78
	44	04	59.30		41	16	58.04
	121	41	53.79		122	57	01.99
	43	58	46.45		41	16	57.65
	121	41	14.56		122	57	02.08
	43	47	28.48		40	58	20.94
	122	43	23.12		123	00	04.22
	43	31	14.91		40	56	36.62
	122	08	53.46		122	52	18.17
					40	41	53.32
					121	37	04.09

¹ No check on this position.² Position checked by vertical angles only³ This station is not on Goosenest Mountain.

GEOGRAPHIC POSITIONS—Continued

Second-order triangulation, southwest Oregon

77264°—32—3

Station	Latitude and longitude	Seconds in meters	Azimuth	Back azimuth	To station	Distance		
						Logarithm (meters)	Meters	Feet
<i>Principal points</i>								
Camas, 1906.....	43 00 06.306	194.6	257 25 01.94	77 55 20.97	White.....	4.7903482	61,708.96	202,456.8
	123 46 37.721	854.4	307 22 00.23	127 44 21.28	Onion.....	4.7519090	55,481.86	185,307.6
Boliver, 1907.....	42 47 30.921	954.2	191 27 12.58	11 29 34.52	Camas.....	4.3763045	23,785.07	78,034.9
	123 50 06.242	141.9	240 27 50.89	61 00 28.45	White.....	4.8728755	74,640.67	244,883.6
			282 25 37.30	102 50 17.22	Onion.....	4.7060959	50,827.16	166,755.4
Johnson, 1906.....	42 48 54.767	1,690.0	231 06 19.64	51 19 13.54	Camas.....	4.5195697	33,080.32	108,531.0
	124 05 34.420	782.0	276 54 22.10	97 04 52.78	Boliver.....	4.3273387	21,249.01	69,714.5
Bennett, 1906.....	42 57 31.916	964.9	263 06 43.24	83 27 00.03	Camas.....	4.6098083	40,720.05	133,595.7
	124 16 22.529	510.6	297 15 06.91	117 32 59.42	Boliver.....	4.6052771	40,297.41	132,200.2
			317 16 29.84	137 23 50.91	Johnson.....	4.3364939	21,701.71	71,190.7
Sugar, 1906.....	43 03 49.601	1,530.6	285 38 03.83	105 50 20.96	Camas.....	4.4049387	25,406.14	83,353.3
	124 04 37.893	857.4	2 39 45.93	182 39 07.42	Johnson.....	4.4415828	27,642.85	90,691.6
			53 55 25.74	233 47 25.08	Bennett.....	4.2858023	19,760.70	64,831.6
Westport, 1906.....	43 18 42.323	1,306.1	334 08 06.55	154 14 50.33	Sugar.....	4.4857440	30,601.59	100,396.7
	124 14 27.880	628.3	3 47 32.64	183 46 14.15	Bennett.....	4.5942779	39,289.63	128,902.7
Cathcart, 1906.....	43 21 04.941	152.5	13 42 58.36	193 39 02.44	Sugar.....	4.5169815	32,883.77	107,886.2
	123 58 53.306	1,200.6	28 37 49.52	208 25 51.87	Bennett.....	4.6957669	49,632.59	162,326.3
			78 16 55.31	258 06 13.99	Westport.....	4.3326378	42,509.87	139,570.3
Noah, 1906.....	43 23 25.962	801.2	289 48 43.2	109 54 50.6	Cathcart.....	4.107500	12,808.6	42,023
	124 07 48.370	1,088.7	45 49 35.4	225 45 01.2	Westport.....	4.098745	12,552.9	41,184
Marshfield Hill, 1899.....	43 22 24.507	756.3	254 23 11.3	74 26 38.8	Noah.....	3.848761	7,059.3	23,180
	124 12 50.446	1,135.7	277 20 30.3	97 30 05.1	Cathcart.....	4.278968	19,009.4	62,367
			17 45 28.5	197 44 21.7	Westport.....	3.857296	7,199.4	23,620
Squirrel, 1907.....	42 35 51.579	1,591.6	141 22 13.09	321 06 10.48	Bennett.....	4.7114656	51,459.51	168,830.1
	123 52 45.197	1,030.4	190 30 12.40	10 34 22.08	Camas.....	4.6595313	45,659.52	149,801.3
Bald, 1907.....	42 40 15.151	467.5	192 30 04.02	12 33 36.73	Bennett.....	4.5155137	32,772.81	107,522.1
	124 21 35.506	806.5	232 09 06.79	52 32 53.10	Camas.....	4.7794040	60,173.32	197,413.6
			281 29 35.67	101 49 07.64	Squirrel.....	4.6048176	40,254.80	132,069.3
Butler, 1907.....	42 46 02.824	87.1	37 35 53.75	217 31 47.74	Bald.....	4.1314338	13,534.24	44,403.6
	124 15 32.879	747.5	176 58 13.92	356 57 40.14	Bennett.....	4.3282534	21,293.81	69,861.4
			236 22 15.62	56 41 56.44	Camas.....	4.6739634	47,201.24	154,850.4
Sixes, 1869.....	42 50 38.799	1,197.3	289 57 12.91	110 08 50.70	Butler.....	4.3951297	24,838.75	81,491.8
	124 32 39.778	903.3	321 48 27.91	141 55 58.88	Bald.....	4.3885356	24,464.46	80,263.8
Cape, 1907.....	42 50 12.422	383.3	240 12 19.10	60 24 12.57	Bennett.....	4.4373722	27,376.14	89,816.6
	124 33 50.678	1,150.9	317 43 06.43	137 51 25.50	Bald.....	4.3959103	24,883.43	81,638.4

TRIANGULATION IN OREGON

GEOGRAPHIC POSITIONS—Continued

Second-order triangulation, southwest Oregon—Continued

Station	Latitude and longitude			Seconds in meters	Azimuth			Back azimuth			To station	Distance		
	°	'	"		°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Principal points—Continued</i>														
Madden, 1907	42 50 26.703			824.0	334 55 12.89			154 59 36.11			Bald	4.3186695	20,829.05	68,336.6
	124 28 03.228			73.3	86 50 10.29			266 46 14.05			Cape	3.8977863	7,902.90	25,928.1
					93 25 38.71			273 22 30.74			Sixes	3.7987306	6,291.16	20,640.2
Heads, 1869	42 44 27.549			850.1	155 40 51.42			335 38 27.55			Cape	4.0674432	11,680.01	38,320.2
	124 30 18.883			429.5	195 32 00.20			15 33 32.35			Madden	4.0608287	11,503.47	37,741.0
					303 07 46.33			123 13 41.30			Bald	4.1532528	14,237.57	46,691.4
Port Orford, astronomical 2, 1907	42 44 27.848			859.3	88 25 56.88			268 25 46.83			Heads	2.5278159	337.14	1,106.1
	124 30 04.066			92.5	193 55 03.71			13 56 25.80			Madden	4.0572425	11,408.87	37,430.6
					303 55 13.16			124 00 58.09			Bald	4.1447518	13,955.71	45,786.4
Craggy, 1907	42 20 25.697			792.9	146 06 02.97			325 53 50.34			Bald	4.6461170	44,270.77	145,245.0
	124 03 31.200			714.2	207 15 32.83			27 22 49.01			Squirrel	4.5072551	32,155.49	105,496.8
Stack, 1907	42 24 59.142			1,824.8	167 36 52.08			347 33 47.71			Bald	4.4615122	28,940.91	94,950.3
	124 17 02.906			66.4	238 41 37.54			58 58 02.49			Squirrel	4.5890969	38,896.18	127,611.9
					294 21 30.42			114 30 37.53			Craggy	4.3095651	20,396.94	66,919.0
Bosley, 1907	42 12 33.305			1,027.6	167 51 54.22			347 49 28.52			Stack	4.3718164	23,540.54	77,232.6
	124 13 26.472			607.2	213 13 35.11			33 27 32.17			Squirrel	4.3002253	51,645.14	169,439.1
					223 02 50.24			43 09 30.67			Craggy	3.8395578	6,911.27	22,674.7
Grizzly, 1907	42 23 50.509			1,558.5	252 07 47.41			72 11 01.43			Stack	4.3779142	23,873.40	78,324.6
	124 21 50.599			1,157.2	331 01 36.63			151 07 15.94			Bosley	3.9875981	9,718.47	31,884.7
Sundown 2, 1907	42 18 38.038			1,173.7	172 46 55.91			352 46 19.94			Grizzly	4.1113880	12,923.74	42,400.6
	124 20 57.211			1,310.2	204 29 20.94			24 31 58.82			Stack	4.1840336	15,276.84	50,120.8
					317 24 17.59			137 29 20.71			Bosley	4.045297	11,090.3	36,415
Dolan, 1873	42 18 05.289			163.2	196 18 45.7			16 20 17.5			Grizzly	3.649418	4,460.9	14,635
	124 24 06.910			158.3	256 53 23.9			76 55 31.6			Sundown 2	3.792830	6,206.3	20,362
Red Rock, 1873	42 15 08.422			259.9	151 34 13.6			331 32 46.8			Dolan	4.207092	16,109.9	52,854
	124 21 57.918			1,327.7	190 35 43.4			0 35 48.3			Grizzly	3.820565	6,615.5	21,704
					192 07 55.4			12 08 36.2			Sundown 2	4.1716394	14,847.02	48,710.6
Pollywog, 1913	42 11 51.953			1,603.0	94 59 23.99			274 52 10.84			Bosley	4.4953948	31,289.22	102,654.7
	124 02 41.691			956.5	175 54 37.55			355 54 04.24			Stack	4.2011780	15,891.98	52,138.9
					157 02 20.21			336 58 14.71			Craggy	4.3329214	21,523.92	70,616.4
Elk, 1913	42 01 51.131			1,577.5	199 01 52.39			19 04 59.32			Bosley	4.2925353	19,612.61	64,345.7
	124 07 20.435			470.1	90 04 43.83			270 00 04.95			Pollywog	3.9814483	9,581.83	31,436.4
Packsaddle, 1913	42 01 50.913			1,570.8	137 51 54.53			317 43 09.67			Elk	4.4274592	26,758.34	87,789.7
	124 00 23.900			549.8	170 19 32.83			350 18 00.43			Bosley	4.2744500	18,812.65	61,721.2
											Pollywog			
High Divide (Calif.), 1913	41 54 25.688			792.6	157 50 06.74			337 47 23.06			Elk	4.1715015	14,842.31	48,695.1
	124 03 17.014			392.2	196 09 56.39			16 11 52.15			Packsaddle	4.1554345	14,303.24	46,926.5
Long Ridge (Calif.), 1913	41 55 01.974			60.9	84 06 26.19			264 01 14.11			High Divide	4.0344337	10,826.14	35,515.5
	123 55 29.821			687.2	127 43 06.51			307 35 11.26			Elk	4.3152396	20,665.20	67,799.1
					151 48 25.83			331 45 09.15			Packsaddle	4.1559145	14,319.06	46,978.4
Gordon (Calif.), 1913	41 47 59.248			1,827.9	127 33 35.44			307 26 05.96			High Divide	4.2919497	19,586.18	64,250.0
	123 52 03.368			77.8	159 57 39.31			339 55 21.54			Long Ridge	4.1425240	13,884.30	45,552.1
Bald Hill (Calif.), 1913	41 45 37.350			1,152.3	172 59 31.44			352 58 33.45			High Divide	4.2154654	16,423.49	53,882.7
	124 01 50.075			1,156.8	206 41 47.99			26 46 01.63			Long Ridge	4.2901385	19,504.66	63,991.5
					252 02 22.75			72 08 53.66			Gordon	4.1534799	14,239.01	46,715.8
Child (Calif.), 1913	41 42 11.049			340.9	177 23 35.51			357 23 27.16			Bald Hill	3.8042307	6,371.34	20,903.3
	124 01 37.531			867.8	230 56 44.89			51 08 07.23			Gordon	4.2322282	17,069.79	56,003.1
Red Mountain (Calif.), 1913	41 31 28.207			870.2	153 16 02.39			333 11 15.38			Child	4.3466198	22,213.64	72,879.3
	123 54 25.364			588.1	158 35 33.97			338 30 38.46			Bald Hill	4.4494214	28,146.31	92,343.4
					186 07 10.93			6 08 45.32			Gordon	4.4878593	30,751.01	100,888.9
Rattle (Calif.), 1913	41 37 29.266			902.9	343 04 10.40			163 05 47.44			Red Mountain	4.0660587	11,642.83	38,198.2
	123 56 51.600			1,194.5	142 45 26.64			322 42 16.56			Child	4.0383835	10,924.05	35,840.0
					198 53 49.13			18 57 00.92			Gordon	4.3127377	20,546.49	67,409.6
Mound (Calif.), 1914	41 33 30.058			927.3	237 10 05.82			57 15 34.19			Rattle	4.1344431	13,628.34	44,712.3
	124 05 06.275			145.4	284 08 28.87			104 15 33.89			Red Mountain	4.1853738	15,324.06	50,275.7
Klamath South 2 (Calif.), 1914	41 31 55.332			1,707.0	164 25 18.85			344 24 55.53			Mound	3.4819949	3,033.86	9,963.6
	124 04 31.116			721.3	225 53 44.52			45 58 49.47			Rattle	4.1706717	14,813.98	48,602.2
					273 21 15.73			93 27 57.33			Red Mountain	4.1482512	14,068.61	46,156.8
Flint Rock 2 (Calif.), 1914	41 31 28.942			892.9	177 15 59.46			357 15 54.36			Mound	3.5729608	3,740.77	12,272.8
	124 04 58.577			1,358.1	218 01 19.08			38 01 37.29			Klamath South 2	3.0143164	1,033.51	3,390.8
Flint Ridge (Calif.), 1872	41 31 30.443			939.2	86 25 15.86			266 24 54.70			Flint Rock 2	2.8700464	741.39	2,432.4
	124 04 26.662			618.2	166 01 51.83			346 01 25.56			Mound	3.5800931	3,802.71	12,476.1
					172 20 28.25			352 20 25.30			Klamath South 2	2.8991572	774.74	2,541.8
High Bluff (Calif.), 1871	41 30 42.404			1,306.2	166 02 39.95			346 02 29.75			Flint Rock 2	3.1700823	1,479.39	4,853.6
	124 04 43.188			1,001.5	194 29 43.82			14 29 54.78			Flint Ridge	3.1849098	1,530.77	5,022.2
<i>Supplementary points</i>														
Camas (U. S. G. S.), 1911 ¹	43 00 06.11			188.6	173 46 13			353 46 13			Camas	0.77685	5.982	19.63
	123 46 37.69			853.7										
Edson, 1907	42 52 21.342			658.6	186 12 37.7			6 13 29.7			Bill	4.208476	15,976.3	52,416
	124 19 58.360			1,324.7	207 02 16.1			27 04 43.1			Bennett	4.031880	10,761.7	35,307
					224 23 52.0			44 34 19.5			Sugar	4.473772	20,789.5	67,669
Cotton, 1907	42 57 22.306			688.3	260 09 48.5			80 10 40.0			Bennett	3.239810	1,737.0	5,699
	124 17 38.039			862.2	18 55 49.0			198 54 13.5			Edson	3.992000	9,817.5	32,210
Pilot Knob, 1907	42 50 17.483			539.5	115 15 51.5			295 11 48.5			Edson	3.952616	8,966.4	29,417
	124 14 01.111			25.2	166 33 12.7			346 31 36.5			Bennett	4.139388	13,784.4	45,224
					282 27 22.6			102 33 07.1			Johnson	4.071472	11,788.9	38,677
Salmon Mountain, 1907	42 46 18.296			564.6	54 50 16.5			234 42 23.4			Bald	4.288389	19,426.3	63,734
	124 09 58.076			1,320.3	104 41 33.4			284 26 06.2			Sixes	4.504700	31,966.9	104,878

GEOGRAPHIC POSITIONS—Continued

Second-order triangulation, southwest Oregon—Continued

Station	Latitude and longitude			Seconds in meters	Azimuth			Back azimuth			To station	Distance		
	°	'	"		°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Supplementary points—Continued</i>														
Port Orford south base, 1869.....	42	44	37.462	1,156.0	157	51	07.6	337	49	01.7	Cape	4.047697	11,160.6	36,617
	124	30	45.408	1,032.7	198	51	59.3	18	53	49.5	Madden	4.056509	11,389.6	37,367
Tower Rock, 1907.....	42	52	34.050	1,050.7	247	17	31.1	67	28	33.4	Bennett	4.378435	23,902.0	78,418
	124	32	35.319	801.6	1	37	51.5	181	37	48.5	Sixes	3.551187	3,557.8	11,673
					21	23	13.9	201	22	22.6	Cape	3.671481	4,693.3	15,398
Castle Rock, 1907.....	42	51	24.535	757.1	323	29	57.2	143	37	32.6	Bald	4.400506	25,674.7	84,234
	124	32	46.180	1,048.5	354	07	08.9	174	07	13.3	Sixes	3.151921	1,418.8	4,655
					33	21	26.6	213	20	42.6	Cape	3.425532	2,664.0	8,740
Bill, 1907.....	43	00	56.026	1,728.9	254	15	39.7	74	25	15.8	Sugar	4.297648	19,844.9	65,108
	124	18	42.037	951.9	333	20	20.5	153	21	55.6	Bennett	3.849010	7,047.1	23,120
Coquille River Lighthouse, 1907.....	43	07	26.730	824.9	323	00	13.2	143	04	47.0	Bill	4.178845	15,068.5	49,503
	124	25	22.962	519.8	326	15	55.8	146	22	04.7	Bennett	4.343578	22,068.6	72,371
					330	31	15.7	150	36	33.0	Cotton	4.330747	21,416.4	70,264
					345	13	25.4	165	17	06.8	Edson	4.460756	28,890.6	94,785
Rocky Peak, 1906.....	42	39	36.741	1,133.7	349	19	47.5	169	22	18.4	Edson	4.440183	27,553.9	90,400
	124	20	46.038	1,048.5	136	27	30.2	316	26	56.7	Stack	3.213570	1,635.2	5,365
					182	37	34.1	2	38	06.5	Bald	4.373253	23,618.5	77,488
					190	12	16.2	10	15	15.3	Edson	4.527802	33,713.4	110,608
Island Rock, 1907 ¹	42	40	00.69	21.3	165	31	17	345	30	13	Bennett	3.950166	8,514.6	27,935
	124	28	30.47	693.9	267	15	24	87	20	05	Port Orford astronomical 2	3.975904	9,460.3	31,088
Sister Rock, 1907 ¹	42	35	39.98	1,233.7	203	56	32	23	58	24	Bald	3.969075	9,291.3	30,483
	124	24	21.09	490.8	351	03	52	171	05	34	Bald	4.345561	22,159.6	72,702
Saddle Mountain, 1907.....	42	24	07.942	245.1	320	23	39.1	140	26	26.1	Craggy	3.949274	8,897.6	29,192
	124	07	38.987	891.6	97	02	14.9	276	55	54.6	Stack	4.113655	12,981.4	42,623
					147	28	25.6	327	19	00.1	Bald	4.549340	35,427.5	116,232
Collier Butte, 1907.....	42	21	55.522	1,713.1	24	42	27.0	204	38	33.0	Bosley	4.290810	19,090.2	62,632
	124	07	38.622	883.7	113	45	08.3	293	38	47.9	Stack	4.149090	14,085.8	46,246
					150	41	52.2	330	32	26.7	Bald	4.590390	38,938.6	127,751
					163	24	36.5	343	16	15.1	Edson	4.769431	58,807.3	192,987
Cape Sebastian, pole, 1907 ¹	42	19	40.35	1,245.0	286	27	14	106	30	25	Sundown 2	3.831046	6,777.1	22,235
	124	25	41.00	938.7	323	41	14	143	42	18	Dolan	3.561048	3,639.6	11,941
Sundown, 1873.....	42	18	37.257	1,149.6	77	10	30.9	257	08	23.7	Dolan	3.647161	4,437.7	14,559
	124	20	58.005	1,328.4	217	03	49.3	37	03	44.4	Sundown 2	1.480050	30,203	99,09
					12	01	57.3	192	01	17.0	Red Rock	3.818765	6,588.2	21,615
Red Mountain, 1907 ¹	42	08	26.34	812.7	109	41	45	289	31	20	Bosley	4.356125	22,705.2	74,492
	123	57	54.58	1,253.4	160	51	27	340	47	40	Craggy	4.371050	23,499.0	77,096
Small hill southwest (south) of Bosley, 1913.....	42	07	36.91	1,138.8	181	03	53	1	03	58	Bosley	3.961261	9,146.6	30,008
	124	13	33.88	778.2	242	12	46	62	20	04	Pollywog	4.228241	16,913.8	55,491
St. Georges Reef Lighthouse (Calif.), 1913.....	41	50	13.643	420.9	196	40	31.0	16	46	32.5	Elk	4.136506	13,693.2	44,925
	124	22	26.347	607.9	224	02	21.3	44	12	26.7	Bosley	4.6350708	43,158.9	141,597
					234	39	05.5	54	53	49.3	Elk	4.4768024	29,978.0	98,353
					253	32	31.8	73	45	18.9	Packsaddle	4.5716709	37,296.7	122,364
Second peak north of Preston Peak (Calif.), 1914.....	41	52	09.12	281.4	70	13	33	255	03	16	High Divide	4.4412498	27,621.7	90,622
	123	36	38.40	885.6	96	40	12	276	22	25	Gordon	4.355885	22,692.6	74,451
					118	47	52	298	31	59	High Divide	4.569328	37,096.1	121,706
Preston Peak (Calif.), 1914.....	41	50	07.01	216.3	35	39	02	215	27	12	Packsaddle	4.573096	37,419.3	122,766
	123	36	38.85	896.4	50	16	55	230	03	28	Red Mountain	4.627624	42,425.2	139,190
					67	09	06	246	52	28	Rattle	4.562272	36,498.2	119,745
					79	37	10	259	26	54	Child	4.575208	37,601.7	123,365
Preston Peak south (Calif.), 1914.....	41	49	59.64	1,840.1	36	00	10	215	48	15	Gordon	4.336441	21,699.1	71,191
	123	36	32.11	740.9	50	42	51	230	29	19	Red Mountain	4.626871	42,332.2	138,885
					67	33	49	247	17	06	Rattle	4.561981	36,473.8	119,664
Bear Mountain (Calif.), 1913.....	41	47	46.71	1,441.1	111	14	41	290	59	18	Child	4.575857	37,658.0	123,550
	123	40	15.30	353.3	124	58	26	304	40	21	High Divide	4.533617	34,167.8	112,099
					133	11	31	312	58	04	Elk	4.659184	45,623.0	149,681
Four Brothers No. 1 (Calif.), 1914.....	41	44	58.65	1,809.5	75	40	12	255	30	33	Packsaddle	4.581311	38,133.9	125,111
	123	47	06.88	159.0	128	05	44	307	54	57	Child	4.317586	20,777.2	68,167
					149	36	13	329	27	20	High Divide	4.453503	28,412.1	93,215
Four Brothers No. 2 (Calif.), 1914.....	41	44	20.95	646.4	78	38	04	258	28	34	Packsaddle	4.559133	36,235.4	118,882
	123	47	21.09	487.4	130	18	37	310	07	59	Child	4.305313	20,198.2	66,267
					150	56	53	330	48	09	High Divide	4.460789	28,892.8	94,792
Four Brothers No. 3 (Calif.), 1914.....	41	44	09.35	288.5	22	17	15	202	12	38	Packsaddle	4.569169	37,082.5	121,662
	123	47	30.36	701.6	46	29	43	226	23	30	Red Mountain	4.404340	25,371.1	83,238
					79	31	15	259	21	51	Rattle	4.253163	17,912.8	58,769
					131	07	21	310	56	49	Child	4.299291	19,920.1	65,355
Four Brothers No. 4 (Calif.), 1914.....	41	43	42.04	1,297.1	22	33	44	202	29	13	High Divide	4.461859	28,964.0	95,026
	123	47	39.77	919.2	48	01	56	227	55	49	Red Mountain	4.389331	24,509.3	80,411
					81	49	47	261	40	29	Rattle	4.235052	17,181.1	56,368
					132	38	20	312	27	54	Child	4.201564	19,568.8	64,202
Crescent City Lighthouse (Calif.), 1913 ¹	41	44	39.38	1,215.0	257	22	44	77	36	05	High Divide	4.467822	29,364.5	96,340
	124	12	06.67	154.1	287	24	36	107	31	35	Gordon	4.454359	28,468.1	93,399
Peak No. 6 (Calif.), 1914 ¹	41	39	51.73	1,595.9	53	59	42	233	49	31	Child	4.183127	15,245.0	50,016
	123	39	05.22	120.8	79	59	59	259	48	11	Red Mountain	4.421138	26,371.7	86,521
Sawtooth north (Calif.), 1914 ¹	41	36	51.30	1,582.7	58	49	24	238	41	33	Rattle	4.390101	25,066.9	82,240
	123	42	36.17	837.4	93	27	49	273	18	21	Red Mountain	4.283178	19,218.4	63,052
Sawtooth south (Calif.), 1914 ¹	41	36	45.29	1,397.2	59	14	48	239	06	58	Rattle	4.297517	19,838.9	65,088
	123	42	37.64	871.5	94	00	18	273	50	51	Red Mountain	4.280890	19,093.7	62,643
Peak No. 8 (Calif.), 1914 ¹	41	33	03.40	104.9	75	07	34	255	02	18	Rattle	4.057191	11,407.5	37,428
	123	46	29.83	691.3	119	43	14	299	36	21	Red Mountain	4.219420	16,573.7	54,378
Rock (Calif.), 1914.....	41	34	45.352	1,399.2	323	24	28.0	143	26	19.4	Klamath South 2	3.815020		

GEOGRAPHIC POSITIONS—Continued

Second-order triangulation, northwest Oregon

Station	Latitude and longitude			Seconds in meters	Azimuth			Back azimuth			To station	Distance		
	°	'	"		°	'	"	°	'	"		Logarithm (meters)	Meters	Feet
<i>Principal points</i>														
Cummins, 1908.....	44	14	08.950	276.2	229	27	15.52	49	45	43.87	Mary.....	4.6634729	46,075.80	151,167.0
Fairview, 1908.....	123	59	29.450	653.6	330	22	19.77	150	32	56.71	Roman.....	4.6162604	41,329.52	135,595.3
Cape, 1908.....	44	06	22.238	686.4	202	08	17.47	122	10	30.09	Cummins.....	3.7157932	5,197.48	17,062.1
Maple, 1908.....	124	01	58.112	1,290.4	323	19	57.27	143	32	17.37	Roman.....	4.5965461	39,769.13	130,475.9
Trail, 1908.....	43	46	07.736	238.8	207	08	17.47	122	10	30.09	Fairview.....	4.0499199	11,218.12	36,804.8
Dean, 1908.....	124	05	07.382	165.1	307	30	48.49	127	45	20.24	Roman.....	4.5477197	35,295.53	115,798.8
Burn, 1908.....	43	41	43.076	1,329.5	163	00	02.99	342	56	29.85	Cape.....	4.3680861	23,339.21	76,572.1
Schooner, 1908.....	123	54	25.628	573.9	175	28	50.13	355	27	29.19	Fairview.....	4.5150825	32,808.21	107,638.3
Burn, 1908.....	43	43	17.265	532.8	181	06	58.34	1	07	20.77	Cummins.....	4.5649985	36,728.10	120,498.8
Schooner, 1908.....	124	07	57.316	1,283.0	267	50	28.06	88	01	25.46	Roman.....	4.3256415	21,166.13	69,442.5
Table, 1908.....	43	41	53.870	1,662.6	204	12	36.46	24	16	08.19	Maple.....	4.2210185	16,634.84	54,576.1
Table, 1908.....	123	50	36.138	798.8	240	14	40.87	60	29	09.20	Roman.....	4.5061271	32,220.12	105,708.8
Foulweather, 1908.....	44	45	21.990	678.8	119	41	20.22	299	33	56.58	Trail.....	4.2180624	16,522.75	54,208.4
Iron, 1908.....	124	02	57.168	1,257.4	162	11	15.38	342	07	22.78	Maple.....	4.3894467	24,515.84	80,432.4
Bald, 1908.....	44	41	34.540	1,066.2	209	31	01.91	29	38	05.44	Roman.....	4.4264070	27,710.67	90,914.1
Bald, 1908.....	124	03	06.304	138.8	215	50	22.72	35	52	20.22	Trail.....	3.8123379	6,431.39	21,297.2
Salmon, 1908.....	44	58	30.732	948.7	179	00	36.31	99	09	57.19	Dean.....	4.2649096	18,403.89	60,380.1
Cascade, 1908.....	123	47	49.114	38.9	270	50	10.21	300	47	57.04	Burn.....	3.7010405	5,023.89	16,482.5
Hebo, 1908.....	45	01	11.324	349.6	176	16	46.58	356	16	30.83	Trail.....	3.8949564	7,851.57	25,759.7
Buzzard Butte, 1908.....	123	58	01.778	38.9	271	19	02.67	91	26	10.28	Dean.....	4.1419167	13,864.90	45,488.4
Ginger, 1908.....	45	01	00.570	12.5	280	19	20.81	80	31	37.75	Mary.....	4.3722987	23,566.70	77,318.4
Foley, 1908.....	123	58	01.778	38.9	352	09	02.33	172	13	28.87	Roman.....	4.7957057	62,474.91	204,969.8
Neahkahnie, 1875.....	45	03	41.316	1,275.4	24	32	08.66	204	25	55.84	Cummins.....	4.4548517	28,500.45	93,505.2
Saddle Mountain, 1874.....	123	58	01.778	38.9	305	06	14.54	125	27	13.95	Mary.....	4.6848946	48,405.49	158,810.3
Tillamook Head, 1874.....	45	03	41.316	1,275.4	332	47	21.35	152	56	01.78	Table.....	4.5541368	35,820.93	117,522.5
Battery (Wash.), 1873.....	46	16	36.442	1,183.3	355	26	28.36	175	28	53.94	Cummins.....	4.7634042	57,995.83	190,277.9
Scarboro Hill 2 (Wash.), 1873.....	123	58	01.778	38.9	181	38	21.57	1	38	28.00	Foulweather.....	3.8465742	7,023.83	23,044.0
Saddle Mountain 2, 1909.....	45	03	41.316	1,275.4	326	16	13.55	146	25	00.10	Table.....	4.4751178	29,861.92	97,972.0
East Battery (Wash.), 1911.....	46	16	45.065	1,391.5	3	45	24.82	183	43	27.29	Table.....	4.7508552	56,344.97	184,858.5
Fort Stevens longitude, 1911.....	123	57	38.463	824.6	32	48	02.73	212	37	16.06	Iron.....	4.5714876	37,281.00	122,312.7
					39	23	55.07	219	13	14.49	Foulweather.....	4.4978645	31,467.67	103,240.2
					287	07	17.23	107	15	54.42	Bald.....	4.2245561	16,770.89	55,022.5
					7	33	02.60	187	30	57.97	Foulweather.....	4.4707073	29,560.20	96,982.1
					305	29	37.68	125	36	51.04	Bald.....	4.2171846	16,488.63	54,096.4
					10	50	22.70	190	46	54.17	Foulweather.....	4.5384283	34,548.43	113,347.6
					29	19	37.92	209	18	13.87	Salmon.....	3.7251179	5,310.29	17,422.2
Hebo, 1908.....	45	12	52.574	1,623.0	7	03	20.38	187	01	33.94	Bald.....	4.4282543	26,807.38	87,950.5
Buzzard Butte, 1908.....	123	45	18.838	411.1	44	29	08.38	224	20	02.60	Cascade.....	4.3769794	23,822.07	78,156.2
Ginger, 1908.....	45	16	41.666	1,286.3	306	24	08.63	126	29	20.47	Hebo.....	4.0757302	11,905.02	39,058.4
Shell Point, 1866.....	123	52	37.963	827.4	349	21	18.43	169	24	43.13	Bald.....	4.5348386	34,264.04	112,414.6
Boulder Point, 1866.....	45	26	48.757	1,505.2	16	23	27.81	196	19	38.16	Cascade.....	4.3997828	25,106.31	82,369.6
Doty, 1908.....	123	43	52.475	1,140.3	4	10	31.34	184	09	29.92	Hebo.....	4.4130086	25,882.64	84,916.6
Green Hill 2, 1908.....	45	30	32.719	1,010.1	31	26	39.75	211	20	25.83	Buzzard Butte.....	4.3415494	14,030.21	46,030.8
Miami, 1875.....	123	53	14.555	316.0	299	28	11.23	119	34	51.98	Ginger.....	4.1470643	14,030.21	46,030.8
Pitcher Point, 1866.....	45	29	32.059	989.7	342	23	53.60	162	29	32.10	Hebo.....	4.5356369	34,327.08	112,621.4
Miami, 1875.....	123	55	01.442	31.3	358	13	09.87	178	13	35.92	Buzzard Butte.....	4.4094004	25,668.49	84,214.0
Crag, 1875.....	45	32	12.705	392.2	231	05	09.53	51	06	25.77	Shell Point.....	3.4745100	2,982.02	9,783.5
Foley, 1875.....	123	51	06.282	136.3	289	04	00.23	109	11	57.12	Ginger.....	4.1870013	15,381.59	50,464.4
Neahkahnie, 1875.....	45	33	43.769	1,351.0	316	40	16.6	136	45	26.0	Ginger.....	4.137949	13,738.8	45,075
Saddle Mountain, 1874.....	123	55	02.022	1,128.3	42	03	29.2	222	01	57.7	Shell Point.....	3.618751	4,156.7	13,637
Tillamook Head, 1874.....	45	33	43.769	1,351.0	45	50	49.9	225	48	02.2	Boulder Point.....	3.852295	7,117.0	23,350
Battery (Wash.), 1873.....	123	55	02.022	1,128.3	294	22	00.9	114	25	24.9	Doty.....	3.832891	6,806.0	22,329
Scarboro Hill 2 (Wash.), 1873.....	45	30	24.237	748.3	309	17	12.6	129	25	45.9	Ginger.....	4.305419	20,203.1	66,283
Saddle Mountain 2, 1909.....	123	56	30.966	672.2	329	54	02.7	149	55	55.1	Shell Point.....	3.833534	6,816.1	22,362
East Battery (Wash.), 1911.....	45	34	58.824	1,816.1	351	57	17.9	171	57	54.0	Boulder Point.....	3.894747	7,847.8	25,747
Fort Stevens longitude, 1911.....	123	56	30.966	672.2	187	48	25.9	7	48	53.7	Green Hill 2.....	3.793612	6,217.4	20,398
					266	27	58.7	86	30	18.8	Shell Point.....	3.630606	4,271.8	14,015
					309	38	32.9	129	39	36.8	Boulder Point.....	3.402168	2,524.5	8,282
					350	01	11.98	170	01	59.52	Shell Point.....	3.9212395	8,341.41	27,366.8
					4	57	24.66	184	56	55.90	Boulder Point.....	4.0054338	10,125.90	33,221.4
					24	25	19.35	204	21	12.29	Boulder Point.....	4.2593641	18,170.38	59,614.0
					45	44	32.55	225	40	54.10	Miami.....	3.9662784	9,252.91	30,357.3
					355	56	58.81	175	57	01.58	Crag.....	3.0750147	1,188.54	3,899.4
					40	33	55.81	220	30	20.11	Miami.....	4.0026507	10,061.22	33,009.2
					196	50	48.39	16	56	44.22	Saddle Mountain.....	4.5666247	36,865.89	120,950.8
					175	31	51.48	355	30	47.46	Tillamook Head.....	4.3920439	24,662.89	80,914.8
					218	23	30.08	38	34	32.20	Saddle Mountain.....	4.5049795	31,987.44	104,945.5
					317	55	35.48	138	00	40.67	Foley.....	4.1392327	13,779.48	45,208.2
					320	46	08.71	140	51	16.64	Crag.....	4.1683494	14,734.98	48,343.0
					351	24	28.81	171	25	57.95	Miami.....	4.2572962	18,084.07	59,330.9
					16	56	44.22	196	50	48.39	Foley.....	4.5666247	36,865.89	120,950.8
					38	34	32.20	218	23	30.08	Neahkahnie.....	4.5049795	31,987.44	104,945.5
					268	42	40.0	88	54	47.5	Saddle Mountain.....	4.338304	21,792.3	71,497
					355	30	47.5	175	31	51.5	Neahkahnie.....	4.392044	24,662.9	80,915
					125	2	07.9	140	44	50.3	Saddle Mountain.....	4.45795	44,237.9	145,137

GEOGRAPHIC POSITIONS—Continued

Second-order triangulation, northwest Oregon—Continued

Station	Latitude and longitude			Seconds in meters	Azimuth			Back azimuth			To station	Distance		
												Logarithm (meters)	Meters	Feet
<i>Supplementary points</i>														
Yaquina Head Lighthouse, 1908.....	44	40	36.898	1,139.0	194	37	27.8	14	38	41.2	Foulweather.....	3.958817	9,095.3	29,840
	124	04	41.572		915.6	229	41	25.8	49	42	32.8	Iron.....	3.439476	2,750.9
Life, 1908.....	44	35	16.400	506.2	320	58	03.2	141	07	56.5	Table.....	4.472372	29,673.7	97,354
	124	03	56.982		1,257.0	174	19	50.6	354	19	19.3	Yaquina Head Lighthouse.....	3.997462	9,941.7
Yaquina Lighthouse, old, 1908.....	44	37	27.565	850.9	185	27	39.5	5	28	15.1	Iron.....	4.069136	11,725.6	38,470
	124	03	42.471		936.3	306	37	41.8	126	47	03.3	Table.....	4.343558	22,057.6
Hill, first east of Yaquina Lighthouse, 1908.....	44	40	32.49	1,002.9	183	53	32.9	3	54	04.7	Foulweather.....	4.166681	14,678.5	48,158
	124	04	23.07		508.1	185	57	48.6	5	58	14.0	Iron.....	3.884517	7,665.1
Euchre Mountain, 1908.....	44	50	07.12	219.8	314	42	58.1	134	52	09.7	Table.....	4.388448	24,459.5	80,248
	123	52	11.04		242.5	4	31	14.2	184	31	04.1	Life.....	3.608672	4,061.4
Cape Lookout, summit, 1908.....	45	21	48.64	1,501.6										
	123	55	43.54		947.6									
Rock Point, 1866.....	45	29	03.626	111.9	133	05	39.9	313	05	09.1	Boulder Point.....	3.106871	1,284.9	4,216
	123	54	18.232		396.0	206	40	50.4	26	41	35.9	Shell Point.....	3.488333	3,078.5
Mud, 1866.....	45	29	26.621	821.8	70	43	29.0	250	42	22.4	Rock Point.....	3.332352	2,149.6	7,052
	123	52	44.800		972.8	93	15	05.7	273	13	28.3	Boulder Point.....	3.473027	2,971.9
Slough, 1866.....	45	29	19.579	604.4	79	55	37.3	259	54	06.4	Rock Point.....	3.449080	2,812.4	9,227
	123	52	10.726		232.9	106	22	39.4	286	22	15.1	Mud.....	2.887166	771.2
Tillamook Bay, west base, 1866.....	45	30	09.216	284.5	328	47	32.4	148	48	02.9	Slough.....	3.253242	1,791.6	5,878
	123	52	53.475		1,160.9	351	50	53.5	171	50	59.7	Mud.....	3.123358	1,328.4
Tillamook Bay, east base, 1866.....	45	30	09.920	306.3	42	16	30.4	222	15	30.0	Rock Point.....	3.437165	2,736.3	8,977
	123	52	21.497		466.7	67	34	41.9	247	33	10.7	Boulder Point.....	3.477982	3,006.0
					147	45	45.0	327	45	30.1	Shell Point.....	2.933412	857.9	2,815
					351	26	30.0	171	26	37.7	Slough.....	3.196353	1,571.6	5,156
					20	44	05.1	200	43	48.5	Mud.....	3.155120	1,429.3	4,689
					88	12	39.1	268	12	16.3	Tillamook Bay, west base.....	2.841727	694.588	2,278.83

ELEVATIONS

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

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

TABLE OF ELEVATIONS
Idaho-Washington arc

Station	Point to which elevation refers	Elevation		Station	Point to which elevation refers	Elevation	
<i>Class 1</i>				<i>Class 2—Contd.</i>			
Alkali.....	Station mark.	<i>Meters</i> 827.17	<i>Feet</i> 2,713.8	Maryhill (U. S. G. S.)	Station mark.	<i>Meters</i> 955.4	<i>Feet</i> 3,135
Job.....	do.	513.78	1,685.6	John.....	do.	725.2	2,379
Stanfield west base.....	do.	188.94	619.9	Stacker.....	do.	984.2	3,229
Stanfield east base.....	do.	231.11	758.2	Lookout.....	do.	1,988.7	6,525
<i>Class 2</i>				Huckle.....	do.	1,458.1	4,784
Nyssa.....	do.	697.0	2,287	Chinidere.....	do.	1,424.6	4,674
B. M. G.....	do.	663.6	2,177	Larch.....	do.	1,234.9	4,052
Silver.....	do.	2,652.0	8,406	Red.....	do.	1,517.3	4,978
Shafer.....	do.	2,313.9	7,591	North.....	do.	855.2	2,806
Mitchell.....	do.	1,067.5	3,502	South.....	do.	240.0	787
Oregon - Idaho boundary monument.	do.	700.9	2,300	West.....	do.	365.6	1,199
Squaw.....	do.	1,800.2	5,906	149 L eccentric (U. S. E.)	do.	59.2	194
Iron.....	do.	1,978.8	6,492	<i>Class 3</i>			
Dry.....	do.	1,978.1	6,490	Nyssa standpipe.....	Top.....	702.0	2,303
Beaver.....	do.	1,953.9	6,410	Bennet ¹	Ground.....	2,159.0	7,083
Medical.....	do.	1,988.1	6,523	Rock Creek Mountain cairn. ¹	Top.....	2,725.9	8,943
Maxwell.....	do.	2,655.6	8,713	Echo Catholic Church spire.....	Top of cross.....	209.4	687
Fanny.....	do.	2,182.6	7,161	Gate ¹	Ground.....	122.8	403
La Grande.....	do.	849.7	2,788	East.....	do.	869.1	1,211
Powder.....	do.	2,714.1	8,905	Gravel ¹	do.	125.7	412
Emly.....	do.	1,848.4	6,064	Umatilla standpipe.....	Top.....	125.7	412
Birch.....	do.	1,398.8	4,589	148 L ¹	Ground.....	96.8	318
Big Hill.....	do.	1,169.0	3,835	Tygh ¹	do.	831.8	2,729
Laurila.....	do.	422.9	1,387	Big Huckleberry.....	do.	1,281.2	4,203
Echo.....	do.	217.0	712	Observation ¹	do.	1,262.3	4,141
Expansion (U. S. G. S.)	do.	309.9	1,017	Little ¹	do.	1,290.9	4,235
Alder (U. S. G. S.)	do.	396.7	1,302	Mount Hood (U. S. G. S.)	do.	3,430	11,253
Ella.....	do.	492.2	1,615				
Montgomery (U. S. G. S.)	do.	746.7	2,450				
Toby (U. S. G. S.)	do.	449.2	1,474				

¹ No check on this elevation.

¹ Leveling by the Pacific Power & Light Co. in 1930 gave an elevation of 2,711.0 feet for this station.

TABLE OF ELEVATIONS—Continued

Idaho-California arc

Station	Point to which elevation refers	Elevation		Station	Point to which elevation refers	Elevation	
		Meters	Feet			Meters	Feet
<i>Class 1</i>				<i>Class 2—Continued</i>			
Burns bench mark C 19.	Station mark.	1,264.61	4,149.0	Kings Mountain, summit.	Ground	2,045.4	6,711
Lakeview bench mark M 16.	do.	1,443.06	4,734.4	Placidia Butte, summit.	do.	1,680.5	5,513
Klamath Falls bench mark A 15.	do.	1,274.57	4,181.7	Iron	do.	1,636.0	5,367
<i>Class 2</i>				Steens Mountain.	do.	2,851.0	9,354
Vale	do.	965.1	3,166	Beatys Butte, summit.	do.	2,412.8	7,916
Beulah	do.	1,776.6	5,829	Little Juniper, summit.	do.	1,872.5	6,143
Freezeout	do.	1,671.7	5,485	Glass Butte, summit.	do.	1,947.6	6,390
Star	do.	1,841.7	6,042	Hampton Butte, summit.	do.	1,930.4	6,333
Crow	do.	1,796.0	5,892	Crook Peak, highest point.	do.	2,387.9	7,834
Riddle	do.	1,937.4	6,356	Paisley high school.	Finial	1,345.7	4,415
Burns	do.	1,605.1	5,279	Paisley Methodist Church.	Cupola	1,348.6	4,425
Jack	do.	1,709.5	5,600	Drake Peak (U. S. G. S.).	Cairn, top.	2,560.9	8,402
Grays	do.	1,881.6	6,173	Drake Peak, lookout house.	Top of house.	2,505.0	8,218
Wagontire	do.	1,982.5	6,504	Peak, first north of station Drake.	Ground	2,482.3	8,144
Paisley, south base ¹	do.	1,354.4	4,444	Monument Mountain (U. S. G. S.).	Top of cairn.	2,224.1	7,297
Paisley, north base	do.	1,345.3	4,414	Gearhart	Ground	2,549.2	8,364
Sharp	do.	1,749.0	5,738	Mount McLoughlin (Mount Pitt), lookout house.	Top of house.	2,898.6	9,510
Diablo	do.	1,873.1	6,145	Weed Lumber Co., east chimney.	Top	1,128.3	3,702
White	do.	1,891.9	6,207	Weed Lumber Co., west chimney.	do.	1,127.3	3,696
Juniper	do.	2,035.8	6,679	Black Fox	Station mark.	1,984.4	6,510
Hart	do.	2,444.4	8,020	Turret	do.	1,871.1	6,139
Drake	do.	2,535.3	8,318	Soldier	do.	1,688.5	5,540
Round	do.	2,278.9	7,477	Dixie	do.	1,852.0	6,076
Dog	do.	2,114.0	6,936	Bald Mountain (U. S. G. S.).	Ground	1,701.3	5,582
Crane	do.	2,574.5	8,447	Burney (U. S. G. S.).	Cairn, top.	2,399.2	7,871
Cougar	do.	2,415.6	7,925	Boliver, lookout house.	Top of house.	2,472.6	8,112
Yonna	do.	2,202.6	7,226	Crater (U. S. G. S.).	Ground	2,645.3	8,679
Aspen	do.	2,502.5	8,210	Bonanza, lookout house.	Top of house.	2,124.9	6,971
Hoffman	do.	2,416.4	7,928	Granite ¹	Ground	2,467	8,064
Goosenest	do.	2,526.5	8,289				
Bally	do.	1,892.4	6,209				
Boliver	do.	2,451.5	8,043				
Mears	do.	2,174.1	7,133				
Whaleback	do.	2,601.7	8,536				
Grizzly	do.	1,906.0	6,253				
Eddy	do.	2,753.4	9,033				
<i>Class 3</i>							
Lookout Mountain, peak.	Ground	2,172.4	7,127				
Juniper Mountain, peak.	do.	1,973.7	6,475				
Burnt River Mountains.	Summit	2,381.9	7,815				
Castle Rock (U. S. G. S.).	Cairn, middle point.	2,087.0	6,847				
Owyhee Mountains	Summit	2,571.9	8,438				

¹ No check on this elevation.² The elevation of this point was determined by second-order leveling in 1931, but the adjusted elevation is not available at the time this publication goes to press.

TABLE OF ELEVATIONS—Continued

Washington-California arc

Station	Point to which elevation refers	Elevation		Station	Point to which elevation refers	Elevation	
		Meters	Feet			Meters	Feet
<i>Class 1</i>				<i>Class 3—Contd.</i>			
Oregonian.....	Top of tower.	69.22	227.1	Forest Peak.....	Top of peak.	671.9	2,204
Willamette north base.	Station mark.	101.39	332.6	Thomas, cairn.....	do.....	1,320.5	4,332
Willamette south base.	do.....	116.62	382.6	Round Peak.....	do.....	1,312.8	4,307
Roseburg latitude station.	do.....	165.24	542.1	Mount Jefferson.....	do.....	3,207.2	10,522
Central Point astronomical station.	do.....	369.92	1,213.6	Albany court-house, cupola.	Base, large cupola.	88.1	289
Gazelle astronomical station.	do.....	848.28	2,783.1	Lebanon tall brick chimney.	Top of chimney.	135.3	444
Redding astronomical station.	do.....	202.16	663.3	Corvallis open cupola.	Bottom of cupola, top of roof.	98.2	322
<i>Class 2</i>				Corvallis closed cupola.	do.....	96.3	316
Davis.....	do.....	900.3	2,954	Cannibal Peak, highest wooded peak.	Top of peak.	869.4	2,852
Star.....	do.....	1,328.7	4,359	Alsea Peak (Grass Mountain).	do.....	1,100.8	3,612
Barnes.....	do.....	383.5	1,258	Left Nipple.....	do.....	1,243.4	4,079
Warren.....	do.....	38.9	128	Hayrick (Three Fingered Jack).	do.....	2,375.2	7,793
Rocky Butte.....	do.....	185.3	608	Mount Washington.	do.....	2,368.0	7,769
Harney.....	do.....	38.7	127	Nebo.....	do.....	1,037.4	3,404
River.....	do.....	50.2	165	North Sister.....	do.....	3,068.4	10,067
Cem.....	do.....	325.8	1,069	Middle Sister.....	do.....	3,059.6	10,038
Hill.....	do.....	296.8	974	South Sister.....	do.....	3,155.2	10,352
Fir.....	do.....	345.9	1,135	St. Mary Butte (Broken Top).	do.....	2,789.6	9,152
Monument, General Land Office.	do.....	289.7	950	Ball Butte (Bachelor Butte).	do.....	2,756.6	9,044
Hult.....	do.....	383.3	1,258	Prairie Peak.....	do.....	1,047.6	3,437
Yam.....	do.....	354.4	1,163	Herman Peak.....	do.....	634.7	2,082
Peterson.....	do.....	437.2	1,434	Seavies (U. S. G. S.).	do.....	607.3	1,992
Mary.....	do.....	1,248.8	4,097	Mount Zion.....	do.....	1,406.4	4,614
Spencer.....	do.....	626.2	2,054	Diamond Peak.....	do.....	2,679.7	8,792
Roman.....	do.....	872.3	2,862	Old Bailey (Mount Bailey).	Top.....	2,548.3	8,361
Twin.....	do.....	389.8	1,279	Quartz Peak.....	Top of peak.	1,686.4	5,533
Ridge.....	do.....	361.0	1,184	Dodson (U. S. G. S.).	do.....	984.5	3,230
Rauch.....	do.....	202.2	663	High Rock (Highrock Mountain).	Top.....	1,893.8	6,213
Yellow.....	do.....	746.3	2,448	Liao (Liao) Rock.....	do.....	2,484.0	8,150
Fairview.....	do.....	1,806.3	5,926	Mount Scott.....	Top of peak.	2,717.7	8,916
Scott.....	do.....	1,294.6	4,247	Union Peak.....	Top.....	2,347.9	7,703
White.....	do.....	1,222.7	4,011	Lost Peak (Pelican Butte).	do.....	2,446.2	8,026
Black.....	do.....	1,874.1	6,149	Kerby Peak.....	do.....	1,689.5	5,543
Rose.....	do.....	453.3	1,487	Greyback.....	Top of peak.	2,149.5	7,052
Burg.....	do.....	608.7	1,997	Wagner Butte.....	Highest summit.	2,211.4	7,255
Onion.....	do.....	1,597.1	5,240	Ashland Peak, cairn.	Summit.....	2,296.7	7,535
Rust.....	do.....	1,891.2	6,205	Siskiyou Peak.....	Top of peak.	2,178.4	7,147
Soda.....	do.....	1,867.4	6,094	Pilot Rock.....	Summit.....	1,803.9	5,918
Sterling.....	do.....	2,239.3	7,347	Goosenest, tall tree.	Tree top.....	2,398.5	7,869
Spur.....	do.....	2,786.9	9,078	Marble Mountain.....	Summit.....	2,533.3	8,311
Round (Calif.).....	do.....	1,043.4	3,423	Mount Shasta.....	Top of peak.	4,316.3	14,161
<i>Class 3</i>				Black Butte, cairn.....	Top of cairn.	1,933.8	6,344
Mitchell (Wash.).....	Top of peak.	1,213.7	3,982	China Mountain (not the cairn).	Summit.....	2,606.2	8,551
Eagle (Old Baldy), cairn.	do.....	1,283.0	4,209	Russian Peak, north point.	Highest summit.	2,494.3	8,183
Squaw, cairn.....	do.....	1,455.9	4,777	Sawtooth.....	Summit.....	2,717.4	8,915
Sheridan Peak.....	do.....	941.1	3,088	Thompson Peak.....	Top.....	2,555.0	8,383
White church spire west of Brooks.	Top of square part.	72.0	236	Redding Court-house.	Tangent to roof.	198.2	650
Arquett (Soosap Peak), cairn.	Top of peak.	1,417.4	4,650				
Table Rock, cairn.....	do.....	1,487.8	4,881				
Chemawa tank.....	Foot of tank, top of tower.	77.0	253				
Salem Capitol, dome.	Top, large part of dome.	100.4	329				
Monmouth Peak (Bald Mountain).	Top of peak.	984.6	3,230				

TABLE OF ELEVATIONS—Continued

Second-order triangulation, southwest Oregon

Station	Point to which elevation refers	Elevation		Station	Point to which elevation refers	Elevation	
		Meters	Feet			Meters	Feet
<i>Class 1</i>							
U. S. G. S. bench mark Marshfield.	Bronze tablet marked 11.	3.28	10.8	Butler.....	Station mark	801.4	2,925
<i>Class 2</i>							
Camas.....	Station mark.	995.6	3,266	Cotton.....	do.....	566.4	1,858
Boliver.....	do.....	1,309.8	4,297	Salmon Mountain.	Top of peak.	962.4	3,157
Johnson.....	do.....	890.8	2,923	Port Orford astronomical 2.	Station mark.	74.1	243
Bennett.....	do.....	661.5	2,170	Heads.....	do.....	78.2	257
Sugar.....	do.....	453.8	1,489	Madden.....	do.....	242.4	795
Westport.....	do.....	216.8	711	Rocky Peak.....	Top of peak.	971.3	3,187
Cathcart.....	do.....	557.6	1,829	Sixes.....	Station mark.	60.5	198
Marshfield Hill.....	do.....	70.6	232	Saddle Mountain (Curry County).	Top of peak.	1,332.9	4,373
Noah.....	do.....	279.6	917	Collier Butte.....	Top of sharp peak.	1,315.4	4,316
Edson.....	do.....	841.8	2,762	Small Hill southwest (south) of Bosley.	Bushes.....	625.5	2,052
Bill.....	do.....	464.0	1,522	Preston Peaks south.	Top of peak.	2,206.0	7,238
Bald (Curry County).	do.....	900.5	2,954	Bear Mountain.....	do.....	1,948.1	6,391
Cape (Curry County).	do.....	56.0	184	Second peak north of Preston Peak.	do.....	2,069.9	6,791
Squirrel.....	do.....	1,611.0	5,285	Four Brothers No. 1.....	do.....	1,588.7	5,212
Stack.....	do.....	1,062.7	3,487	Four Brothers No. 2.....	do.....	1,608.7	5,278
Craggy.....	do.....	1,368.3	4,489	Four Brothers No. 3.....	do.....	1,611.2	5,286
Bosley.....	do.....	1,037.4	3,404	Four Brothers No. 4.....	do.....	1,602.2	5,257
Grizzly.....	do.....	705.4	2,314	Preston Peak.....	do.....	2,217.2	7,274
Sundown 2.....	do.....	648.0	2,126	Peak No. 6.....	do.....	1,911.3	6,271
Dolan.....	do.....	216.1	709	Sawtooth north.....	do.....	1,759.1	5,771
Red Rock.....	do.....	394.6	1,295	Sawtooth south.....	do.....	1,753.2	5,752
Pollywog.....	do.....	811.1	2,661	Peak No. 8.....	do.....	1,575.2	5,168
Elk.....	do.....	504.6	1,656	Mound.....	Station mark.	244.8	803
Packsaddle.....	do.....	815.7	2,676	Klamath south 2.....	do.....	144.2	473
High Divide.....	do.....	708.8	2,325				
Long Ridge.....	do.....	1,056.0	3,465				
Bald Hill.....	do.....	585.2	1,920				
Gordon.....	do.....	1,258.1	4,121				
Child.....	do.....	698.2	2,291				
Rattle.....	do.....	1,100.5	3,611				
Red Mountain.....	do.....	1,287.7	4,225				

Second-order triangulation, northwest Oregon

Station	Point to which elevation refers	Elevation		Station	Point to which elevation refers	Elevation	
		Meters	Feet			Meters	Feet
<i>Class 2</i>							
Burn.....	Station mark	134.1	440	Hebo.....	Station mark	961.0	3,163
Dean.....	do.....	479.0	1,572	Buzzard Butte.....	do.....	613.8	1,996
Trall.....	do.....	268.4	881	Ginger.....	do.....	468.4	1,537
Maple.....	do.....	343.8	1,128	Shell Point.....	do.....	2.6	9
Cape (Lane County).	do.....	431.7	1,416	Tillamook Head.....	do.....	346.3	1,136
Fairview.....	do.....	703.0	2,306	Battery.....	do.....	81.7	268
Cummins.....	do.....	765.6	2,479	Scarboro Hill 2.....	do.....	207.3	680
Table.....	do.....	838.9	2,752	Saddle Mountain 2.....	do.....	995.6	3,266
Life.....	do.....	36.0	118	<i>Class 3</i>			
Iron.....	do.....	198.6	652	Doty.....	Top of peak.	438.3	1,438
Yaquina Head Lighthouse.	Center of ball.	51.9	170	Boulder Point.....	Station mark.	0.8	3
Bald (Lincoln County).	Station mark	849.7	2,788	Euchre Mountain.....	Top of trees.	786.3	2,580
Foulweather.....	do.....	315.0	1,033	Cape Lookout, summit.	do.....	605.8	1,988
Cascade.....	do.....	477.1	1,565	Green Hill 2.....	Station mark.	126.8	416
Salmon.....	do.....	180.9	594				

DESCRIPTIONS OF TRIANGULATION STATIONS

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

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

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

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

MARKING OF STATIONS

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

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

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

the same as for the station mark except that the words "reference mark" take the place of the words "triangulation station."

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

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

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

STANDARD NOTES ON THE MARKING OF STATIONS

Surface marks

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

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

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

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

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

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

Underground marks

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

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

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

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

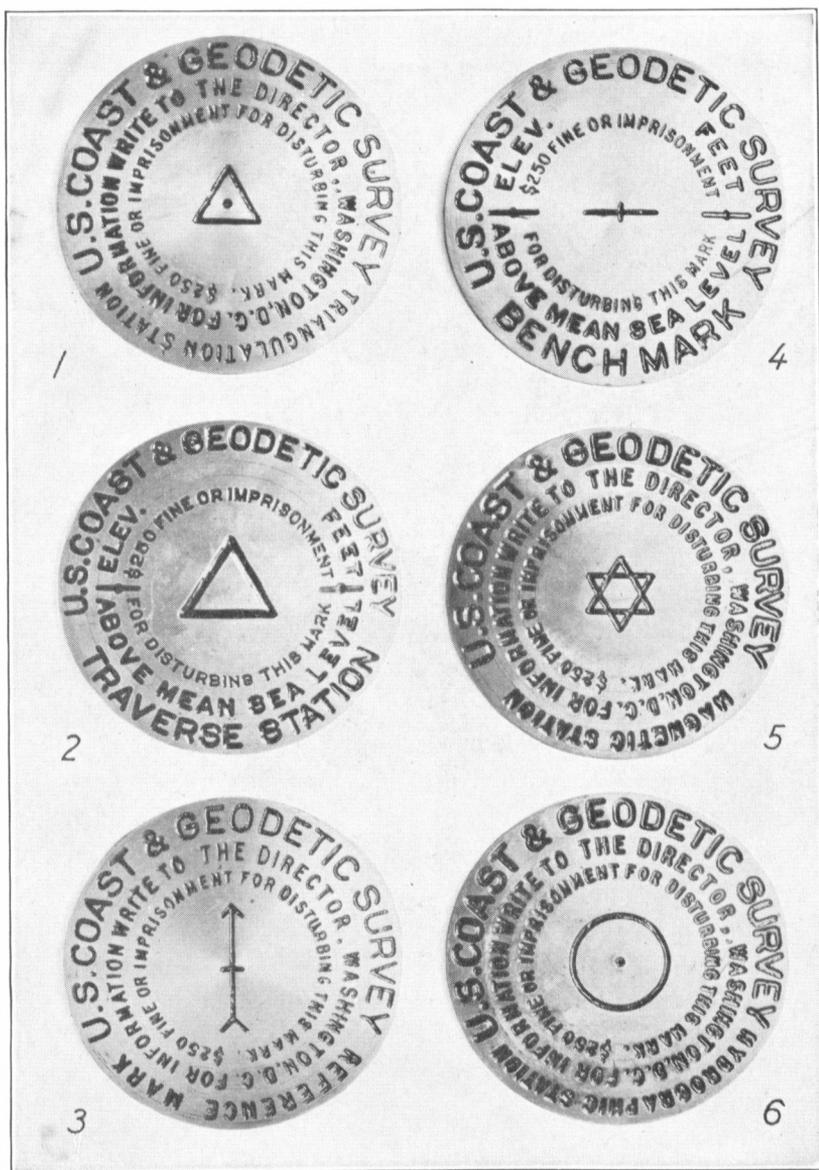


FIGURE 2.—STANDARD MARKS OF THE UNITED STATES COAST AND GEODETIC SURVEY

- | | |
|--------------------------------|-------------------------------|
| 1. Triangulation station mark. | 4. Bench mark. |
| 2. Traverse station mark. | 5. Magnetic station mark. |
| 3. Reference mark. | 6. Hydrographic station mark. |



FIGURE 3.—OLD-TYPE STATION MARK

Reference marks

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

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

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

Witness marks

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

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

ADDITIONAL NOTES ON THE MARKING OF STATIONS

Station marks

Note 16.—A $\frac{3}{8}$ -inch copper bolt 3 inches long cemented into a drill hole in the rock, and directly above the bolt in the same drill hole an old-type station mark, described on page 41. A cross in the top of the copper bolt and another in the polished center of the disk mark the station.

Note 17.—This marking is similar to that described in note 16, except that the copper bolt and the disk are in separate boulders and the boulder containing the bolt is at some distance beneath the surface. The cross in the disk is directly above the one in the bolt.

Note 18.—The station is marked by an old-type station mark, described on page 41, cemented into a drill hole in the rock. No underground mark was used.

Reference mark

Note 19.—A drill or punch hole in the top of a $\frac{3}{8}$ -inch copper bolt 3 inches long, which is leaded or cemented into a drill hole in a rock with the top of the bolt flush with the surface.

IDAHO-WASHINGTON ARC

Principal points

Silver (Owyhee County, Idaho, C. V. Hodgson, 1915).—About 5 miles southeast of Silver City and $2\frac{1}{2}$ miles southeast of War Eagle Mountain, on the highest point of what is known locally as Cinnabar or Quicksilver Mountain. The station is marked by a bronze tablet in a boulder as described in note 5. The reference mark, a bronze tablet in a boulder, note 12d, is 11.63 meters (38.2 feet) from the station in azimuth $337^{\circ} 14'$.

Shafer (Boise County, Idaho, C. V. Hodgson, 1915).—About 12 miles northeast of Boise on the highest point of Shafer Butte, which is the highest in this group of hills. It is about 6 miles by trail north of where the divide is crossed by a wagon road which leads up Stuarts Gulch around the head of Dry Creek and over to an old sawmill on Daggett Creek. The station is marked by a bronze tablet in a boulder as described in note 5. The reference mark, a bronze tablet in a boulder, note 12d, is on the south side of the remains of a large cairn, 9.15 meters (30.0 feet) from the station in azimuth $64^{\circ} 03'$. It is $3\frac{1}{2}$ feet higher than the station.

Dry (Malheur County, Oreg., C. V. Hodgson, 1916; 1920).—About 22 miles, air line, northwest of Vale, 8 miles, air line, southwest of Brogan, 6 miles, air line, southeast of Juniper Mountain, and 6 miles southwest of Charles Pritchard's ranch, on the highest point of the west end of a bald ridge. The station is marked by a bronze tablet in a boulder as described in note 5. The reference mark, a bronze tablet in a boulder, note 12d, is 22.25 meters (73.0 feet) from the station in azimuth $132^{\circ} 59'$. The U. S. Geological Survey Station, Dry Ridge,

marked by a cairn about 7 feet in diameter at the base and 10 feet high, is 3.70 meters (12.1 feet) from the station in azimuth $30^{\circ} 47'$.

Squaw (Gem County, Idaho, C. V. Hodgson, 1915; 1920).—On or near the line between Canyon and Boise Counties, about 11 miles north and 6 miles east of Emmett, about 5 miles east of the Van Deusen ranch, $2\frac{1}{2}$ miles E. 10° N. of H. M. Shearer's house, on the highest and most northerly butte of Squaw Mountain, about one-fourth mile south of the Cold Springs, well known to the ranchers of that vicinity. The station is marked by a bronze tablet in a bowlder as described in note 5, the bowlder extending 4 inches above the surface of the ground. The reference mark, a bronze tablet in a bowlder, note 12d, is 18 inches above the ground and at the same elevation as the station, 5.56 meters (18.2 feet) distant in azimuth $156^{\circ} 39'$.

Iron (Washington County, Idaho, C. V. Hodgson, 1916).—About 1 mile south of Mineral, Idaho, 6 miles east of the Snake River, 22 miles, air line, and 27 miles by road north of Weiser, on a bald peak known as Iron Mountain, the northeastern and higher of two peaks whose tops are nearly level. An old freight road leading from Weiser to Mineral passes around the peak about 250 meters (820 feet) south of the station and 300 feet below it. This road is known as the Jenkins Creek and Sheep Creek road. The station is marked by a bronze tablet in a bowlder as described in note 5. The reference mark, a bronze tablet in a bowlder, note 12d, is 17.31 meters (56.8 feet) from the station in azimuth $227^{\circ} 32'$. The U. S. Geological Survey Station of the same name is 41.30 meters (135.5 feet) from the station in azimuth $212^{\circ} 35' 30''$.

Nyssa (Canyon County, Idaho, C. V. Hodgson, 1915; 1920).—Three-fourths mile east of Nyssa, Oreg., on a small sand hill covered with sagebrush on the east bluff of the Snake River and about one-eighth mile south of the east end of the wagon bridge across the Snake River at Nyssa. The station is marked by a bronze tablet in concrete as described in notes 1a and 7a. The reference mark, a bronze tablet in concrete, note 11a, is 1 foot lower than the station and 9.66 meters (31.7 feet) distant in azimuth $146^{\circ} 54'$.

Beaver (Baker County, Oreg., C. V. Hodgson, 1916).—About 12 miles south and 3 miles east of Baker, on the northern and higher of the two bald grassy knobs on Beaver Mountain or Bald Ridge, which lies just south and east of the head of Beaver Creek, and about $1\frac{1}{2}$ miles south of Echam & Sons' sawmill on Beaver Creek. The station is marked by a nail in a block of concrete and covered by a cairn. The reference mark is a hole in rock, flush with the surface of the ground, 16.48 meters (54.1 feet) from the station in azimuth $261^{\circ} 47'$.

Maxwell (Baker County, Oreg., C. V. Hodgson, 1916).—About 13 miles, air line, northwest of Baker, 7 miles southwest of Haines, 4 miles southwest of Rock Creek Power Plant, and one-fourth mile north of the trail leading over the ridge from the Maxwell mine to the Elkhorn mine, on the highest point of the mountain to the north of the trail. The station is about $1\frac{1}{2}$ miles northeast of the Maxwell mine and is marked by a bronze tablet in a bowlder as described in note 5. The reference mark, a bronze tablet in a bowlder, note 12d, is 9.82 meters (32.2 feet) from the station in azimuth $146^{\circ} 37'$.

Medical (Baker County, Oreg., C. V. Hodgson, 1916).—On the line between Union and Baker Counties, about 7 miles, air line, and 10 miles by trail from Medical Springs, on the highest point, at the south end of a bald ridge known as Flagstaff Butte, at the head of Big Creek. The trail from Medical Springs to Sand Pass goes around the butte on its west side near the top. The station is marked by a bronze tablet in a bowlder as described in note 5. The reference mark, a bronze tablet in a bowlder, note 12d, is 62.21 meters (204.1 feet) from the station in azimuth $62^{\circ} 11' 10''$. Small cairns were placed over both the station and the reference marks.

Fanny (Union County, Oreg., C. V. Hodgson, 1916).—About 18 miles east of La Grande and 5 miles east of Cove post office and about $1\frac{1}{2}$ miles west of Mount Fanny ranger station. The station is on the easternmost and highest peak on Mount Fanny and is marked by a bronze tablet in a bowlder as described in note 5. The reference mark, a bronze tablet in a bowlder, note 12d, is 8.195 meters (26.89 feet) from the station in azimuth $49^{\circ} 12'$. The U. S. Geological Survey station of the same name is 6.07 meters (19.9 feet) from the station in azimuth $236^{\circ} 28'$.

Powder (Baker County, Oreg., C. V. Hodgson, 1916).—About 10 miles, air line, north of west from Haines and $1\frac{1}{2}$ miles north of the North Powder River on the easternmost and highest of the three peaks on the highest ridge north of the North Powder River, on what is known as North Powder Mountain and also as the

Three Sisters Peak. The station is very difficult to reach by pack animals. It is marked by a bronze tablet in a boulder as described in note 5. The reference mark, a bronze tablet in a boulder, note 12d, is 4.81 meters (15.8 feet) from the station in azimuth $119^{\circ} 56'$.

Emily (Union County, Oreg., C. V. Hodgson, 1916).—About 7 miles direct and 12 miles by road and trail north of La Grande, on the highest bald point at the edge of the timber at the south end of the long ridge known locally as Mount Emily. The station is easily located by the Forest Service lookout tower, which is used as a witness mark. The station is marked by a bronze tablet in rock as described in note 2a. The reference mark, a bronze tablet in a boulder, note 12d, is 28.41 meters (93.2 feet) from the station in azimuth $234^{\circ} 32'$. The northwest corner post of the *State Forest Service lookout tower* is 34.4 meters (113 feet) from the station in azimuth $307^{\circ} 02'$. The U. S. Geological Survey station of the same name is on Mount Harris about 10 miles east of this station.

La Grande (Union County, Oreg., C. V. Hodgson, 1916).—Opposite the freight depot, southwest of the intersection of Chestnut Street with the street running south of the railroad tracks, on a lot formerly occupied by a building which had been burned. The station is not marked. Reference mark No. 1, a bronze tablet in concrete, note 11a, is in the southwest corner of the small sodded park between the passenger and freight depots, 49.79 meters (163.4 feet) from the station in azimuth $279^{\circ} 53' 24''$. Reference mark No. 2, a bronze tablet in concrete, note 11a, with its top 1 inch below the surface, is 10 feet north of the north edge of the sidewalk, 87.00 meters (285.4 feet) from the station in azimuth $149^{\circ} 58' 17''$. Reference mark No. 3 is a small cross chiseled in the concrete pavement about 15 inches back from the corner of the curb at the southwest corner of the intersection of Chestnut Street with the street along the south side of the railroad, 10.535 meters (34.56 feet) from the station in azimuth $274^{\circ} 46'$. *Precise level B. M. 2782A* (see p. 48) is 69.43 meters (227.8 feet) from the station in azimuth $16^{\circ} 00' 15''$. *La Grande astronomical* is 3.42 meters (11.2 feet) from reference mark No. 2 in azimuth $251^{\circ} 40'$.

Birch (Umatilla County, Oreg., C. V. Hodgson 1916).—About 9 miles east and 6 miles south of Pilot Rock and 5 miles east of Charles Manning's ranch. The station is best located by going east $1\frac{1}{2}$ miles from Pilot Rock and taking the road known as Ridge Road, leading south and southeast over the ridge and following that to a point about 16 miles from Pilot Rock, when the station will lie about one-half mile to the north on a bald knob, with trees on the north and east slopes, which makes out to the north from the main ridge. The station is on the highest point of the knob and is marked by a bronze tablet in rock as described in note 2. The reference mark, a bronze tablet in rock, note 12a, is 6.77 meters (22.2 feet) from the station in azimuth $170^{\circ} 32'$.

Big Hill (Umatilla County, Oreg., C. V. Hodgson 1916; 1931).—About 19 miles southeast from Pendleton, Oreg., along the Old Oregon Trail, 11 miles northwest from Meacham, and about 800 feet north of the highway at mileage 250.5, on a bald hill, the north slope of which is covered with pine timber. About one-third mile to the eastward on the south side of the road and on the same ridge is another bald knob about 10 feet higher than the one on which the station is located. The station is marked by a bronze tablet in a boulder as described in notes 4 and 8a. The reference mark, a bronze tablet in a boulder, note 12c, is 59.62 meters (195.6 feet) from the station in azimuth $190^{\circ} 24' 14''$. Two witness marks, triangular blazes on trees, note 15a, are, respectively, 21.8 meters (71.5 feet) from the station in azimuth $181^{\circ} 09'$ and 20.7 meters (67.9 feet) in azimuth $194^{\circ} 27'$.

Alkali (U. S. G. S.) (Umatilla County, Oreg., C. V. Hodgson, 1916).—Seventeen miles southeast of Echo, 12 miles west and 5 miles north of Pilot Rock, $1\frac{1}{2}$ miles north and three-fourths mile west of the Reeder ranch in the SW. $\frac{1}{4}$ sec. 29, T. 1 N., R. 30 E., on the uncultivated top of a rounded knoll of land owned by the Slusher brothers. The station is identical with the U. S. Geological Survey station of the same name and is marked by a U. S. G. S. marker. The reference mark, a bronze table in concrete, note 11c, is 3.16 meters (10.4 feet) from the station in azimuth $271^{\circ} 43'$.

Laurila (Umatilla County, Oreg., C. V. Hodgson, 1916; 1931).—About 2 miles north and 12 miles east of Stanfield, Oreg., 9 miles north and 7 miles west of Pendleton, 192 feet east and 2 feet south of a T intersection of the fence at the quarter corner between sections 17 and 20, T. 4 N., R. 31 E., 2 feet south of the

For notes in regard to marking of stations see pp. 42 and 43.

east-and-west section-line fence, on land owned by John Laurila, who lives 1 mile south on the Missouri Gulch wagon road. The station is marked by a bronze tablet in concrete as described in notes 1b and 7a.

Job (U. S. G. S.) (Umatilla County, Oreg., C. V. Hodgson, 1916).—About 9 miles southwest of Echo and 3 miles southwest of the Spike ranch on the highest part of a dome-shaped hill locally known as Service Butte. The station is identical with the U. S. Geological Survey station of the same name and is marked by a U. S. G. S. tablet cemented into the top of a large boulder about 4 inches above the surface of the ground. The reference mark, a bronze tablet in rock, note 12a, is 37.65 meters (123.5 feet) from the station in azimuth $190^{\circ} 23' 41''$.

Expansion (U. S. G. S.) (Benton County, Wash., C. V. Hodgson, 1916; 1925).—On the highest point of the group of hills just north of the Columbia River, 3 miles northeast of Umatilla, Oreg., 2 miles northeast of the Umatilla ferry landing on the Washington side of the Columbia River, and one-third mile north of the wagon trail leading from the ferry landing northeast over the hills. The station is identical with the U. S. Geological Survey station of the same name and is marked by a U. S. G. S. metal station mark cemented into the top of a boulder about flush with the surface of the ground. The reference mark, a bronze tablet in rock, note 12a, is 13.325 meters (43.72 feet) from the station in azimuth $93^{\circ} 38'$.

Stanfield west base (Morrow County, Oreg., C. V. Hodgson, 1916).—Thirteen miles west of Stanfield, 7 miles south of Irrigon, 5 miles west and one-half mile north of the Stapish ranch, on the east side of an abandoned wagon trail leading from Irrigon to Sand Hollow. The 20-foot swath cleared through the sagebrush along the base line will locate the station for some years to come. The station is marked by a bronze tablet in concrete as described in notes 1a and 7a. The reference mark, a bronze tablet in concrete, note 11a, is 22.74 meters (74.6 feet) from the station in azimuth $175^{\circ} 11'$. A U. S. Geological Survey bench mark, stamped 620, is 9.458 meters (31.03 feet) from the station in azimuth $92^{\circ} 08'$.

Stanfield east base (Umatilla County, Oreg., C. V. Hodgson, 1916).—Three and one-half miles west and one-half mile south of Stanfield, a station on the Oregon-Washington Railroad & Navigation Co. The station is near the west face of the middle mound of a prominent low hill called Emigrant Butte. A smaller hill lies about one-half mile to the southwest with a wagon trail between. The station is marked by a bronze tablet in concrete as described in notes 1a and 8b. Reference mark No. 1, a bronze tablet in concrete, note 11a, is 18.365 meters (60.25 feet) from the station in azimuth $7^{\circ} 57'$. Reference mark No. 2, a nail in a wooden plug set in a block of concrete, is 11.850 meters (38.88 feet) from the station in azimuth $300^{\circ} 03'$.

Echo (Umatilla County, Oreg., C. V. Hodgson, 1916).—In the town of Echo, about 225 meters northeast of the railroad depot, 25 meters east of the upper irrigation canal, on a point of ridge nearest the town. The station is marked by a bronze tablet in concrete as described in notes 1a and 7a, except that the underground mark bears an iron bolt in place of the usual metal mark. The reference mark, a bronze tablet in concrete, note 11a, is 9.530 meters (31.27 feet) from the station in azimuth $200^{\circ} 28'$. The center chimney of the concrete schoolhouse at Echo is in azimuth $0^{\circ} 38' 26''$, and the center of the red wooden water tank at Echo is in azimuth $42^{\circ} 03' 08''$.

Alder (U. S. G. S.) (Klickitat County, Wash., C. V. Hodgson, 1916; 1925).—On the highest point of a ridge about 2 miles north of the Columbia River and about the same distance west of north of Alderdale, Wash. The station is identical with the U. S. Geological Survey station of the same name and is marked by a U. S. G. S. marker in a boulder as described in note 5. The reference mark, a bronze tablet in rock, note 12b, is 18.88 meters (61.9 feet) from the station in azimuth $253^{\circ} 49'$. The east gable of the Alderdale schoolhouse is in azimuth $324^{\circ} 06' 30''$.

Ella (Morrow County, Oreg., C. V. Hodgson, 1916).—About 5 miles north and about one-half mile east of Ione, $3\frac{1}{2}$ miles south and $1\frac{1}{2}$ miles east of what was formerly Ella post office, 1 mile south and one-half mile west of U. S. Geological Survey station Ella, on a flat-topped ridge in a cultivated field in the NE. $\frac{1}{4}$ sec. 14, T. 1 N., R. 24 E., on the highest point in the vicinity. The fence line to the west is about 135 meters distant. The station is marked by a bronze tablet in concrete as described in notes 1a and 7a. The reference mark, a bronze tablet in concrete, note 11a, is 9.30 meters (30.5 feet) from the station in azimuth $181^{\circ} 01'$.

Toby (U. S. G. S.) (Gilliam County, Oreg., C. V. Hodgson, 1916).—About 15 miles south and 2 miles east of Arlington, Oreg., one-half mile south and 1 mile

east of the Toby ranch, in a cultivated field on the highest point of a ridge and just east of three large cisterns which are used for storing water for the Toby ranch. The station is identical with the U. S. Geological Survey station of the same name and is marked by an iron pipe and cap extending 8 inches above the surface. The reference mark, a bronze tablet in concrete, note 11a, is 7.63 meters (25.0 feet) from the station in azimuth $168^{\circ} 13'$.

Montgomery (U. S. G. S.) (Klickitat County, Wash., C. V. Hodgson, 1916).—On the highest part of a ridge about 8 miles northwest of Arlington, Oreg., and 7 miles northwest of Roosevelt, Wash., on land formerly owned by a Mr. Montgomery. Fred Emily's ranch is about 1 mile to the east and a conspicuous rocky knob near the edge of the bluff is 135 paces to the southwest. The hill is covered with large boulders. The station is identical with the U. S. Geological Survey station of the same name and is marked by a U. S. G. S. marker in a boulder as described in note 5. The reference mark, a bronze tablet in rock, note 12b, is 11.091 meters (36.39 feet) from the station in azimuth 312° .

John (Sherman County, Oreg., C. V. Hodgson, 1916).—In the northwest corner of the NW. $\frac{1}{4}$ sec. 17, T. 2 S., R. 18 E., on the highest part of a knoll in a cultivated field now leased by Joseph Eddy. Moro, Oreg., is about 7 miles north and 7 miles west of the station. The station is marked by a bronze tablet in concrete as described in notes 1a and 7a. Reference mark No. 1, a bronze tablet in concrete, note 11a, is 139.23 meters (456.8 feet) from the station in azimuth $179^{\circ} 57' 43''$. Reference mark No. 2, a bronze tablet in a boulder, note 12d, is at the northwest corner of section 17 and 201.88 meters (662.3 feet) from the station in azimuth $130^{\circ} 13' 28''$. Permission was given the owner of the land to remove the surface mark, but the underground mark can be recovered from the reference marks.

Maryhill (U. S. G. S.) (Klickitat County, Wash., C. V. Hodgson, 1916).—About 8 miles southeast of Goldendale, 5 miles northeast of Maryhill, and 5 miles east of the Maryhill-Goldendale road, on the highest point of the hills overlooking the Columbia River. The station is identical with the U. S. Geological Survey station of the same name and is marked by a U. S. G. S. marker in a boulder according to note 5. The reference mark, a bronze tablet in rock, note 12b, is 12.180 meters (39.96 feet) from the station in azimuth $179^{\circ} 19'$.

Stacker (Klickitat County, Wash., C. V. Hodgson, 1916).—About 9 miles northeast of The Dalles, Oreg., and 10 miles southwest of Centerville, Wash., on a high bald hill on the first high ridge north of the Columbia River, 1 mile south of the Lyle-High Prairie-Centerville road and 1 mile east of the steep road which leads north from Grand Dalles over the ridge to the Lyle-High Prairie-Centerville road. The station is on land belonging to Leo F. Brun and is marked by a bronze tablet in a boulder as described in notes 5 and 9a. The underground mark is about 2 feet below the surface. The reference mark, a bronze tablet in a boulder, note 12d, is 9.88 meters (32.4 feet) from the station in azimuth $142^{\circ} 49'$.

Lookout (Hood River County, Oreg., C. V. Hodgson, 1916).—On the highest part of Lookout Mountain near the U. S. Geological Survey station of the same name marked by a cairn which was not removed. A Forest Service ranger cabin and lookout station is near by, a little to the south and west. Dufur is about 24 miles by road to the northeast. The station is marked by a bronze tablet in a boulder, as described in note 5. The reference mark, a bronze tablet in a boulder, note 12d, is 12.13 meters (39.8 feet) from the station in azimuth $189^{\circ} 47'$.

Chinidere (Hood River County, Oreg., C. V. Hodgson, 1916).—On the highest point of Chinidere Mountain, about 10 miles southeast of Cascade Locks, Oreg., 1 mile west of Wahtum Lake, and $10\frac{1}{2}$ miles by trail south of Herman ranger station, on the Columbia River Highway. The station is marked by a bronze tablet in a boulder, as described in note 5. The reference mark, a bronze tablet in a boulder, note 12d, is 14.50 meters (47.6 feet) from the station in azimuth $334^{\circ} 11'$. *Chinidere* (U. S. G. S.), marked by a cairn, is 3.35 meters (11.0 feet) from the station in azimuth 348° .

Huckle (Skamania County, Wash., C. V. Hodgson, 1916).—On the highest point of Little Huckleberry Mountain, about 14 miles south of Guler post office and 8 miles south of Peterson Prairie ranger station. The station is marked by a bronze tablet in rock, as described in note 2. The reference mark, a bronze tablet in rock, note 12a, is 31.53 meters (103.4 feet) from the station in azimuth $312^{\circ} 39' 48''$.

Supplementary points

Mitchell (Malheur County, Oreg., C. V. Hodgson, 1915; 1920).—About 12 miles southwest of Nyssa, Oreg., on the highest part of Mitchell Butte, near its north edge. The station is marked by a bronze tablet in a bowlder, as described in note 5. The reference mark, a bronze tablet in a bowlder, note 12d, is 9.17 meters (30.1 feet) from the station in azimuth 123° 03'. A U. S. Geological Survey station by the same name, marked by a cairn, is 12 meters (39 feet) from the station in azimuth 228° 08'.

B. M. G. (Malheur County, Oreg., C. V. Hodgson, 1915).—In the town of Nyssa, on the east side of the Oregon Short Line Railroad, about 1.5 meters (4.9 feet) west of the east fence along the railroad right of way and 190 meters (623 feet) south of the wagon road leading east to the bridge across the Snake River. The nearest rail of the railroad track is 23.5 meters (77.1 feet) west of the station, which is marked by a bronze tablet in concrete, as described in note 1a. The underground mark is a ½-inch iron pipe 8 inches long, the top of which is 10 inches below the surface of the ground. A reference mark, a bronze tablet in concrete, note 11a, is in the fence line along the east side of the right of way, 19.28 meters (63.3 feet) from the station in azimuth 2° 39'.

Idaho-Oregon boundary monument (Canyon-Malheur Counties, Idaho and Oreg., C. V. Hodgson, 1915).—In the big bend of the Snake River about 2½ miles east and about one-half mile south of River View Ferry, 2 miles south and 3 miles west of Roswell, Idaho, at the intersection of the State line with the east and west section line between secs. 19 and 30, T. 21 S., R. 47 E., State of Oregon, and one-fourth mile south of Lee Baldrige's farmhouse. The station is 5 feet east of the east wagon track of the boundary road and is marked by a standard disk station mark set in the top of a stone 14 inches square and 26 inches long which projects 2 inches above the surface and marks the southeast corner of section 19 and the northeast corner of section 30, State of Oregon. A standard disk reference mark was set in the top of a stone in the middle of the road. The stone projects 2 inches above the surface and marks the southwest corner of sec. 35, T. 5 N., R. 6 W., and the northwest corner of sec. 2, T. 4. N., R. 6 W., State of Idaho, at the intersection of the township and State lines.

Precise level B. M. G. (Malheur County, Oreg., C. V. Hodgson, 1915; 1931).—At Nyssa, Oreg., in the capstone of the Oregon Short Line Railroad water tank, 0. 1 meter (0. 3 foot) from the north edge and 0. 1 meter (0. 3 foot) from the east edge. The station is marked by a hole in a horizontal surface. Reported as probably destroyed in 1931.

Bennet (Baker County, Oreg., C. V. Hodgson, 1916).—The cupola on the Forest Service lookout house on the summit of Bennet Peak, in the SW. ¼ sec. 13, T. 6 S., R. 43 E., W. M. The station is most easily reached over Forest Service trails from Medical Springs.

Granite (Union County, Oreg., C. V. Hodgson, 1916).—On the summit of the Wallowa Mountains along the divide south of Minam River, in the northeast corner of the unsurveyed sec. 13, T. 5 S., R. 42 E. The peak is flat topped and covered with large bowlders, in the top of one of which near the south side of the summit the station was placed. The peak has an elevation of about 8,700 feet and is best reached from Medical Springs over Forest Service trails. The station is marked by a bronze tablet in rock, as described in note 3.

Ireland Mountain lookout cupola (Baker-Grant Counties, Oreg., C. V. Hodgson, 1916).—The station is the center of the top of the Forest Service lookout house on Ireland Mountain in sec. 29, T. 8 S., R. 36 E., W. M. The lookout house is situated on the highest point of the mountain on the divide between Grant and Baker Counties, near the head of Powder River.

Tower (Umatilla County, Oreg., C. V. Hodgson, 1916).—About 14 miles by road southeast of Lehman Springs in sec. 13, T. 6 S., R. 34 E., W. M., on a bare rocky point about one-fourth mile east of the Forest Service lookout tower on Tower Mountain. The station is best reached by a wagon road which leads to the ranger station on top. It is marked by a bronze tablet in rock, as described in note 3.

Precise level B. M. 2782 A (Union County, Oreg., C. V. Hodgson, 1916; 1931).—At La Grande, Oreg., in the north face of the brick building of the Foley Hotel in the stone facing of the wall on the Chestnut Street side. The station is marked by a U. S. Geological Survey bench mark. This mark has probably been moved slightly.

Arbuckle (Morrow County, Oreg., C. V. Hodgson, 1916).—About 100 yards east of the highest point of Arbuckle Mountain in sec. 29, T. 4 S., R. 29 E., W. M., directly beneath the top of a large tree. The station is best reached by wagon road from Heppner or Ukiah. It is marked by a bronze tablet in a boulder, as described in note 5.

Gate (Umatilla County, Oreg., C. V. Hodgson, 1916).—On the north bank of the Reclamation Service irrigation canal about one-half mile south of Umatilla, Oreg., near the concrete house at the top of the small spillway leading down to the river. The station was used only in making connection with the U. S. Engineers' triangulation and was not marked. The northwest corner of the concrete gatehouse is 1.45 meters (4.8 feet) from the station in azimuth 315° 07'.

Gravel (Umatilla County, Oreg., C. V. Hodgson, 1916).—At the top of a gravel bank which was being excavated by the railroad for ballast. The station was used only in making connections with the U. S. Engineers' triangulation and was not marked.

43 R (U. S. E.) (Benton County, Wash., C. V. Hodgson, 1916).—About one-half mile east of the ferry landing where the rocky ridge from the group of hills on which station *Expansion* is located meets the river. The station is described by the U. S. Engineers as "marked by a small cement patch on the first bench of rock near the ferry landing," and is on the Washington side of the Columbia River, across from Umatilla, Oreg.

44 L (U. S. E.) (Umatilla County, Oreg., C. V. Hodgson, 1916).—About 1½ miles east of Umatilla, Oreg., and about 10 meters (33 feet) back from the bank of the Columbia River on the Oregon side. The station is marked by a cedar hub with a nail in the top.

148 L (U. S. E.) (Wasco County, Oreg., C. V. Hodgson, 1916).—About eight-tenth mile east of Celilo, Oreg., and 190 feet above the river level, opposite, and 200 feet above milepost No. 101 of the Oregon-Washington Railroad & Navigation Co. The station is marked by a small pipe cemented in rock.

149 L (U. S. E.) (Wasco County, Oreg., C. V. Hodgson, 1916).—On the southern edge of the village of Celilo, at the southeast corner of the land reserved for the lock-keeper's quarters. The station is a first-order bench mark and is marked by brass monument No. 15. Station *149 L* (U. S. E.) *eccentric* is 4.90 meters (16.1 feet) from the station in azimuth 320° 55'.

Mount Hood (U. S. G. S.) (Clackamas and Hood River Counties, Oreg., U. S. Geological Survey, 1906).—On the highest point of Mount Hood. The station is marked by a U. S. Geological Survey triangulation tablet set in rock. A rock cairn with pole in center was built above the tablet.

Tygh (Wasco County, Oreg., C. V. Hodgson, 1916).—About 2 miles east of Friend, Oreg., in the NE. ¼ sec. 31, T. 2 S., R. 13 E., in a boulder pile near the top of a cultivated knoll on land belonging to Michael Glavey. The station is marked by a bronze tablet in a boulder, as described in note 5.

Bald Peter (Wasco County, Oreg., C. V. Hodgson, 1916).—In the extreme southeast corner of the Mt. Hood National Forest in sec. 12, T. 6 S., R. 11 E., W. M., on the northwest corner of the top of a bald rocky knob. The station is best reached by a wagon road from Wapinitia. It is marked by a bronze tablet in concrete, as described in note 1a.

Sedum Point (Skamania County, Wash., C. V. Hodgson, 1916).—On a rocky outcrop on the crest of Rock Creek Ridge, about 3½ miles southwest of Hemlock ranger station in sec. 31, T. 4 N., R. 7 E., W. M. The top is reached by trail from the ranger station. Sedum Point is about 4 miles southwest of Bunker Hill. The station is marked by a bronze tablet in rock, as described in note 3. Two witness marks, triangular blazes on trees, note 15, are located, respectively, 15 feet southeast and 15 feet northwest of the station.

Little (Skamania County, Wash., C. V. Hodgson, 1916).—On the highest point of Lookout Mountain on the divide between Washougal River and the south fork of Lewis River and reached by Forest Service trails from Hemlock ranger station. The station is marked by a bronze tablet in rock, as described in note 3.

Big Huckleberry (Skamania County, Wash., C. V. Hodgson, 1916).—On the divide between Panther Creek and the Little White Salmon River about 4 miles southeasterly from station *Huckle*, on the highest point of the most southerly of the three summits forming Big Huckleberry Mountain. The station is best reached over the Forest Service trails from Wind River. It is marked by a bronze tablet in concrete as described, in note 1a.

Observation (Skamania County, Wash., C. V. Hodgson, 1916).—On the highest point of Sister Rocks about 21 miles northeast of Carson. A Forest Service lookout house is on the summit. The station is marked by a bronze tablet in rock, as described in note 3, the tablet being cemented in the rock floor beneath the tower. It is best reached from Carson via Government Mineral Springs over the Forest Service trails.

IDAHO-CALIFORNIA ARC

Principal points

Vale (Malheur County, Oreg., E. W. Eickelberg, 1920).—About 2 miles east by south from the town of Vale, 0.6 mile south from the Vale-Ontario road, and on the highest point of a prominent rocky butte, the highest in the immediate vicinity. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 17.00 meters (55.8 feet) from the station in azimuth $303^{\circ} 29'$ and 6.45 meters (21.2 feet) in azimuth $195^{\circ} 47'$. A U. S. Geological Survey cairn is 4.12 meters (13.5 feet) from the station in azimuth $137^{\circ} 41'$.

Freezeout (Malheur County, Oreg., E. W. Eickelberg, 1920).—About 40 miles southwest from the town of Vale, about 15 miles south from Harper, about 4 miles south from the main Vale-Skull Spring-Crane road, 2 miles north from an old dim road leading from the main Vale-Skull Spring road at a point 3 miles east of Coyote Wells via Buckboard Springs to the McKnight sheep ranch on the Vale-Watson road. Station bears north from the road at a point $5\frac{1}{2}$ miles east of Buckboard Springs, where it leads through a narrow gap in the rock, but is not visible from the road. The U. S. Geological Survey cairn "Grass," on or near the highest point of a ridge known as Freezeout Hills, is 4.5 meters from the station in azimuth $348^{\circ} 01'$. The station is marked by a bronze tablet in a boulder as described in note 4. Two reference marks, bronze tablets in boulders, note 12c, are, respectively, 14.23 meters (46.7 feet) from the station in azimuth $222^{\circ} 48'$ and 5.60 meters (18.4 feet) in azimuth $306^{\circ} 03'$.

Beulah (Malheur County, Oreg., E. W. Eickelberg, 1920).—About 5 miles southeast from Beulah post office, and about 12 miles north from Juntura, on highest point in vicinity. Station is on hill directly behind one which appears as highest one from Beulah. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 17.01 meters (55.8 feet) from the station in azimuth $153^{\circ} 42'$ and 6.12 meters (20.1 feet) in azimuth $359^{\circ} 56'$.

Star (Malheur County, Oreg., E. W. Eickelberg, 1920).—About 15 miles southeast from Riverside, about 2 miles east of the Riverside-Crowley road, about 3 miles southwest from the Star ranch and 2 miles east by south from the ranch house formerly owned by Sam A. Armstrong, and on the southerly end and highest point of Star Mountain. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 9.83 meters (32.3 feet) from the station in azimuth $83^{\circ} 23'$ and 10.48 meters (34.4 feet) in azimuth $244^{\circ} 26'$.

Crow (Harney County, Oreg., E. W. Eickelberg, 1920).—About 9.5 miles northeast of Crane, about 30 miles east of Burns, and 5 miles by road and trail east of the Crowcamp ranch, and on the highest point of Crowcamp Mountain. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 13.19 meters (43.3 feet) from the station in azimuth $311^{\circ} 26'$ and 12.95 meters (42.5 feet) in azimuth $57^{\circ} 57'$. A U. S. Geological Survey station of the same name, marked by a cairn, is 3.90 meters (12.8 feet) from the station in azimuth $173^{\circ} 58'$.

Riddle (Harney County, Oreg., E. W. Eickelberg, 1920).—About 26 miles southeast from Narrows, about 24 miles south from Crane, 6 miles east from Smith post office (locally known as Coon Town), 4 miles north of James Paul ranch, and on the eastern end and highest point of Riddle Mountain. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 16.55 meters (54.3 feet) from the station in azimuth $122^{\circ} 41'$ and 4.75 meters (15.6 feet) in azimuth $272^{\circ} 22'$.

Burns (Harney County, Oreg., E. W. Eickelberg, 1920).—About 7 miles west from Burns, 4.4 miles north (by wood road) from the Burns-Bend highway, and on the highest point of one of the Sagehen Hills. The station is about 2 miles farther west and to the left of the hill which appears to be the highest when

looking from Burns. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 6.18 meters (20.3 feet) from the station in azimuth $354^{\circ} 41'$ and 8.42 meters (27.6 feet) in azimuth $162^{\circ} 00'$.

Jack (Harney County, Oreg., E. W. Eickelberg, 1920).—About 40 miles south from Burns, about 16 miles south from Narrows, and 4 miles west from the Narrows—"P" Ranch-Denio road, on the westerly and higher of two prominent hills known locally as the Jackass Buttes. The station is marked by a bronze tablet in bedrock as described in note 2. The reference mark, a bronze tablet in a boulder, note 12c, is 13.65 meters (44.8 feet) from the station in azimuth $329^{\circ} 23'$.

Juniper (Harney County, Oreg., E. W. Eickelberg, 1920).—About 60 miles northeast from Lakeview, about 20 miles south from Butte, and 5 miles east from Alkali Lake, on the highest point of Big Juniper Butte. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are in azimuths $7^{\circ} 12'$ and $118^{\circ} 35'$, respectively, from the station.

Wagontire (Lake-Harney Counties, Oreg., E. W. Eickelberg, 1920).—About 4 miles west of the Burns-Butte road, on Wagontire Mountain, and about 100 meters north of its highest point. This highest point has several massive rocks on it. The station is marked by a standard disk station mark set in the center of a flat rock about 6 by 10 feet in size and about 1 foot above the level of the ground. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 13.43 meters (44.1 feet) from the station in azimuth $353^{\circ} 43'$ and 15.22 meters (49.9 feet) in azimuth $123^{\circ} 15'$.

Diablo (Lake County, Oreg., E. W. Eickelberg, 1920).—About 20 miles north of Paisley and about 7 miles east of the north end of Summer Lake, on Diablo Mountain, and about 50 meters south of its highest point. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 14.16 meters (46.5 feet) from the station in azimuth $1^{\circ} 19'$ and 22.50 meters (73.8 feet) in azimuth $147^{\circ} 56'$.

Grays (Lake County, Oreg., E. W. Eickelberg, 1920).—About 60 miles northeast from Lakeview, about 20 miles south from Butte, 3 miles east from Alkali Lake, and on the highest point of Grays Butte. The station is marked by a bronze tablet in bedrock as described in note 2. The reference mark, a bronze tablet in bedrock, note 12a, is in azimuth $207^{\circ} 22'$ from the station.

Sharp (Lake County, Oreg., E. W. Eickelberg, 1920).—About 10 miles N. 17° E. from Paisley, about $2\frac{1}{2}$ miles west from a wagon road leading from the Paisley-Butte and Burns road at a point 10 miles from Paisley, and on the highest point of Sharp Butte or Sharp Top. The station bears west from the road at a point 13.8 miles from Paisley, but is not visible from the road. It is marked by a bronze tablet in bedrock as described in note 2. The reference mark, a bronze tablet in bedrock, note 12a, is 6.24 meters (20.5 feet) from the station in azimuth $195^{\circ} 48'$.

White (Lake County, Oreg., E. W. Eickelberg, 1920).—About 7 miles east of Paisley, about 3 miles northeast of the ZX white ranch house, and on the highest point of Coglan Buttes. The station is marked by a bronze tablet in bedrock as described in note 2. The reference mark, a bronze tablet in bedrock, note 12a, is 23.53 meters (77.2 feet) from the station in azimuth $240^{\circ} 20'$.

Paisley north base (Lake County, Oreg., E. W. Eickelberg, 1920).—About 10 miles north of Paisley, 600 meters west of the Paisley-Hoy ranch road at the south base of the southerly of two rocky buttes, the only ones in the vicinity. The station is marked by a bronze tablet in a boulder as described in note 4. The reference mark, a bronze tablet in a boulder, note 12c, is 43.56 meters (142.9 feet) from the station in azimuth $159^{\circ} 51'$.

Paisley south base (Lake County, Oreg., E. W. Eickelberg, 1920; 1931).—About three-fourths mile north of Paisley, on the Fremont Highway, at the junction with the road to Burns, 70 feet south of the latter, 63 feet east of the center line of the Fremont Highway, and 25 feet east of the fence corner, at the fence line. The station is marked by a bronze tablet in concrete, as described in note 1a, and underground by a similar mark, note 7a. The reference mark, a bronze tablet in concrete, note 11a, is 7.97 meters (26.1 feet) from the station in azimuth $71^{\circ} 14'$. The station was used as a second-order bench mark in 1931.

Round (Lake County, Oreg., E. W. Eickelberg, 1920).—About 19 miles south from Paisley, 30 miles north from Lakeview, about one-half mile south from Round Pass, on the highest point of Round Mountain, and about 6 meters

southeast of a Forest Service lookout house under construction (in 1920). The station is marked by a bronze tablet in concrete as described in note 1c. Two witness marks, each consisting of a triangle cut in the west side of a pine tree, are, respectively, 29.12 meters (95.5 feet) from the station in azimuth $202^{\circ} 26'$ and 29.26 meters (96.0 feet) in azimuth $234^{\circ} 40'$.

Hart (Lake County, Oreg., E. W. Eickelberg, 1920).—About 9 miles northeast of Plush post office, 7 miles by road and trail south from Lyons sheep ranch, and three-fourths mile west from a dim road leading from the Lyons sheep ranch to Old Post, on highest part of Hart Mountain, a well-known ridge lying east of Warner Valley. The station is marked by a bronze tablet in a bowlder as described in note 4. Two reference marks, bronze tablets in bowlders, note 12c, are, respectively, 11.48 meters (37.7 feet) from the station in azimuth $122^{\circ} 04'$ and 29.55 meters (96.9 feet) in azimuth $303^{\circ} 10'$.

Crane (Lake County, Oreg., E. W. Eickelberg, 1920; 1931).—About 8 miles southeast from Lakeview, on the highest point of Crane Peak. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 19.8 meters (65 feet) from the station in azimuth $176^{\circ} 44'$ and 9.9 meters (32.5 feet) in azimuth $323^{\circ} 57'$.

Drake (Lake County, Oreg., E. W. Eickelberg, 1920; 1931).—About 14 miles northeast from Lakeview, 3 miles northeast from Bulls Prairie ranger station, five-eighths mile northeast from the Forest Service lookout on Drake Peak, and on a round bald mountain about $1\frac{1}{2}$ miles northwest from Drake Peak. The station is marked by a bronze tablet in a bowlder as described in note 4. The reference mark, a bronze tablet in a bowlder, note 12c, is 22.01 meters (72.2 feet) from the station in azimuth $216^{\circ} 15'$.

Yonna (Klamath County, Oreg., E. W. Eickelberg, 1920).—About 12 miles northeast from Bonanza, on the top of Yainax Butte, and about 70 meters east from its highest point. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 1.73 meters (5.7 feet) from the station in azimuth $354^{\circ} 23'$ and 4.99 meters (16.4 feet) in azimuth $140^{\circ} 26'$.

Cougar (Lake County, Oreg., E. W. Eickelberg, 1920).—About 18 miles northwest from Lakeview, 5 miles by road and trail southwest from Thomas Creek ranger station, $3\frac{1}{4}$ miles by trail from road leading from Lakeview to Thomas Creek ranger station via Mesman Creek, and 10 meters southeast from Forest Service lookout "Cougar Peak." The station is marked by a bronze tablet in a bowlder as described in note 4. Two reference marks, bronze tablets in bowlders, note 12c, are, respectively, 11.42 meters (37.5 feet) from the station in azimuth $89^{\circ} 58'$ and 5.44 meters (17.8 feet) in azimuth $6^{\circ} 05'$.

Hoffman (Siskiyou County, Calif., E. W. Eickelberg, 1920).—About 32 miles northeast from McCloud, about 21 miles east by south from Bray, 4 miles northeast from Medicine Lake ranger station, and on the highest point of Big Hoffman Mountain. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 11.51 meters (37.8 feet) from the station in azimuth $107^{\circ} 23'$ and 11.67 meters (38.3 feet) in azimuth $329^{\circ} 38'$.

Aspen (Klamath County, Oreg., E. W. Eickelberg, 1920).—Located 18 miles west from Klamath Falls, Oreg., on the highest point of Aspen Butte. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 5.31 meters (17.4 feet) from the station in azimuth $338^{\circ} 14'$ and 6.56 meters (21.5 feet) in azimuth $110^{\circ} 54'$.

Goosenest (Siskiyou County, Calif., E. W. Eickelberg, 1920).—About 20 miles east from Montague, Calif., on the highest point of Goosenest Mountain, and at the edge of an old crater. The station is marked by a bronze tablet in bedrock as described in note 2. One reference mark, a bronze tablet in bedrock, note 12a, is 31.12 meters (102.1 feet) from the station in azimuth $343^{\circ} 15'$. Another reference mark, an arrow cut in bedrock, is 16.05 meters (52.7 feet) from the station in azimuth $171^{\circ} 29'$.

Whaleback (Siskiyou County, Calif., E. W. Eickelberg, 1920).—About 15 miles east from Weed, Calif., on the highest point of Black Crater Mountain. The station is on the southeast edge of an old crater and is surrounded by a heavy growth of timber. It is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respec-

tively, 7.31 meters (24.0 feet) from the station in azimuth $188^{\circ} 59'$ and 8.78 meters (28.8 feet) in azimuth $266^{\circ} 13'$.

Grizzly (Shasta County, Calif., E. W. Eickelberg, 1920).—On top of Grizzly Peak, 12 miles (3 by road and 9 by trail) from Henderson, Calif., and about 30 meters northeast of a lookout house. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 26.53 meters (87.2 feet) from the station in azimuth $22^{\circ} 19'$ and 19.13 meters (62.8 feet) in azimuth $230^{\circ} 01'$.

Eddy (Siskiyou County, Calif., E. W. Eickelberg, 1920).—On top of Mount Eddy, about 15 miles by road and trail from Sisson, Calif., a little below the highest point on the mountain, and about 18 meters east from a new lookout house. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 30.02 meters (98.5 feet) from the station in azimuth $298^{\circ} 43'$ and 14.32 meters (47.0 feet) in azimuth $97^{\circ} 45'$.

Supplementary points

Burns bench mark C 19 (Harney County, Oreg., E. W. Eickelberg, 1920; 1931).—In the town of Burns, on the west side of Broadway, about 165 feet south of the Central Oregon Highway and about 200 feet southwesterly from the Welcome Hotel, in the cement sidewalk. The station is marked by a standard bench-mark disk in the top of a concrete post. The disk is about 3 inches below the sidewalk level and is reached through an opening about 4 inches in diameter. It is stamped "X 71 1931."

Iron (Harney County, Oreg., E. W. Eickelberg, 1920).—About $2\frac{1}{2}$ miles west of the Burns-Lakeview (via Plush) road. Reached from Burns by following this road to a point where Iron Mountain bears about due west, then take road leading to ranch house, pass to south of house, and follow around south side of valley along foothills to a small and dilapidated schoolhouse; station is on Iron Mountain and about three-fourths mile west of schoolhouse. It is marked by a bronze tablet in bedrock as described in note 2.

Gearhart (Klamath County, Oreg., E. W. Eickelberg, 1920).—On the summit of Gearhart Mountain, about 10 miles northeast of Bly. The station is marked by a bronze tablet in bedrock, as described in note 2.

Lakeview bench mark M 16 (Lake County, Oreg., E. W. Eickelberg, 1920; 1931).—On the west edge of the town of Lakeview, on the south side (in fence line) of the Klamath Falls-Lakeview Highway, and about 300 yards west from the N. C. O. Railroad crossing. The station is marked by a bronze tablet in concrete, as described in note 1c. The disk was stamped "M 16 1920" in 1931. The reference mark, a bronze tablet in concrete, note 11c, is 18.45 meters (60.5 feet) from the station in azimuth $186^{\circ} 29'$.

Dog (Lake County, Oreg., E. W. Eickelberg, 1920; 1931).—About 22 miles south by west from Lakeview, $2\frac{1}{2}$ miles by trail north by west from Dog Lake ranger station, and 5 meters northeast from a Forest Service lookout which occupies the highest point on Dog Mountain. The station is marked by a bronze tablet in bedrock, as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 3.30 meters (10.8 feet) from the station in azimuth $0^{\circ} 14'$ and 4.58 meters (15.0 feet) in azimuth $182^{\circ} 53'$. In 1931 it was found that the reference mark south of the station had been covered up by the erection of a lookout house, the center of which is 3.85 meters (12.6 feet) south of the station.

Klamath Falls bench mark, A 15 (Klamath County, Oreg., E. W. Eickelberg, 1920).—About 4.4 miles east of the White Pelican Hotel at Klamath Falls, 1.3 miles east of steel bridge over irrigation canal, in the southwest corner of a field, 30 meters (98 feet) northwest of a house owned by Mrs. John A. Short, and 2 meters (7 feet) east of the old Klamath Falls-Merrill Road. The station is marked by a standard bench-mark disk set in top of a concrete post, having been established by a precise level party.

Soldier (Shasta County, Calif., E. W. Eickelberg, 1920).—About 7 miles northwest from Fall River Mills, $2\frac{1}{2}$ miles west from Glenburn and 3 miles northeast from Cayton, on Soldier Mountain, 5 meters west from Forest Service lookout *Soldier*. The station is marked by a bronze tablet in bedrock as described in note 2. Two reference marks, bronze tablets in bedrock, note 12a, are, respectively, 7.36 meters (24.1 feet) (inclined distance) from the station in azimuth $315^{\circ} 21'$ and 15.40 meters (50.5 feet) (inclined) in azimuth $115^{\circ} 09'$.

Black Fox (Siskiyou County, Calif., E. W. Eickelbert, 1920).—A Forest Service lookout point, 15 miles northeast of McCloud, Calif., on highest point of Black Fox Mountain. The station is marked by a bronze tablet in bedrock as described in note 2.

Turret (Modoc County, Calif., E. W. Eickelberg, 1920).—About 20 miles north of Bieber, 13 miles north of Lookout post office, and 4 miles by trail southeast of Happy Camp ranger station, on the highest point of Turret Mountain, and 9 meters west from Forest Service lookout, *Happy Camp*. The station is marked by a bronze tablet in bedrock as described in note 2. Reference mark No. 1, a standard bronze tablet cemented in a drill hole in the concrete foundation of the lookout house, is 9.05 meters (29.7 feet) from the station in azimuth $273^{\circ} 54'$. Reference mark No. 2, a bronze tablet in bedrock, note 12a, is 8.10 meters (26.6 feet) from the station in azimuth $106^{\circ} 44'$.

Dixie (Lassen County, Calif., E. W. Eickelberg, 1920).—About 25 miles southeast of Fall River Mills, $2\frac{1}{4}$ miles north of the Cox and Clark ranch in Dixie Valley, on highest point of first range of lava rock hills lying north of Dixie Valley and visible from the Cox and Clark ranch house. The station is marked by a bronze tablet in bedrock as described in note 2. A standard bronze station marker of the U. S. Geological Survey, set in bedrock, is 2.68 meters (8.8 feet) from the station in azimuth $310^{\circ} 09'$.

Bald Mountain (U. S. G. S.) (Shasta County, Calif., E. W. Eickelberg, 1920).—About 8 miles south by east from Fall River Mills, $1\frac{1}{4}$ miles southeast of the St. Johns ranch (W. S. Bernard), and one-half mile east of road leading southward from St. Johns ranch. The station is marked by a standard bronze station marker of the U. S. Geological Survey set in bedrock.

Crater (U. S. G. S.) (Shasta County, Calif., E. W. Eickelberg, 1920).—About 13 miles south from Burney, 16 miles northeast from Whitmore, 5 miles by trail northeast from Cow Creek ranger station, three-fourths mile northeast of Forest Service lookout, *Magee Peak*, on the northern and highest point of a volcanic mountain known locally as Magee Peak. The station is marked by a standard bronze station marker of the U. S. Geological Survey set in bedrock. Bronze station and reference tablets of the Coast and Geodetic Survey were set in bedrock near by, but their positions relative to the station were not determined.

Burney (U. S. G. S.) (Shasta County, Calif., E. W. Eickelberg, 1920).—About $5\frac{1}{2}$ miles south by east from Burney, 4 miles east of Dry Lake on the Burney-Whitmore (Tamarack) wagon road, 2 miles north of old road leading from Hat Creek to Burney Springs, on highest point of prominent volcanic mountain known as Burney Butte. The station is marked by a U. S. Geological Survey bronze disk set in a boulder under a cairn having a 7-foot base and height of 8 feet.

Granite (Trinity County, Calif., E. W. Eickelberg, 1920).—Ten miles west of Trinity Center, on Granite Peak, and 150 yards northeast of lookout house. The station is marked by a bronze tablet in bedrock as described in note 2.

Bonanza (Trinity County, Calif., E. W. Eickelberg, 1920).—About 10 miles north of Trinity Center, a short distance from Bonanza King mine, and 25 yards north of Bonanza King lookout. The station is marked by a bronze tablet in bedrock as described in note 2.

WASHINGTON-CALIFORNIA ARC

Principal points

Red (Skamania County, Wash., J. S. Hill, 1906; 1916).—On the highest point of a bald, red hill near the sources of the Little White Salmon and Lewis Rivers and not far from Klickitat Pass. It is best reached from White Salmon on the Columbia River via Guler post office, Ice Cave, Peterson Prairie, Goose Lake, Steamboat Lake, and the Indian race track, being about 1 mile southwest from the last place and $1\frac{1}{2}$ miles west of Steamboat Lake. There is a Forest Service lookout station with its south wall about 2 meters north of the station mark. The station is marked by an old-type bronze tablet set in rock as described in note 18. Two reference marks, copper bolts set in rock, see note 19, are, respectively, 7.40 meters (24.3 feet) from the station in azimuth $96^{\circ} 14'$ and 5.42 meters (17.8 feet) in azimuth $188^{\circ} 46'$.

Larch (Multnomah County, Oreg., O. B. French, 1903; 1916).—Southeast of Bridal Veil, a town on the Columbia River, on the highest peak of Larch Mountain and on the west point of a small rock ledge which is on the north end of a spur from the main summit. The ledge is about 20 feet higher than the spur

of which it forms the end, and descends abruptly on the north in a cliff about 100 feet high. It can be reached either from Bridal Veil or Latourell via Donahue's logging camp. The station is marked by an old-type bronze tablet set in rock as described in note 16. Two reference marks, copper bolts set in rock, note 19, are in the east summit of the ledge, one in rather a low place, 10.89 meters (35.7 feet) from the station in azimuth $298^{\circ} 51'$, and the other near the east end of the summit, 15.01 meters (49.2 feet) from the station in azimuth $287^{\circ} 02'$.

Star (Clark County, Wash., J. S. Hill, 1906; 1916).—On the most southerly of the two summits of Silver Star Mountain, on the line between Clark and Skamania Counties, about 35 miles northeast of Vancouver. The station is marked by an old-type bronze tablet set in rock as described in note 18. Two reference marks, copper bolts in rock, note 19, are, respectively, 5.91 meters (19.4 feet) from the station in azimuth $305^{\circ} 43'$ and 5.16 meters (16.9 feet) in azimuth $26^{\circ} 11'$.

Davis (Cowlitz County, Wash., J. S. Hill, 1906).—About 14 miles northeast of Woodland on the highest point of a hill on a north-and-south ridge which may be reached from Woodland by following the road up the Lewis River to the Fisher place and packing from there. The station is marked by an old-type bronze tablet set in rock as described in note 18. Two reference marks, copper bolts in rock, note 19, are, respectively, 5.61 meters (18.4 feet) from the station in azimuth $15^{\circ} 02'$ and 5.37 meters (17.6 feet) in azimuth $96^{\circ} 51'$. When the station was visited in 1928 no marks could be recovered. It is probably lost.

Barnes (Multnomah County, Oreg., O. B. French, 1903; 1932).—On a cleared hill just west of Portland, about 600 feet northwest of the intersection of Greenleaf Road and Skyline Boulevard, the latter connecting the Barnes and Cornell roads, and just east of the highest hill of this group, which hill is still wooded. The station is marked by an old-type bronze tablet in a boulder as described in note 17. Two reference marks, copper bolts in boulders, note 19, are near the roots of stumps 15.80 meters (51.8 feet) from the station in azimuth $156^{\circ} 11'$ and 7.02 meters (23.0 feet) in azimuth $233^{\circ} 23'$. A third reference mark, similar to the other two except that there is also an underground mark consisting of a cross in a boulder, is about 3 feet north of the main east-and-west fence line, about 30 feet east of where this fence crosses the highest part of the ridge, about 3 feet east of a fence extending northward from this fence, and 44.95 meters (147.5 feet) from the station in azimuth $184^{\circ} 35'$. In 1932 the surface mark could not be found as the top of the hill is now cultivated, but an underground mark may still be in place.

Hult (Marion County, Oreg., O. B. French, 1903).—On a prominent bare hill about 6 miles by road and 4 miles in a straight line southeast of Silverton, just south of the road from Silverton to Hult post office and on the farm of Al Porter. It is on the northeast side of the hill and slightly lower than the summit, 17 feet from a line fence on the west and 8 feet from another fence on the south. The station is marked at the surface by a half-inch copper bolt set in a boulder and underground by a similar mark. Two reference marks, copper bolts set in boulders, note 19, are, respectively, 5.79 meters (19.0 feet) from the station in azimuth $108^{\circ} 55'$ and 7.12 meters (23.4 feet) in azimuth $304^{\circ} 40'$. Both reference marks are in the fence line.

Yam (Polk County, Oreg., O. B. French, 1903; 1908).—On the highest point of the highest of the Eola Hills about 12 miles northwest of Salem, and about 10 meters south of a wire fence which passes over the summit. A slightly lower wooded hill is about a half mile northwest of the station and a group of hills is about halfway between the station and Salem. The station is marked by an old-type bronze tablet set in a boulder as described in note 17. Two reference marks, copper bolts set in boulders with a few loose rocks piled around them for identification, note 19, are, respectively, 11.06 meters (36.3 feet) from the station in azimuth $197^{\circ} 10'$ and 8.59 meters (28.2 feet) in azimuth $329^{\circ} 07'$. The first reference mark mentioned is in the line of the wire fence.

Peterson (Linn County, Oreg., O. B. French, 1903).—About 4 miles southwest of Lebanon on the highest part of the most westerly of the two summits known as Peterson Butte. The station is marked by an old-type bronze tablet set in rock as described in note 16. Two reference marks, copper bolts set in rock, note 19, are, respectively, 4.64 meters (15.2 feet) from the station in azimuth $7^{\circ} 30'$ and 3.27 meters (10.7 feet) in azimuth $185^{\circ} 00'$. One is in the largest rock on the south side of the summit and the other is in the ledge just east of the largest rock on the north side of the summit.

Mary (Benton County, Oreg., O. B. French, 1903; 1931).—On the highest point of the grassy summit of Marys Peak, about south-southwest from Corvallis.

The station is marked by an old-type bronze tablet set in a boulder as described in note 17. Two reference marks, copper bolts set in boulders, note 19, are, respectively, 13.77 meters (45.2 feet) from the station in azimuth $326^{\circ} 22'$ and 29.36 meters (96.3 feet) in azimuth $58^{\circ} 11'$.

Spencer (Lane County, Oreg., O. B. French, 1903).—This station is near a U. S. Geological Survey station. It is on the south end and highest point of the summit of Spencer Butte, about 4 miles south of Eugene. Two trees used by the Geological Survey are at the north end of the summit, which is in the form of a ridge. The station is marked by an old-type bronze tablet set in rock as described in note 16. Two reference marks, copper bolts in boulders, note 19, are, respectively, 5.34 meters (17.5 feet) from the station in azimuth $175^{\circ} 02'$ and 4.57 meters (15.0 feet) in azimuth $328^{\circ} 51'$. The Geological Survey station is 7.97 meters (26.1 feet) from the station in azimuth $176^{\circ} 12'$.

Twin (Linn County, Oreg., O. B. French, 1905).—On the farm of Mr. Gentry near the southwest corner of sec. 24, T. 14 S., R. 3 W., about 6 or 7 miles from Rowland. It is on the highest summit of a partly wooded ridge, the south slope being bare and the north slope wooded, and about 8 or 10 meters southeast of the highest point of the summit. The station is marked by an old-type bronze tablet set in a boulder as described in note 17. Three reference marks, copper bolts set in rock, note 19, are at the following distances and azimuths from the station: 6.66 meters (21.9 feet), $314^{\circ} 12'$; 6.39 meters (21.0 feet), $53^{\circ} 57'$; and 6.87 meters (22.5 feet), $155^{\circ} 44'$. The last-mentioned reference mark is near the highest point of the summit.

Ridge (Lane County, Oreg., O. B. French, 1905).—On the highest part of a ridge on land owned by Mr. J. J. Winn, about $1\frac{1}{2}$ miles north of his residence, and about 10 miles by road in a northwesterly direction from Junction City. The station is marked by an old-type bronze tablet set in a boulder as described in note 17. Three reference marks, copper bolts set in boulders, note 19, are at the following distances and azimuths from the station: 4.86 meters (15.9 feet), $164^{\circ} 32'$; 30.69 meters (100.7 feet), $278^{\circ} 43'$; and 9.73 meters (31.9 feet), $356^{\circ} 15'$. A triangular blaze in a large maple tree is 11.63 meters (38.2 feet) from the station in azimuth $92^{\circ} 16'$, and a similar blaze in a large fir tree is 8.45 meters (27.7 feet) from the station in azimuth $213^{\circ} 33'$.

Rauch (Lane County, Oreg., O. B. French, 1903).—About 12 miles west by south from Eugene, $2\frac{1}{2}$ miles southwest of Llewellyn post office and about one-half mile west of the road leading from Llewellyn to Crow post office, on land belonging to Mrs. Frances Rauch. It is about 150 meters east of the summit on the north side of a sloping ridge about 300 feet higher than the valley through which the road runs, the first prominent ridge encountered in going from Llewellyn to Crow and the only ridge in the vicinity from which *Willamette south base* can be seen. The station is about 200 feet west of a point where the ridge becomes steeper. The station is marked by an old-type bronze tablet set in a boulder as described in note 17. Two reference marks, copper bolts in boulders, note 19, are, respectively, on the highest part of the ridge, 11.96 meters (39.2 feet) from the station in azimuth $286^{\circ} 02'$ and 12.22 meters (40.1 feet) in azimuth $51^{\circ} 46'$.

Willamette south base (Lane County, Oreg., O. B. French, 1903; 1908).—About 5 miles from Eugene and 220 meters south of the Eugene-Elmira Road on land belonging to William Nelson. It is about 100 meters north of a large gravel pit, 78 meters from the line fence between William Nelson and M. Nelson, and about in line with the west face of the barn belonging to William Nelson, which is 86.79 meters (284.7 feet) north of the station. The station is marked by an old-type bronze tablet in the top of a 6-inch drain tile embedded in concrete. It is surmounted by a concrete pillar $2\frac{1}{2}$ feet high, 18 inches square at the base and 12 inches square at the top, with the letters "U. S. C. S." on the south side. The underground mark is a copper bolt set in a block of concrete. Four reference marks, the first three of which are copper bolts set in concrete and the fourth a copper bolt set in a boulder, note 19, are at the following distances and azimuths from the station: 212.29 meters (696.5 feet), $177^{\circ} 32' 02''$; 225.16 meters (738.7 feet), $200^{\circ} 19' 30''$; 78.38 meters (257.2 feet), $265^{\circ} 16' 42''$; and 86.79 meters (284.7 feet), $181^{\circ} 30' 16''$. The first two reference marks have underground marks similar to the surface marks. The second reference mark is at the intersection of the road fence and that dividing the farms of William Nelson and M. Nelson, the third is in the line of the boundary fence, and the fourth is in the southwest corner of the foundation of the main part of William Nelson's barn.

Willamette north base (Lane County, Oreg., O. B. French, 1905; 1908).—One and one-half miles south and one-half mile west of Junction City in the

east center of sec. 7, T. 16 S., R. 4 W., on land owned by Mr. William M. Pittney, of Junction City. It is in the northeast corner of a field on the south side of the main east-and-west road, about 71 yards from the north-and-south fence to the east and 4 or 5 yards from the fence on the south side of the road, and almost opposite the main gate which leads into the barnyard corral of the farm across the road. The station is marked by an old-type bronze tablet in the top of an 8-inch drain tile embedded in concrete. The underground mark is a copper bolt set in a block of concrete. Three reference marks, each consisting of a copper bolt set in the top of a concrete post, are at the following distances and azimuths from the station: 32.06 meters (105.2 feet), $97^{\circ} 10'$; 19.88 meters (65.2 feet), $186^{\circ} 24'$; and 65.08 meters (213.5 feet), $271^{\circ} 28'$. The first reference mark is in the fence line on the south side of the road and nearly in the prolongation of the fence line on the west side of the corral; the second is in the corral 10 inches from the road fence and 6 or 8 feet east of the east end of the main road gate; and the third is on the south side of the main road, 12 or 15 feet from the road fence, just west of the north-and-south fence. Each reference mark has an underground mark consisting of a copper bolt in a block of concrete.

Seavies 2 (Lane County, Oreg., W. H. Burger, 1908).—In the same locality as **Seavies** (U. S. G. S.). (See p. 61.) It is on the south slope of the peak near the lower edge of the first timber from the top and almost in line with **Spencer** (see p. 56) and the tangent line to the west bank of the McKenzie River at the big curve in the flat below the station. The station is marked by a drill hole in the rock and by piles of rock around the tripod erected at the station.

Pisgah (Lane County, Oreg., W. H. Burger, 1908).—Located north and east from Goshen on a hill known as Mount Pisgah, about 200 feet southwest, or toward Spencer Butte, from the highest point of the hill. The station is on top of a rock about 4 by 6 feet in area, projecting 16 inches above the ground, the largest one of a cluster of rocks and, with the exception of a large rock on the west slope about 175 feet to the north, the largest rock in the vicinity. Station is marked by a $\frac{1}{2}$ -inch drill hole $1\frac{1}{4}$ inches deep, 6 inches from the west edge of the rock and 23 inches from its south point.

Eugene astronomical station (Lane County, Oreg., O. B. French, 1904; 1908).—This station is identical with the U. S. Geological Survey station. It is on the east end of Skinner Butte, near Eugene, Oreg., just above the reservoir and north of the railroad station, on the site of the old observatory of the University of Oregon. It was learned in 1908 that the land was to be converted into a park and that the station would be demolished, so two marble reference stones, projecting 2 inches above the surface and bearing on the top the letters "U. S.," with a cross between, were set to preserve the station. The first, 5 by 5 by 18 inches, is 18.29 meters (60.0 feet) from the station in azimuth $119^{\circ} 59'$, and the second, 4 by 7 by 14 inches, is on the south brow of the hill 12.21 meters (40.1 feet) from the station in azimuth $52^{\circ} 47'$. The distance between these marks is 17.62 meters (57.8 feet). From the first reference mark the Patterson School spire is in azimuth $315^{\circ} 28'$ and the Humphrey Memorial Methodist Church spire is in azimuth $353^{\circ} 53'$. A large concrete "O" on the brow of the hill overlooking the railroad station is in azimuth 2° from the station.

Roman (Douglas County, Oreg., O. B. French, 1903; 1908).—On the most westerly of the two summits of the highest peak of the Coast Range known as Roman Nose Mountain, situated near the north line of Douglas County about 5 miles southwest of the junction of Wildcat Creek with the Siuslaw River. It is on the highest point of the summit, about 6 feet from the southern edge of the bluff and 20 feet from the steep part of the slope east of the station. The peak is bare except for a few low shrubs, and has a steep bluff on the south side and a gentle grassy slope on the north side. The station is marked by an old-type bronze tablet set in a boulder as described in note 17. Two reference marks, the first a copper bolt in bedrock and the second a copper bolt in a boulder, note 19, are, respectively, 14.76 meters (48.4 feet) from the station in azimuth $148^{\circ} 06'$ and 6.78 meters (22.2 feet) in azimuth $205^{\circ} 33'$. An arrow pointing to the reference mark is cut in the rock near each mark. An old burned stump is about 5 feet from the station in azimuth 232° .

Yellow (Douglas County, Oreg., O. B. French, 1904).—On the highest summit of the timbered ridge about 10 miles west of Yoncalla. The station is marked by an old-type bronze tablet set in a boulder as described in note 17. A reference mark, a copper bolt in a rock ledge, note 19, is 22.62 meters (74.2 feet) from the station in azimuth $334^{\circ} 37'$. Two other reference marks, pieces of copper wire

set in boulders, are, respectively, 21.04 meters (69.0 feet) from the station in azimuth $197^{\circ} 31'$ and 20.70 meters (67.9 feet) in azimuth $107^{\circ} 02'$.

Fairview (Lane County, Oreg., O. B. French, 1904).—On the west side of the summit of Fairview Peak in the Bohemia Mountains, about 25 miles southeast of Cottage Grove and 6 miles by road from Mineral post office. The station is marked by an old-type bronze tablet set in a boulder as described in note 16. Three reference marks, copper bolts in rock ledges, note 19, are at the following distances and azimuths from the station: 6.69 meters (21.9 feet), $47^{\circ} 29'$; 2.92 meters (9.6 feet), $181^{\circ} 39'$; and about 175 feet, $266^{\circ} 09'$.

Scott (Douglas County, Oreg., O. B. French, 1904).—On the highest part of the summit of Scott Mountain, about 20 miles northeast of Roseburg. The station is marked by an old-type bronze tablet set in a large boulder as described in note 16. Two reference marks, copper bolts in rock, note 19, are, respectively, 32.71 meters (107.3 feet) from the station in azimuth $195^{\circ} 02'$ and 18.17 meters (59.6 feet) in azimuth $305^{\circ} 42'$. The first is in a white rock near the middle of a prominent ledge and the second is in a rocky ledge near the edge of the brush.

Black (Douglas County, Oreg., O. B. French, 1904).—Near the northeast corner of the highest part of the summit of Black Rock, a high, prominent, rocky peak about 40 miles in a direct line east of Roseburg and north and northwest of some near-by higher wooded peaks. The station is marked by an old-type bronze tablet set in bedrock as described in note 16. Two reference marks, copper bolts in bedrock, note 19, are, respectively, 13.78 meters (45.2 feet) from the station in azimuth $4^{\circ} 55'$ and 6.47 meters (21.2 feet) in azimuth $297^{\circ} 45'$.

White (Douglas County, Oreg., O. B. French, 1904).—On the highest part of the summit of White Rock, a prominent peak about 15 miles east of Roseburg. The station is marked by an old-type bronze tablet in a large boulder as described in note 16. A reference mark consisting of a copper bolt in a large boulder just east of a prominent ledge, note 19, is 34.44 meters (113.0 feet) from the station in azimuth $353^{\circ} 11'$.

Rust (Jackson County, Oreg., O. B. French, 1904).—On the highest summit of Rustler Peak, about 20 miles north of Mount McLoughlin and 26 miles by road and trail from Big Butte post office via Parker's ranch. The station is marked by an old-type bronze tablet set in rock as described in note 16. Two reference marks, copper bolts in rock, note 19, are, respectively, 12.00 meters (39.4 feet) from the station in azimuth $264^{\circ} 33'$ and 10.12 meters (33.2 feet) in azimuth $337^{\circ} 53'$.

Onion (Jackson and Josephine Counties, Oreg., O. B. French, 1904).—On the highest part of the bare summit of Onion Springs (King) Mountain, about 1 mile south of the Onion Springs, and best reached from Wolf Creek. The station is marked by an old-type bronze tablet in a rocky ledge as described in note 16. Two reference marks, copper bolts in rock, note 19, are, respectively, 24.62 meters (80.8 feet) from the station in azimuth $91^{\circ} 50'$ and 47.22 meters (154.9 feet) in azimuth $182^{\circ} 47'$. The first is in a prominent ledge and the second is in an inconspicuous, low boulder at the western edge of the summit. The door of the State forest look-out house is about 12 feet northwest of the station.

Soda (Jackson County, Oreg., O. B. French, 1904).—On a peak known as Soda Mountain, in the Siskiyou Mountains, about 20 miles by road and trail southeast of Ashland and 5 miles east by north from Pilot Rock, a prominent peak in the same range. The best approach is from Ashland via Soda Springs and Davis's ranch. The station is marked by an old-type bronze tablet set in a large boulder flush with the ground as described in note 16. Two reference marks, copper bolts in boulders, note 19, are, respectively, 12.91 meters (42.4 feet) from the station in azimuth $299^{\circ} 53'$ and 23.95 meters (78.6 feet) in azimuth $35^{\circ} 36'$.

Sterling (Jackson County, Oreg., O. B. French, 1904).—In the Siskiyou Mountains, on Observation Peak, about 25 miles southwest of Ashland and 2 miles west of Mount Sterling, on the northernmost summit of a ridge just south of the Silver Fork Basin and at the western end of the long east-and-west valley which is just north of Mount Sterling. The station is about 80 or 90 meters southeast of the highest point of the summit in the center of a group of small boulders. The station is marked by an old-type bronze tablet set in the top of a large boulder as described in note 16. Two reference marks, copper bolts in rock, note 19, are, respectively, 34.85 meters (114.3 feet) from the station in azimuth $18^{\circ} 13'$ and 20.44 meters (67.1 feet) in azimuth $136^{\circ} 03'$.

Spur (Siskiyou County, Calif., O. B. French, 1904; 1919).—On the west slope of Mount Shasta at an elevation of about 9,100 feet, in a position best identified by approaching the summit from Igerna, by the road leading through Kite

Canyon. In ascending this route several prominent peaks are discerned ahead and from the right-hand one a narrow shoulder extends in a westerly direction, or toward Black Butte. The station is about 50 meters below an abrupt change of slope of the ridge of this shoulder, and about 1 mile from the peak mentioned above. The station is marked by an old-type bronze tablet in the top of a large boulder flush with the ground as described in note 16. Two reference marks, copper bolts in rock, note 19, are, respectively, 13.77 meters (45.2 feet) from the station in azimuth $165^{\circ} 53'$ and 8.10 meters (26.6 feet) in azimuth $228^{\circ} 47'$.

Boliver (Siskiyou County, Calif., O. B. French, 1904; 1920).—On the north side of a large group of boulders about 60 yards northeast of the highest part of the summit of Mount Scott, known locally as Old Craggy or Boliver, which is the high peak about 5 miles in a southerly direction from Callahan. The station is marked by an old-type bronze tablet set in rock as described in note 16. Two reference marks, copper bolts in rock, note 19, are, respectively, 6.57 meters (21.6 feet) from the station in azimuth $272^{\circ} 41'$ and 9.88 meters (32.4 feet) in azimuth $107^{\circ} 47'$.

Gazelle astronomical station (Siskiyou County, Calif., O. B. French, 1904; 1908).—About 250 yards north by east from the Gazelle railroad station near the center of the top of a very prominent knoll and about 40 feet northeast of the largest boulder on the knoll. The station is marked by an old-type bronze tablet in an underground boulder as described in note 16. A reference mark, a copper bolt set in rock, note 19, is 19.20 meters (63 feet) from the station in azimuth $290^{\circ} 12'$. A concrete longitude pier, recovered in 1919, is 8.72 meters (28.6 feet) east and 0.19 meter (0.6 foot) north of the station.

Mears (Shasta County, Calif., O. B. French, 1904; 1928).—About 4 or 5 miles west by south from Castella and about southwest from Castle Crags, on the southern summit of the highest rocky peaks in the region known locally as Gray Rocks. The station is about 20 feet below the highest part of the peak and near the bluff on the south and east sides, with a ledge 3 or 4 feet higher about 10 feet distant toward the southeast. The peak was approached from the south and the 30-foot bluff near the station surmounted by means of ladders. The station is marked by an old-type bronze tablet set in rock as described in note 16. Two reference marks, copper bolts in boulders, note 19, are, respectively, 7.92 meters (26 feet) from the station in azimuth $70^{\circ} 50'$ and 17.77 meters (58.3 feet) in azimuth $143^{\circ} 03'$. The first is near the trail to the station, the second just east of a high pointed rock.

Round (Shasta County, Calif., O. B. French, 1904; 1919).—On the highest part of what is known as Round Mountain just north of the post office of the same name. The station is marked by an old-type bronze tablet set in a large boulder as described in note 16. The boulder projects about 6 inches above the ground. Two reference marks, copper bolts set in rock, note 19, are, respectively, 28.72 meters (94.2 feet) from the station in azimuth $345^{\circ} 30'$ and 6.43 meters (21.1 feet) in azimuth $57^{\circ} 13'$. The south reference mark is in the most eastern rock of a prominent group of rocks near the south end of the summit.

Bally (Shasta County, Calif., O. B. French, 1904; 1928).—On the northernmost of the two main peaks on the summit of Bally Mountain, a prominent and well-known mountain about 15 miles by road west of Redding. The best way to reach the station is from the Frank Pawnee ranch, near the "Tower House," about 10 miles west of Redding on the Weaverville road. The station is marked by an old-type bronze tablet set in a rock on the north side of the most prominent group of rocks on the peak and 5 or 6 feet below the top of the group. The mark is described in note 16. Two reference marks, copper bolts set in rock, note 19, are, respectively, 4.29 meters (14.1 feet) from the station in azimuth $247^{\circ} 07'$ and 10.62 meters (34.8 feet) in azimuth $154^{\circ} 49'$.

Supplementary points

Warren (Columbia County, Oreg., O. B. French, 1903).—About a mile southwest of Warren, a station on the Spokane, Portland & Seattle Railway, on a slight elevation or ridge near the west side of a pasture owned by Mr. E. Harnes and about 250 meters north of an east-and-west road. The station is marked by an old-type bronze tablet set in a boulder as described in note 17. The letters "U. S." are cut in the north side of the boulder. Three reference marks, copper bolts set in rock, note 19, are in the fence line west of the station at the following distances and azimuths from the station: 23.67 meters (77.7 feet), $93^{\circ} 15'$; 37.46 meters (122.9 feet), $41^{\circ} 26'$; and 37.95 meters (124.5 feet), 142°

46'. The middle one of the three is 246.7 meters (809 feet) north of the north road fence and the other two are each about 30 meters from the middle one, one north and the other south.

Rocky Butte (Multnomah County, Oreg., C. Rockwell, 1889; 1903).—On the north side of the highest part of the brush-covered summit of the butte, about 2 miles northeast of Montavilla. The station is marked by a hole drilled in a large round-topped boulder.

Harney (Clark County, Wash., C. Rockwell, 1881; 1903).—On the north bank of the Columbia River, about $1\frac{1}{2}$ miles above the United States wharf at Vancouver, on the sloping bare bluff immediately above the road leading from Vancouver up the river. It is almost in front of the "Harney House," on land formerly owned by General Harney, and about 80 meters east of the fence inclosing the race track. The underground mark consists of a glass bottle placed 3 feet below the surface, with the neck up, the center of the neck marking the station, and three other bottles placed on their sides at a depth of about 1 foot and at distances of about 6 feet from the center, with the necks of the bottles pointing toward the center. The surface mark is a small drill hole 2 inches deep in a basaltic boulder, weighing about 350 pounds, placed with its top flush with the surface of the ground. The following bearings to the right of magnetic north were read at the station: East chimney of Harney House, $27^{\circ} 05'$; triangle on tree, $74^{\circ} 28'$; white house on south side of river, $172^{\circ} 55'$; ventilator on barn, $220^{\circ} 06'$; and corner of race-track fence, $276^{\circ} 47'$.

Balch (Multnomah County, Oreg., C. Rockwell, 1881; 1917).—This station was occupied for azimuth in 1886. It is immediately northwest of the city limits of Portland, about a mile south of the Willamette River, on the first small level bench of the spur making out from the ridge west of the Cornell road, and about 255 feet above the road. The station was marked by an old-type bronze tablet set in concrete. The station was most probably destroyed by the sluicing operations in grading down the hillside for Westover Terraces.

River (Multnomah County, Oreg., O. B. French, 1903).—Near the junction of the two suburbs of Portland known as Arbor Lodge and Peninsula, on the east bank of the Willamette River about a mile east of Columbia University. It is on a slight elevation, the highest in the vicinity, and in the fence line on the north side of the boulevard along the river bank. It was placed as far east as possible and still keep the Oregonian Building in view. The station is marked by crosses cut in the tops of two boulders, one placed near the surface of the ground and the other directly beneath at a depth of 1.7 feet, each stone bearing the letters "U. S. C. S." cut in the top.

Monument, General Land Office (Multnomah and Washington Counties, Oreg., O. B. French, 1903).—Exactly on the county line, at the initial intersection of the Willamette base and the Willamette meridian, a short distance southeast of station *Barnes*. (See description of *Barnes*.) The station is in a fence corner and is marked by a stone post projecting $1\frac{1}{2}$ feet above the ground.

Oregonian (Multnomah County, Oreg., O. B. French, 1903).—The tall iron pole at the southeast corner of the tower of the Oregonian Building, at the northwest corner of Sixth and Alder Streets, Portland. This tower should not be confused with the taller radio tower subsequently erected.

Portland latitude station (Multnomah County, Oreg., C. H. Sinclair, 1887; 1905).—This station has been destroyed.

Portland longitude station (Multnomah County, Oreg., C. H. Sinclair, 1887; 1905).—This station has been destroyed.

Portland bench mark (U. S. G. S.) (Multnomah County, Oreg., O. B. French, 1903).—At Portland, at the north front or Morrison Street entrance of the old post office, 2 feet east of the doorway, on the first course of stone above the water table. The station is marked by an aluminum tablet of the U. S. Geological Survey stamped 54A. This station has also been used as a bench mark of the Coast and Geodetic Survey with a designation of S 14. (See Special Publication 122, p. 57.)

Springfield Methodist Church (Lane County, Oreg., W. H. Burger, 1908).—The lower and less prominent of the two churches at Springfield.

Springfield Christian Church (Lane County, Oreg., W. H. Burger, 1908).—The taller and more prominent of the two churches at Springfield.

Eugene, Deady Hall, west tower (Lane County, Oreg., W. H. Burger, 1908).—Deady Hall is one of the two older buildings of the University of Oregon, at Eugene, and has large square towers at both the east and west ends.

Eugene, Geary School spire (Lane County, Oreg., W. H. Burger, 1908).—The Geary School is the public school located at Fourth Avenue west and Madison Street, Eugene.

Eugene, United Brethren Church spire (Lane County, Oreg., W. H. Burger, 1908).—At Eleventh Avenue east and Ferry Street, Eugene.

Eugene, Patterson School spire (Lane County, Oreg., W. H. Burger, 1908).—The public school located one block west of the southwest corner of the campus of the University of Oregon, at Eugene.

Eugene, Baptist Church spire (Lane County, Oreg., W. H. Burger, 1908; 1932).—Reported destroyed in 1932.

Eugene, W. O. W. Hall spire (Lane County, Oreg., W. H. Burger, 1908).—The old Episcopal Church located at Eighth Avenue west and Lincoln Street, Eugene, which is now being used as a hall by the Woodmen of the World.

Eugene, Courthouse flagpole (Lane County, Oreg., W. H. Burger, 1908).—At Eighth Avenue east and Oak Street, Eugene.

Eugene, Methodist Church spire (Lane County, Oreg., W. H. Burger, 1908; 1932).—Reported destroyed in 1932.

Seavies (U. S. G. S.) (Lane County, Oreg., O. B. French, 1904).—This station is identical with the U. S. Geological Survey station of the same name. It is on the most southern of the high hills, about 6 miles northeast of Eugene and about 30 or 40 feet southwest of and slightly lower than the highest part of the hill. The station is marked by a square stone 4 by 4 by 24 inches with its top a little below the surface. The old Geological Survey signal was still standing in 1904, anchored in place by rocks, and was not disturbed.

Rose (Douglas County, Oreg., O. B. French, 1904).—On the highest point of the highest bald summit of a ridge about $1\frac{1}{2}$ miles north of Roseburg. The station is marked by an old-type bronze tablet set in a boulder as described in note 17. The underground mark is a copper bolt in a block of concrete. Two reference marks, copper bolts set in rock, note 19, are, respectively, 16.71 meters (54.8 feet) from the station in azimuth $12^{\circ} 24'$ and 7.49 meters (24.6 feet) in azimuth $125^{\circ} 23'$.

Burg (Douglas County, Oreg., O. B. French, 1904).—On a high, bald summit about 3 miles southeast of Roseburg. As seen from the iron bridge over the river just west of the railroad station, it is the highest and most distant peak visible up a small valley. The station is marked by an old-type bronze tablet set in a boulder as described in note 17. The underground mark is a copper bolt in a block of concrete. A reference mark consisting of a copper bolt set in a boulder which is just over the edge of the hill, note 19, is 10.24 meters (33.6 feet) from the station in azimuth $112^{\circ} 45'$.

Roseburg latitude station (Douglas County, Oreg., O. B. French, 1904).—On the point of a spur across the river from the town of Roseburg, about 100 feet west from the end of the bridge and 60 feet above it. The station is marked by an old-type bronze tablet set in a rock ledge as described in note 16. Two reference marks, copper bolts set in rock ledges, note 19, are, respectively, 18.18 meters (59.6 feet) from the station in azimuth $30^{\circ} 17'$ and 32.30 meters (106 feet) in azimuth $109^{\circ} 05'$. The latter is in the side of a ledge flush with the ground.

Central Point astronomical station (Jackson County, Oreg., O. B. French, 1904; 1931).—About 2 miles north of Central Point near the intersection of the Southern Pacific Company track and a road and in the northwest corner of the field which is just east of the county road and south of the private road leading to the house occupied by George Mims. The station is about 30 meters from the railroad. (See *Central Point latitude station*, below.) This station is marked by an old-type bronze tablet set in a granite boulder which is embedded in concrete. The underground mark is a drill hole in a triangular block of granite which is embedded in concrete. The reference mark, a U. S. Geological Survey bench mark, is at the intersection of the railroad and the county road, just east of the rail on the east side of the track, 28.15 meters (92.4 feet) from the station in azimuth $31^{\circ} 55'$. The reference mark was found in 1931 but the station may have been covered by the Pacific Highway.

Central Point latitude station (Jackson County, Oreg., W. H. Burger, 1908; 1931).—Near *Central Point astronomical station* (see above) and marked only by a wooden pier. The following distances and azimuths were measured: Astronomical station, 4.77 meters (15.6 feet), $116^{\circ} 41'$; U. S. Geological Survey

For notes in regard to marking of stations see pp. 42 and 43.

bench mark (reference mark of the preceding station), 28.82 meters (94.6 feet), $41^{\circ} 18'$. The north and west fences of the field are, respectively, 6.18 meters (20.3 feet) and 15.55 meters (51.0 feet) from the station. The station was not found in 1931 and it may have been covered by the Pacific Highway.

Redding courthouse (Shasta County, Calif., O. B. French, 1904; 1908).—The center of the top of the dome of the courthouse upon which stands the statue of justice. The statue is eccentric to the center of the dome by about $1\frac{1}{2}$ feet. A triangle with a small hole at the center is cut in the floor of the dome directly below the center of the dome and may be used as the station.

Redding astronomical station (Shasta County, Calif., O. B. French, 1904; 1908).—On a prominent hill about three-fourths of a mile south by west from the railroad station at Redding. The station is on the brow of a hill somewhat toward the south edge and not quite at the highest point. A live oak about 6 inches in diameter is on the edge of the hill just north of the line to the Geological Survey bench mark and a leaning pine tree about a quarter of a mile distant is in line with the Redding courthouse. The station is marked by an old-type bronze tablet set in the top of a large boulder which projects 4 inches above the ground. (See note 16.) Two reference marks, copper bolts in boulders, note 19, are, respectively, 20.22 meters (66.3 feet) from the station in azimuth $115^{\circ} 49'$ and 9.99 meters (32.8 feet) in azimuth $188^{\circ} 17'$.

Hill (Shasta County, Calif., W. H. Burger, 1908).—On the east brow of a ridge just north of the ridge on which *Redding astronomical station* is located (see above), and almost on the line between that station and the courthouse at Redding. The station is marked only by a wooden stub and the three instrument stubs surrounding it.

Redding south base (Shasta County, Calif., W. H. Burger, 1908).—About 15 feet east of the railroad track at Redding and opposite a large steel oil tank. The station is marked only by a nail in the top of a wooden stub and by the three instrument stubs.

Redding north base (Shasta County, Calif., W. H. Burger, 1908).—Near the northwest corner of the cemetery south of the railroad station at Redding and about 15 feet east of the track. The station is marked only by a nail in a wooden stub and by the three instrument stubs around it.

Black Butte, cairn (Siskiyou County, Calif., O. B. French, 1904; 1931).—This is an intersection station, determined (but not described) in 1904. In 1931 it was found that the top of the mountain, including the cairn had been dynamited in the building of a U. S. Forest Service lookout house.

SECOND-ORDER TRIANGULATION, SOUTHWEST OREGON

Principal points

Camas (Coos County, Oreg., J. S. Hill, 1906).—On the south point of the high ridge which lies to the southwestward of Camas Valley, known as Kenyon Mountain. The eastern and southeastern slopes near the top are bare of trees, while the ridges to the north and west are heavily timbered. The instrument stand was the stump of a tree, so no station mark could be placed. Two reference marks, each consisting of a drill hole in the ledge of rock to the eastward, are, respectively, 22.06 meters (72.4 feet) from the station in azimuth $277^{\circ} 20'$ and 25.54 meters (83.8 feet) in azimuth $250^{\circ} 07'$. The distance between the two marks is 11.70 meters (38.4 feet). The U. S. Geological Survey station of the same name, marked by a copper bolt in the northeast root of a lone fir tree, is 5.98 meters (19.6 feet) from the station in azimuth $353^{\circ} 46'$.

Boliver (Coos County, Oreg., J. S. Hill, 1907).—On a high rocky summit some 25 miles by trail, a little southwest of Camas Valley post office, and about 20 miles by trail west of West Fork station on the Southern Pacific Railroad. The station is marked at the surface by a bronze tablet in a boulder as described in note 5, and underground, 6 inches deep, by a copper bolt 1 by 6 inches, which is an old mark of the U. S. Geological Survey. Two reference marks, each a copper bolt in a large boulder, are, respectively, 6.1 meters (20.0 feet) southeasterly from the station and 7.6 meters (25.0 feet) southwesterly.

Johnson (Coos County, Oreg., J. S. Hill, 1906).—On the east side of the open summit known as Lookout Rock, on what is known as Johnson Mountain, and about 15 meters southeast of a small fir tree with the lower branches trimmed off. Lines were opened on the west side of the summit to stations *Bennett* and *Sugar*. The station is marked by a bronze tablet in a large boulder as described

in note 4. Two reference marks, each a copper bolt in a large boulder, are, respectively, 4.56 meters (15.0 feet) from the station in azimuth $118^{\circ} 24'$ and 10.81 meters (35.5 feet) in azimuth $179^{\circ} 22'$.

Bennett (Coos County, Oreg., J. S. Hill, 1906).—On the highest point of the west summit of Bennett Butte. The station is marked at the surface by a bronze tablet in a boulder as described in note 5, and underground by a copper bolt in a boulder $2\frac{1}{2}$ feet below the surface. There is a reference mark, consisting of a copper bolt driven in a small fir stump, but its distance and direction were not stated in the description.

Sugar (Coos County, Oreg., J. S. Hill, 1906).—On a high summit $3\frac{1}{2}$ miles east of Myrtle Point, on what is locally known as Sugarloaf Mountain. The station is marked at the surface by a bronze tablet in concrete as described in note 1c, and underground by a copper bolt in a boulder $2\frac{1}{2}$ feet below the surface. A copper bolt in a small alder is 17.41 meters (57.1 feet) from the station in azimuth $224^{\circ} 24'$. A copper bolt 3 feet above the ground in another tree is 7.69 meters (25.2 feet) from the station in azimuth $294^{\circ} 07'$.

Westport (Coos County, Oreg., J. S. Hill, 1906).—On the highest point of a long, burned ridge, near the north and west edges of a summit covered with snags and second-growth trees. The station is marked by a standard bronze tablet set in a block of wood 10 inches in diameter and 12 inches long, and underground by a copper bolt in a similar block of wood $2\frac{1}{2}$ feet below the surface. A copper bolt driven in a snag is 11.39 meters (37.4 feet) from the station in azimuth $109^{\circ} 26'$, and a copper bolt in a stump is 19.19 meters (63.0 feet) in azimuth $259^{\circ} 11'$.

Cathcart (Coos County, Oreg., J. S. Hill, 1906).—On a wooded summit of the same name, about 11 miles east of Marshfield. The station, an old station of the U. S. Geological Survey, is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a copper bolt in a boulder $2\frac{1}{2}$ feet below the surface. Two reference marks, each consisting of a copper bolt in a blazed stump, are, respectively, 8.05 meters (26.4 feet) from the station in azimuth $40^{\circ} 04'$ and 7.04 meters (23.1 feet) in azimuth $343^{\circ} 59'$. A blazed tree is 4.6 meters (15.1 feet) east of the station.

Noah (Coos County, Oreg., J. S. Hill, 1906; 1924).—On a high summit known locally as Noahs Butte, about 5 miles a little north of east from Marshfield. The station is marked at the surface by a standard bronze tablet set in a cut stone, and underground by a copper bolt in a similar stone $2\frac{1}{2}$ feet below the surface. In 1922 it was found that the knob had recently been burned over and that the stumps containing the reference marks had been destroyed. The station mark was covered with an inch of soil. The rock containing the mark had deteriorated to such an extent that the mark could be lifted out with the fingers. No new marks were set in 1924, but a signal was erected.

Marshfield Hill (Coos County, Oreg., E. F. Dickens, 1889; 1924).—On the brow of a very prominent hill in the northern section of Marshfield, overlooking the harbor, at the easterly edge of the woods. The station is about 230 feet above the bay, about 25 meters south of a small frame building formerly used as a Marconi wireless station and about 90 meters west of a steel tower of the Weather Bureau. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a copper bolt in a boulder 3 feet below the surface. Two reference marks, each consisting of a copper bolt driven in a large stump, are, respectively, 15.22 meters (50.0 feet) from the station in azimuth $150^{\circ} 17'$ and 4.68 meters (15.4 feet) in azimuth $264^{\circ} 23'$.

Squirrel (Curry County, Oreg., J. S. Hill, 1907).—On the southwest summit of Bear Camp Ridge, locally known as Squirrel Camp, which lies between the Rogue and Illinois Rivers. The station is about 8 meters southwest of the highest point on the north side of an outcrop. It is marked by a cross in the top of a half-inch brass bolt set in rock. A reference mark, consisting of a similar bolt set in the face of a rock lying on the brow of the hill, is 14.5 meters (47.6 feet) from the station in azimuth 111° . A cartridge shell set in rock is on the ridge 10.4 meters (34.1 feet) from the station in azimuth 1° .

Bald (Curry County, Oreg., J. S. Hill, 1907; 1924).—On the highest part of Bald Mountain, about 4 miles from the Oregon Coast Highway by way of Fromm Ranch trail and 1 mile northwest of Rocky Peak. The station is marked at the surface by a bronze tablet in rock as described in note 5, and below this by an iron bolt cemented in a drill hole in rock. A reference mark consisting of a bronze tablet set in rock, note 12d, is 38.84 meters (127.4 feet) from the station in azimuth $332^{\circ} 43'$.

Butler (Curry County, Oreg., J. S. Hill, 1907; 1932).—On the highest point of the highest isolated peak of Mount Butler. The station is marked by a $\frac{3}{4}$ -inch iron bolt cemented in solid rock. The bolt has a square head which is covered with sheet copper and marked with a cross. Two reference marks, each consisting of a half-inch iron bolt set in a drill hole in rock, are, respectively, 2.59 meters (8.5 feet) from the station in azimuth $222^{\circ} 22'$ and 8.33 meters (27.3 feet) in azimuth $276^{\circ} 22'$. This station was disturbed in 1932 by the erection of a look-out house.

Sixes (Curry County, Oreg., A. W. Chase, 1869; 1928).—On a high bank south of the Sixes River. The station is marked at the surface by a bronze tablet set in concrete as described in note 1c, and underground by a lead bolt in a block of wood with an inverted bottle over it, 3 feet below the surface. Two reference marks, each consisting of an iron bolt driven in the side of a small fir tree stump, are, respectively, 5.38 meters (17.7 feet) from the station in azimuth $346^{\circ} 50'$ and 3.48 meters (11.4 feet) in azimuth $281^{\circ} 07'$. None of the marks could be found in 1928 because of a dense overgrowth of underbrush. It was thought, however, that they could be found if a more thorough search were made.

Cape (Curry County, Oreg., J. S. Hill, 1907; 1928).—Near the middle one of the three most western projecting points of Cape Blanco and close to the fence line which follows the edge of the cliff. The station is marked at the surface by a bronze tablet in rock as described in note 4, and underground by an empty cartridge cemented in a drill hole in rock 2 feet below the surface. Two reference marks, each consisting of a drill hole in a boulder, are, respectively, 8.56 meters (28.1 feet) and 6.84 meters (22.4 feet) from the station. The first is in the fence line along the cliff in range with the center line of the twin windows on the west side of the first story of the lightkeeper's dwelling, and the second is in range with the flagpole near the cliff to the north of the station. The flagpole is 23.23 meters (76.2 feet) from the station. Another reference mark, located about 6 feet outside the fence of the lighthouse yard and consisting of a bronze tablet in a boulder, note 12b, is 113.80 meters (373.4 feet) from the station in azimuth $282^{\circ} 49' 28''$.

Madden (Curry County, Oreg., J. S. Hill, 1907).—On a heavily timbered butte $\frac{1}{2}$ miles northeast of Charles Zumwalt's place, on the Oregon Coast Highway, one-half mile north of the Sixes River, about 25 or 30 feet southwest of the highest point of the butte. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by an empty cartridge set in a boulder $\frac{1}{2}$ feet below the surface. Two reference marks, each consisting of an iron bolt driven at the center of a triangular blaze on a fir tree, are, respectively, 3.53 meters (11.6 feet) from the station in azimuth $189^{\circ} 31'$ and 5.83 meters (19.1 feet) in azimuth $293^{\circ} 38'$.

Heads (Curry County, Oreg., A. W. Chase, 1869; 1907).—On the northern slope of the hill known as Port Orford Heads, in the center of an open field, about 200 yards south of Jensen's house, and about in range with the west side of the house and Madden Butte. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a lead bolt in a boulder 3 feet below the surface. Two reference marks, each consisting of a drill hole in a boulder set flush with the ground, are, respectively, 23.37 meters (76.7 feet) from the station in azimuth $156^{\circ} 53'$ and 13.78 meters (45.2 feet) in azimuth $301^{\circ} 55'$. A blazed pine tree is 37.0 meters (121 feet) east of the station.

Port Orford astronomical 2 (Curry County, Oreg., J. S. Hill, 1907; 1928).—On a high point, in a north-and-south fence line, 12 meters from the edge of the bank. The station is marked by a lead bolt in a block of blue sandstone. It was searched for in 1928 but could not be found. It is probably lost.

Craggy (Curry County, Oreg., J. S. Hill, 1907).—On the spur of the highest peak of Craggy Mountains, about 100 yards west of the summit, on the second level bench from the top and 150 feet lower. The station is marked by a $\frac{1}{2}$ -inch drill hole in a rock. Two reference marks, each consisting of a $\frac{1}{2}$ -inch drill hole in rock, are, respectively, 1.59 meters (5.2 feet) from the station in azimuth $229^{\circ} 28'$ and 7.40 meters (24.3 feet) in azimuth $318^{\circ} 22'$. The latter is in the top of a large isolated rock.

Stack (Curry County, Oreg., J. S. Hill, 1907; 1924).—Seven miles east of Gold Beach, on the highest stack of rocks on what is known as Whisky Flats. The station is marked by an empty cartridge cemented in a drill hole in a boulder, which is between two higher and larger rocks, one east and one west. Two reference marks, each consisting of an empty cartridge cemented in a boulder, are, respectively, 5.00 meters (16.4 feet) from the station in azimuth $148^{\circ} 20'$ and 7.23

meters (23.7 feet) in azimuth $245^{\circ} 40'$. Fresh cement was placed around each of the marks in 1924.

Bosley (Curry County, Oreg., J. S. Hill, 1907; 1924).—On Bosley Butte, about 5 meters north of the highest point of rock, on a level space. The station is marked by a bronze tablet in rock as described in note 4. A reference mark, consisting of a bronze tablet in a boulder, note 12c, is 7.98 meters (26.2 feet) from the station in azimuth $23^{\circ} 07'$. Another reference mark, an empty cartridge set in a drill hole in a boulder, is 7.63 meters (25.0 feet) from the station in azimuth $261^{\circ} 18'$. A cairn of the U. S. Geological Survey is a short distance south and a little higher than the station. The top of the station mark was found broken off in 1924 and was cemented back in place.

Grizzly (Curry County, Oreg., J. S. Hill, 1907; 1924).—On a bushy summit of Grizzly Mountain, about 3 miles southeast of Gold Beach and 2 miles by pack train from Jess Turner's ranch. The mountain has two peaks about 90 meters apart and the station is on the highest point of the northern peak. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a drill hole in a boulder 1 foot below the surface. A reference mark, consisting of a drill hole in a flat rock, is in the ridge south of the station, 14.38 meters (47.2 feet) distant in azimuth $346^{\circ} 42'$. Another reference mark, a bronze tablet in bedrock, note 12a, is 17.89 meters (58.7 feet) from the station in azimuth $130^{\circ} 48'$.

Sundown 2 (Curry County, Oreg., J. S. Hill, 1907; 1924).—On the western end of a ridge about 3 miles east of Pistol River, in an open space covered with dead brush, with timber directly to the east. The station is marked by a bronze tablet in a boulder as described in note 4. A reference mark, consisting of a drill hole in a stone cube, is 6.58 meters (21.6 feet) from the station in azimuth $77^{\circ} 26'$. Another reference mark, a bronze tablet in a boulder, note 12c, is 10.09 meters (33.1 feet) from the station in azimuth $346^{\circ} 20'$. A third reference mark, a $\frac{3}{4}$ -inch piece of bronze cemented into the top of a rock, is 9.55 meters (31.3 feet) from the station in azimuth $138^{\circ} 26'$. This last was used as an eccentric station in 1924 for the angle Bosley to Rocky. A fir tree marked with a nail in a triangular blaze 6 feet above the ground is 24.73 meters (81.1 feet) from the station in azimuth $229^{\circ} 10'$.

Dolan (Curry County, Oreg., A. W. Chase, 1873; 1928).—On a high knoll one-half mile south of where the road crosses Myers Creek, a little southwest of the highest point of the hill. The station is marked 2 inches below the surface by a bronze tablet in a boulder as described in note 4, and underground by a cross in a boulder 3 feet below the surface. The reference mark, a bronze tablet in a boulder, note 12c, is 8.53 meters (28.0 feet) from the station in azimuth $262^{\circ} 15'$. Except for a mound of earth 6 feet to the north, it is on the highest point in the vicinity. It is 2 feet east of the edge of a hole and is in range with the station and the largest rock on the beach.

Red Rock (Curry County, Oreg., A. W. Chase, 1873; 1924).—About 3 miles south of where the road crosses the Pistol River, on a ridge bare on the top and south side but timbered on the north side, in a depression in a large bunch of rocks. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a bottle 1 foot below the surface. A reference mark, a bronze tablet in a flat boulder higher than the station, note 12c, is 2.99 meters (9.8 feet) from the station in azimuth $208^{\circ} 43'$. A drill hole in a ledge of rock lower than the station is 41.46 meters (136.0 feet) distant in azimuth $73^{\circ} 06'$, and a drill hole in a point of rock is 3.48 meters (11.4 feet) from the station in azimuth $207^{\circ} 51'$.

Pollywog (Curry County, Oreg., H. A. Seran, 1913).—On the highest part of the wooded butte about one-half mile south of Pollywog Butte, on the ridge extending south from Quail Prairie, and lying about 6 miles west of the Red Mountain Range. The station is marked by a bronze tablet in a boulder as described in note 5. A large rock cairn surrounds the mark.

Elk (Curry County, Oreg., H. A. Seran, 1913; 1924).—On the highest part of the well-known Elk Mountain, which stands on the north bank of the Winchuck River, about 8 miles from the mouth. The station is marked by a bronze tablet in concrete as described in note 1a. The reference mark, a bronze tablet in concrete, note 11a, is 2.60 meters (8.5 feet) from the station in azimuth $157^{\circ} 02'$.

Packsaddle (Curry County, Oreg., H. A. Seran, 1913).—On the highest part of Packsaddle Mountain, a double-peaked mountain about 12 miles by trail from the Winchuck ranger station. The southwestern peak of this mountain is used by

the Forest Service as a lookout station. The station is marked by a bronze tablet in a boulder as described in note 5. The reference mark, a bronze tablet in a boulder, note 12d, is 4.05 meters (13.3 feet) from the station in azimuth $90^{\circ} 05'$.

High Divide (Del Norte County, Calif., H. A. Seran, 1913).—About 10 miles east of Smith River Corners, Calif., on the highest part of the western bench of the plateau known as High Divide. The station is marked by a bronze tablet in a boulder as described in note 5. There is a rock cairn 3 feet high over and around the mark. The reference mark, a bronze tablet in the highest rock on the hill, note 12d, is 8.50 meters (27.9 feet) almost due west from the station.

Long Ridge (Del Norte County, Calif., H. A. Seran, 1913).—About 12 miles northeast of Gasquets Stage station, on the highest part of the mountain known as High Dome. The station is marked by a bronze tablet in a boulder as described in note 5. The reference mark, a bronze tablet in a large square rock, note 12d, is 6.89 meters (22.6 feet) from the station in azimuth $84^{\circ} 06'$.

Gordon (Del Norte County, Calif., H. A. Seran, 1913; 1914).—On the highest part of the summit of Gordon Creek Mountain, the large mountain standing on the west side of Hurdy Gurdy Creek. The station is marked by a bronze tablet in a boulder as described in note 5. The reference mark, a bronze tablet in a large rock about 4 feet high, note 12d, is 14.42 meters (47.3 feet) from the station in azimuth $77^{\circ} 36'$.

Bald Hill (Del Norte County, Calif., H. A. Seran, 1913; 1925).—About 1 mile beyond the Bald Hill ranch house on the old Kelsey trail. The station is marked by a bronze tablet in a boulder as described in note 5. The reference mark, a bronze tablet in a boulder, note 12d, is 4.56 meters (15.0 feet) west of the station.

Child (Del Norte County, Calif., H. A. Seran, 1913; 1925).—About 6 miles south of the well-known Bald Hills, on the western end of the highest part of what is known as Child's Hill. The station is marked by a bronze tablet in a boulder as described in note 5. The reference mark, a bronze tablet in concrete, note 11a, is 5.04 meters (16.5 feet) west of the station.

Red Mountain (Del Norte County, Calif., H. A. Seran, 1913; 1919).—North of the Klamath River, about 5 meters north of the highest point of Red Mountain, the top of which is covered with scraggly pine. The station is about 25 meters north of where the trail makes a decided turn to the southeastward. It is marked by a bronze tablet in a large boulder as described in note 5. A reference mark, consisting of a stone drill cemented in a drill hole in a rock, is 3.21 meters (10.5 feet) northwest of the station. The center of the top of a large rock monument is 10.76 meters (35.3 feet) east of the station. The recovery note of 1919 reads as follows: "Found as described, except that no standard station mark was found. An empty cartridge, cemented in a small flat rock, marked the described position of the station, at the correct distance from the pile of rocks. A standard disk reference mark was cemented in a large rock and placed in the described position of the station." The distance to the iron pin in the boulder is given as 2.22 meters (7.3 feet) in the 1919 recovery note and the distance to a large monument of stone as 19.70 meters (64.6 feet). An aluminum bench mark of the U. S. Geological Survey, reset in 1919, is 1.11 meters (3.6 feet) from the station. Discrepancies in the measured distances makes the recovery of 1919 somewhat doubtful, and this station should be used with caution.

Rattle (Del Norte County, Calif., H. A. Seran, 1914; 1925).—On the highest part of Big Rattlesnake Mountain, which lies between Red Mountain and the south branch of the Smith River. The station is marked by a bronze tablet in a boulder as described in note 5 and has a large cairn of rocks built around it. The reference mark, a bronze tablet in concrete, note 11a, is 7.90 meters (25.9 feet) north of the station.

Mound (Del Norte County, Calif., H. A. Seran, 1914; 1919).—On the small grassy knoll almost due south and about 100 feet below the summit of the first ridge north of the mouth of the Klamath River and about 1,000 meters distant, on what is known as the Lockwood place. The station is marked by a bronze tablet in concrete as described in note 1a. The reference mark, a bronze tablet set in a pine tree about 3 feet above the ground, is 12.65 meters (41.5 feet) north of the station.

Klamath South 2 (Del Norte County, Calif., H. A. Seran, 1914; 1928).—On the highest part of the bald hill on the south side of the mouth of the Klamath River. The station is marked by a bronze tablet in concrete as described in note 1a. The reference mark, a bronze tablet in a boulder, note 12d, is 4.28 meters (14.0 feet) east of the station.

Flint Rock 2 (Del Norte County, Calif., H. A. Seran, 1914; 1929).—On the seaward face of the highest point of Flint Rock, the large rock about 1 mile below the mouth of the Klamath River. It is necessary to use ladders and ropes to climb the rock. The station is surrounded by poison oak. It is marked by a bronze tablet in concrete as described in note 1a. The reference mark, a bronze tablet in concrete, note 11a, is 3.96 meters (13.0 feet) east of the station.

Flint Ridge (Del Norte County, Calif., A. W. Chase, 1872; 1919).—On the long sloping ridge back of Flint Rock, about 800 feet in elevation and 50 or 60 meters from the forest edge. The station is marked at the surface by a bronze tablet in concrete as described in note 1c, and underground by a bottle 3 feet below the surface.

High Bluff (Del Norte County, Calif., A. W. Chase, 1871; 1929).—On the highest part of the first prominent point or high bluff south of Flint Rock, about 1 meter from the edge of the bluff, which is the northern face and almost perpendicular. The station is marked by a bronze tablet in concrete as described in note 1a. It is surrounded by a large rock cairn.

Supplementary points

Camas U. S. G. S. (Coos County, Oreg., U. S. Geological Survey, 1907).—See the description of Camas.

Edson (Curry County, Oreg., J. S. Hill, 1907; 1909).—About 25 meters north of the highest point of Edson Butte. There is a U. S. Geological Survey station marked by a pile of stones at the summit of the butte. The station is marked by a $\frac{3}{8}$ -inch iron plug with a punch hole in the top, set in cement in a drill hole in the rock, and standing 2 inches above the surface. The reference mark is a cartridge set in cement in a drill hole in the rock distant 5.16 meters (16.9 feet) in azimuth $140^{\circ} 51' 31''$.

Cotton (Coos County, Oreg., J. S. Hill, 1907).—On the southwestern spur of the ridge of which Bennett Butte is the summit, about 7 meters west and a little south of the highest point, midway between two large fir snags, and a few feet south of the line joining them. The station is marked by a $\frac{3}{8}$ -inch drill hole in the top of a rock set 10 inches below the surface and by a $\frac{3}{8}$ -inch iron slug set in concrete at the surface of the ground.

Port Orford south base (Curry County, Oreg., A. W. Chase, 1869; 1928).—On a large isolated rock about 50 feet high, directly at the foot of the trail leading from Port Orford to the west beach. The stream forming the outlet of Garrison Lake runs past the southeast side of the rock. The station is at the center of the oblong space, 30 by 60 feet, forming the top of the rock. It is marked at the surface by a bronze tablet in a boulder as described in note 5, and underground by an inverted bottle 2 feet below the surface. Two reference marks, each consisting of a bronze tablet in concrete, note 11c, are, respectively, 5.10 meters (16.7 feet) and 6.77 meters (22.2 feet) from the station. The first is $109^{\circ} 51'$ to the right of the line to Cape Blanco Lighthouse and the second is $75^{\circ} 51'$ to the left of this line.

Bill (Coos County, Oreg., J. S. Hill, 1907; 1922).—On the highest point of the bare summit known as Bill Peak, about one-half mile from Doyle's ranch. The station is marked at the surface by a bronze tablet in concrete as described in note 1c, and directly under the concrete by a copper bolt in a boulder, 1 foot below the surface. The disk is stamped "Bill Δ 1907." A reference mark, a bronze tablet in a boulder, note 12d, is 9.10 meters (29.9 feet) north of the station. Another reference mark, a nail set in cement in a drill hole in bed-rock, is 4.63 meters (15.2 feet) west of the station.

Sundown (Curry County, Oreg., A. W. Chase, 1873; 1907).—This station is 30.20 meters (99.1 feet) from *Sundown 2* (see description) in azimuth $217^{\circ} 04'$. It is marked by a bottle 3 feet below the surface of the ground.

Second Peak north of Preston Peak (Siskiyou County, Calif., H. A. Seran, 1914).—This is the second peak north of Preston Peak, along the same ridge. The peak is very sharp and the south slope is steep, looking from a distance as if it were a perpendicular bluff. It resembles Preston Peak in outline and general appearance, but is not so high.

Preston Peak (Siskiyou County, Calif., H. A. Seran, 1914).—This is the highest mountain of the Siskiyou group. The summit is sharp and the sides are steep. There are several slides and waterfalls on the sea side of the summit, and these make it easy to identify.

Four Brothers No. 1 (Del Norte County, Calif., H. A. Seran, 1914).—One of the four peaks of Ship Mountain which is near the southwestern end of the Siskiyou Range and a little closer to the coast than the balance of the Siskiyou group. Each of the four peaks is sharp with steep sides and they all look alike.

Four Brothers No. 2 (Del Norte County, Calif., H. A. Seran, 1914).—See the description of Four Brothers No. 1.

Four Brothers No. 3 (Del Norte County, Calif., H. A. Seran, 1914).—See the description of Four Brothers No. 1.

Four Brothers No. 4 (Del Norte County, Calif., H. A. Seran, 1914).—See the description of Four Brothers No. 1.

SECOND-ORDER TRIANGULATION, NORTHWEST OREGON

Principal points

Cummins (Lincoln County, Oreg., J. S. Hill, 1908).—On the highest part of the mountain, 20 miles south of Waldport by road and trail. The station is marked by a drill hole $1\frac{1}{2}$ inches deep in a large rock set flush with the surface. One reference mark is a drill hole one-half inch deep in a natural rock projecting about 6 inches a little way down the slope in azimuth $120^{\circ} 42'$, and the other is a drill hole in a large boulder at the south end of the summit in azimuth $33^{\circ} 33'$.

Fairview (Lane County, Oreg., J. S. Hill, 1908; 1927).—On the highest part of the mountain about 6 miles northeast of Heceta, between Tenmile Creek and Rock Creek. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a drill hole in a boulder 12 to 15 inches below the surface. Two reference marks, each consisting of a brass bolt embedded in a boulder, are at the following distances and azimuths from the station: 8.56 meters (28.1 feet), $198^{\circ} 01'$; and 8.21 meters (26.9 feet), $257^{\circ} 45'$.

Cape (Lane County, Oreg., J. S. Hill, 1908; 1927).—On the mountain 13 miles by road and trail north of Florence, about 2 miles east of the Oregon Coast Highway, on a northwesterly spur of Cape Mountain about 1 mile northwest of the highest point of the mountain, about 150 meters east of the timber, and 9 meters south of the highest point which is covered with large boulders. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a drill hole in a boulder 12 to 15 inches below the surface. There are two reference marks, each consisting of a brass bolt embedded in rock. The first is 9.44 meters (31.0 feet) north of the station in a boulder projecting 3 feet above the ground, the largest one on the point. The second is in a boulder projecting $1\frac{1}{2}$ feet above the ground, 8.17 meters (26.8 feet) east of the station.

Maple (Lane County, Oreg., J. S. Hill, 1908).—On the first hill about one-fourth mile south of Bald Mountain, on the highest part of the top, and in the center of the ridge. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a drill hole in a boulder 12 to 15 inches below the surface. Two reference marks, each a drill hole in a boulder, are, respectively, 6.36 meters (20.9 feet) from the station in azimuth $89^{\circ} 19'$ and 8.02 meters (26.3 feet) in azimuth $346^{\circ} 19'$.

Trail (Douglas County, Oreg., J. S. Hill, 1908).—On the trail between Gardiner and Florence in some very large timber about 5 miles from Gardiner, about 90 meters beyond a cabin which is passed on the right and close to the trail. The station and cabin are on the same side of the trail. The station was in the top of a tree 160 feet tall and was not marked on the ground. There are two reference marks; one is a drill hole in a rock 18 inches below the surface, over which is another rock with a drill hole 2 inches below the surface, 41.16 meters (135.0 feet) from the station in azimuth $87^{\circ} 15'$. The other reference mark, similar to the first except that it is buried a few inches deeper, is 37.18 meters (122.0 feet) from the station in azimuth $181^{\circ} 13'$.

Dean (Douglas County, Oreg., J. S. Hill, 1908).—On the north slope of the first prominent knoll about 275 meters east of the timbered summit known as Deer Head Point, about 15 or 18 meters from the highest part of the knoll. The station is marked by an inch drill hole in the center of a long, narrow rock buried 4 inches underground. For reference marks each of two trees was marked with a triangular blaze with a nail at the center. One is 15.32 meters (50.3 feet) N. 23° E. from the station and the other is 14.25 meters (46.8 feet) S. 68° E. These bearings are probably magnetic.

Burn (Douglas County, Oreg., J. S. Hill, 1908; 1928).—On top of a burnt ridge south of Gardiner, 11 meters southeast of the highest part of the hill. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a drill hole in a boulder 12 to 15 inches below the surface. A reference mark, consisting of a brass bolt embedded in a boulder, is 10.79 meters (35.4 feet) from the station in azimuth $76^{\circ} 47'$. When recovered in 1928, the station mark was found nearly covered by a fallen log. The ridge had been recently logged over.

Schooner (Douglas County, Oreg., J. S. Hill, 1908).—On the south side of the Umpqua River, about three-fourths mile above Reed's cannery, in the timber on the side hill, 12 meters northeast of the highest part of the hill and about 400 feet above the river. The station is marked 2 inches below the ground by a bronze tablet in a boulder as described in note 4, and below this by a drill hole in a boulder 14 inches below the surface. Two reference marks, each consisting of a $\frac{3}{8}$ -inch bolt driven into a large tree, are, respectively, 6.01 meters (19.7 feet) from the station in azimuth $218^{\circ} 52'$ and 16.12 meters (52.9 feet) in azimuth $303^{\circ} 33'$.

Table (Lincoln County, Oreg., J. S. Hill, 1908).—On a flat-topped mountain known locally as White Rock, southeast of Newport, between the Yaquina and Alsea Rivers, on a small knoll running north and south, about 90 meters southwest of the highest point of the southwest ridge, about 365 meters north of a prominent rocky bluff, and 60 meters north of the highest point of the southeast spur. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a drill hole in a boulder 12 to 15 inches below the surface. Two reference marks, each consisting of a brass bolt embedded in a boulder, are, respectively, 8.47 meters (27.8 feet) from the station in azimuth $43^{\circ} 43'$ and 9.49 meters (31.1 feet) in azimuth $128^{\circ} 29'$.

Foulweather (Lincoln County, Oreg., J. S. Hill, 1908; 1927).—About 10 miles north of Newport, $1\frac{1}{2}$ miles northeast of Otter Rock, $\frac{3}{4}$ mile east of the Oregon Coast Highway, and 50 meters west of the highest point on Cape Foulweather. The south side of the station hill is bare, and the general location of the station is apparent from the beach to the south because of a cleared line through the timber to the north of the station. The station is at the center of the cleared line and about 25 meters from the south timber line. It is marked at the surface by a bronze tablet in a boulder as described in note 5, and underground by a quart bottle set in concrete 20 inches below the surface. A reference mark set in 1908, consisting of a shallow drill hole in a small boulder 4 inches below the surface, is 7.26 meters (23.8 feet) from the station in azimuth about 138° . Another reference mark set in 1927, consisting of a 1-inch iron pipe 4 feet long projecting 1 foot above the surface, is 8.11 meters (26.6 feet) from the station in azimuth 139° . Two witness marks, each consisting of a triangular blaze in a 14-inch spruce, are, respectively, 11.0 meters (36.1 feet) from the station in azimuth 133° and 11.9 meters (39.0 feet) in azimuth 40° . Another witness mark, a square blaze in a 20-inch spruce, is 13.7 meters (44.9 feet) from the station in azimuth 43° .

Iron (Lincoln County, Oreg., J. S. Hill, 1908; 1927).—On a prominent bare, sharp butte about 5 miles north of Newport and $1\frac{1}{2}$ miles northeast of Yaquina Head Lighthouse. The hill is well timbered on the lower sides, but bare and steep near the top. A blazed trail leads to it from the Oregon Coast Highway, starting at an old skid road near a culvert. The station is 3 meters west of the highest point and is marked by a bronze tablet in bedrock as described in note 3. Two reference marks, each consisting of a bronze tablet in bedrock, note 12a, are, respectively, on the north shoulder of the hill, 8.20 meters (26.9 feet) from the station in azimuth $95^{\circ} 19'$, and on the north end of a prominent ledge on the backbone of the ridge, 18.26 meters (59.9 feet) from the station in azimuth $172^{\circ} 24'$.

Bald (Lincoln County, Oreg., J. S. Hill, 1908).—On Rocky Point, which is a very sharp and prominent point one-fourth mile south-southwest of Bald Mountain summit. Here the ridge forms a horseshoe, Rocky Point being at the northwest end and Bald Mountain at the other. There is a trail at the foot of the point on the west side which goes over the top and within 15 meters of the station. There is a spring about 275 meters southwest and another one to the east. The station is marked by a bronze tablet in a large boulder as described in note 4. Two reference marks, each consisting of a drill hole in rock at the intersection of cross lines and inscribed with the letters "U. S." are, respectively, 9.25 meters (30.3 feet) from the station in azimuth $181^{\circ} 21'$ and 3.24 meters (10.6 feet) in azimuth

20° 14'. The former is on the most western prominent shelf of rock and the latter is in a large boulder.

Salmon (Lincoln County, Oreg., J. S. Hill, 1908).—About 6 miles by road and trail southwest of Otis post office on the highest fern-covered hill on the south side of the entrance to the Salmon River, on top of a ridge 1.5 meters across, 27 meters south of the highest point, and directly in the center of the trail. The station is marked by a bolt 1 inch in diameter set in the top of a large rock flush with the surface. Two reference marks, each consisting of a shallow drill hole in a boulder on the hillside, are, respectively, 3.40 meters (11.2 feet) from the station in azimuth 85° 54' and 2.00 meters (6.6 feet) in azimuth 149° 37'.

Cascade (Tillamook County, Oreg., J. S. Hill, 1908).—On the side hill of the southeast ridge of Cascade Head, about 30 meters from the east edge of the timber and 45 meters east-southeast from the top of the first spur. An opening cut through the timber to the north should help to identify the location. The station is marked at the surface by a bronze tablet in the end of a large boulder as described in note 4, and underground by a drill hole at the intersection of cross lines in a flat stone 2 feet below the surface. Four blazed trees, each marked with a nail, are at the following distances and azimuths from the station: 70.4 meters (231 feet), 35° 34'; 24.8 meters (81 feet), 56° 07'; 40.6 meters (133 feet), 191° 40'; and 43.0 meters (141 feet), 288° 11'.

Hebo (Tillamook County, Oreg., J. S. Hill, 1908).—On a mountain about 3,150 feet high, the highest in the locality, about 27 miles by road south of Tillamook. Approaching from the northwest the station is 4.5 meters to the left of the trail immediately upon reaching the first ridge of the summit. The station is marked at the surface by a bronze tablet in a flat stone as described in note 4, and underground by a drill hole in rock 2 feet below the surface. Two reference marks, each consisting of a drill hole in a large prominent rock, are, respectively, 6.69 meters (21.9 feet) from the station in azimuth 67° 54' and 5.82 meters (19.1 feet) in azimuth 115° 09'.

Buzzard Butte (Tillamook County, Oreg., J. S. Hill, 1908).—Between two small knolls, which are about 4.5 meters apart on top of Bald Butte, west of Beaver, northwest of Hebo, and about 1 mile east and a little south of Buzzard Butte, 1,686 feet above sea level. The station is marked at the surface by a bronze disk in a flat rock as described in note 4, and underground by a drill hole in a boulder 1½ feet below the surface. The reference mark, a drill hole in a large rock projecting 3 inches above the ground on a small knoll on the highest part of the summit, is 2.38 meters (7.8 feet) from the station in azimuth 227° 30'.

Ginger (Tillamook County, Oreg., J. S. Hill, 1908).—About the center of the top on a little knoll on the highest point of a mountain east of Tillamook, on the Trask River road. The station is marked by a bronze disk in a large rock flush with the surface as described in note 4. The reference mark is a drill hole in a very prominent natural rock formation, 9.13 meters (30.0 feet) from the station in azimuth 44° 00'.

Shell Point (Tillamook County, Oreg., J. J. Gilbert, 1866; 1926).—On the east side of Tillamook Bay, on the first prominent point above Bay City, commonly known as Goose Point, about 8 meters from the edge of the grass to the south and 2 meters from the edge of the grass to the west. The station is marked by a bronze tablet in a boulder as described in note 4. A station of the United States Army Engineers, marked by a half-inch iron pipe in a block of concrete, is 1.08 meters (3.5 feet) from the station in azimuth 268° 53'. A reference mark, a bronze tablet set in concrete at the center of a tile, note 13b, is 8.94 meters (29.3 feet) from the station in azimuth 182° 08'.

Boulder Point (Tillamook County, Oreg., J. Kincheloe, 1866; 1926).—On the south side of Tillamook Bay on a heavily timbered prominent point, about 1 mile south of Dick Point dike. The station mark was found destroyed in 1926 because of a road having been built over it, but the two original reference marks were found intact. One reference mark, a bronze tablet in a triangular rock, note 4, is 13.27 meters (43.5 feet) from the station in azimuth 132° 12'. The other reference mark, a bronze tablet in a large boulder projecting 2 feet above the ground, note 12c, with arrow pointing toward the first reference mark, is 5.00 meters (16.4 feet) from the station in azimuth 257° 14'. Both tablets are marked "Boulder Point 2, 1926." A witness mark, an arrow of nails in a piling, is 3.0 meters (9.8 feet) southwest of the first reference mark.

Doty (Tillamook County, Oreg., J. S. Hill, 1908).—On the second small spur, 185 meters from the summit, and the same distance beyond the first prominent

spur below the summit, 1,438 feet above the sea level. The station is marked by a bronze tablet in a boulder as described in note 4. The reference mark, a drill hole at the intersection of cross lines in a boulder projecting 3 inches above the ground, is 2.10 meters (6.9 feet) from the station in azimuth $110^{\circ} 57'$.

Green Hill 2 (Tillamook County, Oreg., J. S. Hill, 1908; 1926).—On the southeast slope of a hill about 45 meters from the highest part and below all the prominent trees. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a drill hole in a boulder 12 to 15 inches below the surface. Two reference marks, each consisting of a nail in a blazed tree, are, respectively, 7.8 meters (26 feet) from the station in azimuth $145^{\circ} 25'$ and 5.3 meters (17 feet) in azimuth $221^{\circ} 07'$. An iron pipe, marking a station of the U. S. Army Engineers, is 9.19 meters (30.2 feet) from the station in azimuth $69^{\circ} 41'$.

Pitcher Point (Tillamook County, Oreg., J. Kincheloe, 1866; 1908).—A few meters east of the extremity of the last prominent point, approaching from the east, on the south side of Tillamook Bay, about 4 meters northwest of the bluff. The station is marked by a drill hole in a stone, buried on the beach below the high-water mark. There is a large cross cut in the top of a prominent rock 2.77 meters (9.1 feet) from the station in azimuth $202^{\circ} 27'$.

Miami (Tillamook County, Oreg., J. J. Gilbert, 1875).—A few feet from the summit of the northeast point of the highest hill northwest from the mouth of the Miami River. The station is marked by a drill hole in a granite block projecting 3 inches above the surface.

Crug (Tillamook County, Oreg., J. J. Gilbert, 1875).—On a high rocky peak, on the highest part of a ridge running north. The station is marked by a nail hole in a soft rock.

Foley (Tillamook County, Oreg., J. J. Gilbert, 1875; 1926).—On the highest part of a well-defined round-topped grass-covered hill 2,000 feet high between the forks of Foley Creek and one of the tributaries of the main branch of the Nehalem. The station is marked by a bronze tablet in a flat stone 4 inches below the surface as described in note 4, and is directly in front of the Forest Service shack on the hill. A large dead tree marked by an iron nail is 6.20 meters (20.3 feet) from the station N. 39° W. (magnetic).

Neahkahnie (Tillamook County, Oreg., J. J. Gilbert, 1875; 1926).—On the highest point of the east peak of Neahkahnie Mountain. The station is marked by a drill hole in solid rock, and is best reached from the south face of the mountain. This station could not be found in 1926 and a new station was established near by.

Saddle Mountain (Clatsop County, Oreg., J. J. Gilbert, 1874; 1875).—Lost.

Tillamook Head (Clatsop County, Oreg., J. J. Gilbert, 1874; 1926).—On the highest point of Tillamook Head. The station is marked, both at the surface and 18 inches below the surface, by a drill hole in a stone. A reference mark, consisting of a stone marked with a drill hole, a faint arrow pointing toward the station, and the letters "R. M.," is about 5 feet from the edge of the slope and 10.08 meters (33.1 feet) from the station. The reference mark has a layer of concrete about 3 inches thick superimposed on the stone and marked in a similar manner. Two other reference marks, each consisting of a nail set in concrete in the top of a 2-inch cast-iron pipe, are, respectively, 4.19 meters (13.7 feet) southeast of the station and 4.49 meters (14.7 feet) northeast. An eccentric signal of live trees, used in 1926, is 13.44 meters (44.1 feet) east of the station.

Battery (Pacific County, Wash., J. J. Gilbert, 1873; 1909).—The station is marked 1 foot below the surface by a $\frac{1}{2}$ -inch drill hole 2 inches deep in the top of a large stone. The station could not be recovered in 1911.

Scarboro Hill 2 (Pacific County, Wash., J. J. Gilbert, 1873; 1926).—On the highest point of the cleared part of the hill, 15 meters on a line to Fort Stevens from the highest point of the hill and 4 feet lower, on the south slope. The station is marked by a bronze tablet set in concrete in the top of a 5-inch cast-iron pipe 4 feet long which projects 5 inches above the ground. A reference mark, consisting of a spike set in concrete in the top of a 2-inch cast-iron pipe projecting 16 inches above the ground, is north of the station near the highest point of the hill. A similar reference mark is on the southeast slope of the hill at about the same elevation as the station. A small pine tree, marked with a blaze and 4 nails in the form of a triangle, is 3 meters west of the station.

East Battery (Pacific County, Wash., E. H. Pagenhart, 1911; 1926).—On the embankment of the old east battery at Forth Canby, on the brow of a steep slope

which rises from the water at the easternmost point, abreast of Sand Island, 50 meters up the hill from the building on the slope, and 4 miles by road or 2 miles by water from Ilwaco. The station is marked by a standard bronze tablet in the top of a square granite post, flush with the ground. Three reference marks, each consisting of an iron bolt embedded in masonry, are at the following distances and azimuths from the station: 9.42 meters (30.9 feet), $45^{\circ} 23'$; 4.71 meters (15.5 feet), $63^{\circ} 09'$; and 6.54 meters (21.5 feet), $120^{\circ} 25'$. The easternmost corner of a concrete manhole, about 3 meters outside the embankment, is 4.89 meters (16 feet) from the station in azimuth $223^{\circ} 09'$.

Fort Stevens longitude (Clatsop County, Oreg., C. V. Hodgson, 1911; 1926).—On the embankment at the edge of the old moat, just in front of Battery Freeman at Fort Stevens. The station is marked by a standard bronze tablet, bearing the usual inscription and the words "Astronomical station," set in the middle of the notch in the top of the pier. The foundation of the pier extends 4 feet below the ground, the lower 2 feet being old concrete blocks tamped in with sand. Station *Gun* (not included in this publication) is 27.90 meters (91.5 feet) distant in azimuth $45^{\circ} 18' 20''$. Reference mark No. 1, a cross one-half inch deep in the concrete embankment in front of the easternmost and smallest cannon in Battery Freeman and about 8 inches from the inner edge of the concrete, is 37.25 meters (122.2 feet) S. $27^{\circ} 30'$ E. (magnetic) from the station. Reference mark No. 2, a small triangle with a drill hole at the center, cut in the concrete directly in front of the easternmost of the two 6-inch guns about 8 inches from the inner edge of the concrete, is 42.20 meters (138.5 feet) S. $40^{\circ} 00'$ W. (magnetic) from the station.

Supplementary points

Life (Lincoln County, Oreg., J. S. Hill, 1908; 1927).—On the highest point and 30 meters from the edge of the bluff about 300 meters south of an old Coast Guard station. The station is marked at the surface by a bronze tablet in a boulder as described in note 4, and underground by a drill hole in a boulder 12 to 15 inches below the surface. In 1927 the original reference marks could not be found and two new reference marks were set, each consisting of a bronze tablet set in concrete in the top of a 10-inch tile, note 13a. One is 7.28 meters (23.9 feet) from the station, $8^{\circ} 25'$ to the right of the line to *Jetty*, and the other is 5.42 meters (17.8 feet) from the station, $106^{\circ} 20'$ to the right of the same line.

Rock Point (Tillamook County, Oreg., J. Kincheloe, 1866).—On the south side of Tillamook Bay, on the flat at a point commonly known as Memalust Point. The station is slightly below high water mark and is marked by a drill hole in a large boulder firmly embedded in the ground. Three reference marks, each consisting of a drill hole in a boulder at a distance of 4 feet from the station, form two right angles with the station.

Mud (Tillamook County, Oreg., J. Kincheloe, 1866).—On the flats south of the bay and below the high-water mark. The station is marked by a drill hole in a boulder. Three stakes were set, each 1.22 meters (4.0 feet) from the station. Two of these stakes are on opposite sides of the station mark and in line with it. The third stake is at right angles to this line as seen from the station.

Slough (Tillamook County, Oreg., J. Kincheloe, 1866).—Near the edge of a slough, on tide land on the southeast side of Tillamook Bay. The station is marked by a drill hole in a boulder. Three stakes were set, each 1.22 meters (4.0 feet) from the station. Two of these stakes are on opposite sides of the station mark and in line with it. The third stake is at right angles to this line as seen from the station.

Tillamook Bay, west base (Tillamook County, J. Kincheloe, 1866).—On the southeast side of the bay, about 50 meters north of Kilchis Point, and near the high-water mark. The station is marked by a drill hole filled with lead, in a stone $2\frac{1}{2}$ feet long, set with the top level with the surface. Two stones were placed, one on either side of the station and in line with it, and a third stone is at right angles to this line as seen from the station. A drill hole in the top of each is 1.22 meters (4.0 feet) from the station.

Tillamook Bay, east base (Tillamook County, J. Kincheloe, 1866).—On the southeast side of the bay and about 20 meters from the high-water mark, and in front of and about 10 meters distant from Peter Morgan's house. The station is marked by a drill hole filled with lead in a stone $2\frac{1}{2}$ feet long, set with the top level with the surface. Two stones were placed, on opposite sides of the station and in line with it, and a third stone at right angles to this line as seen from the station. A drill hole in the top of each is 1.22 meters (4 feet) from the station.

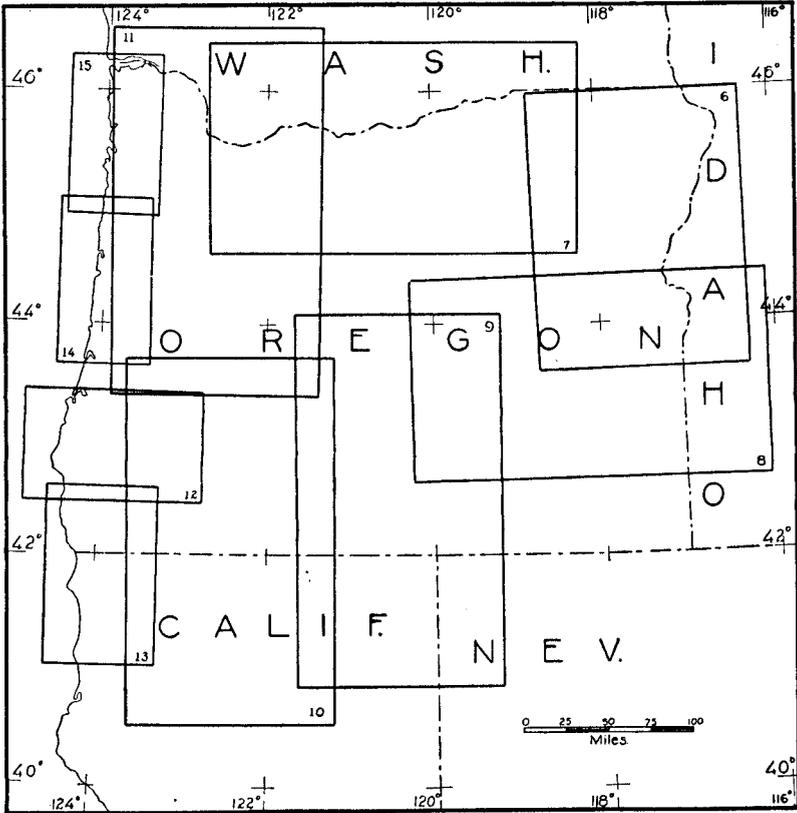


FIGURE 5.—Index map of Oregon showing areas covered by each of the following sketches, Figures 6-15

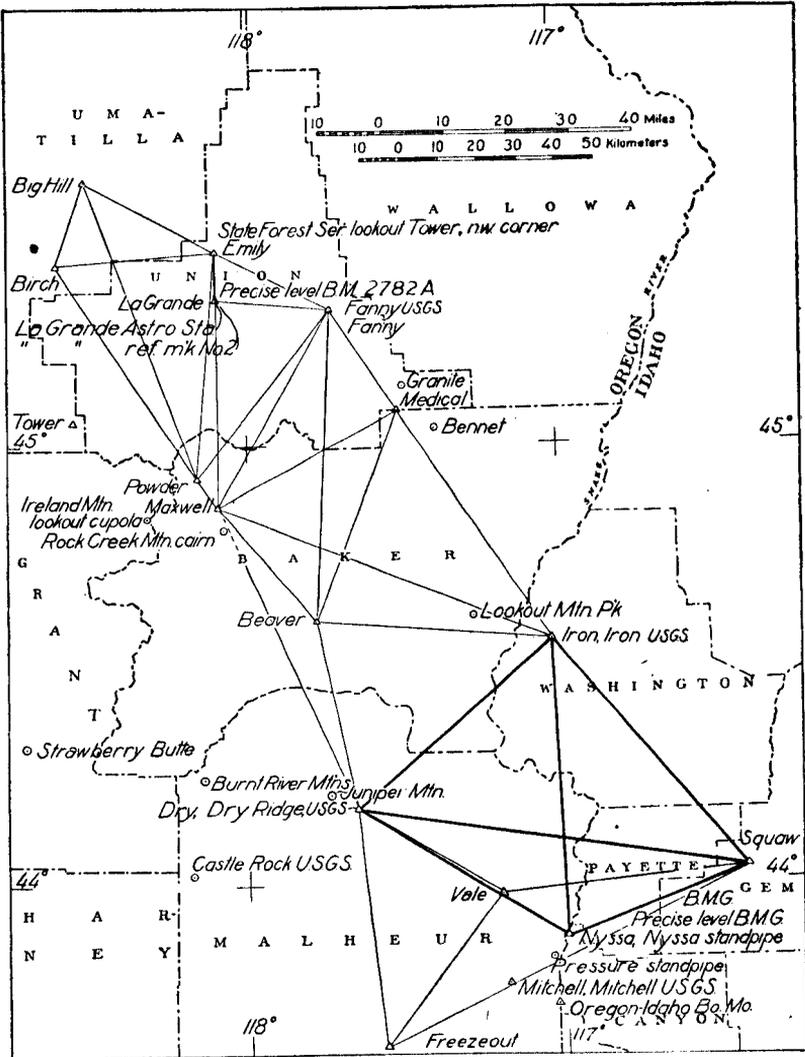


FIGURE 6.—First-order triangulation, Idaho boundary toward the Columbia River

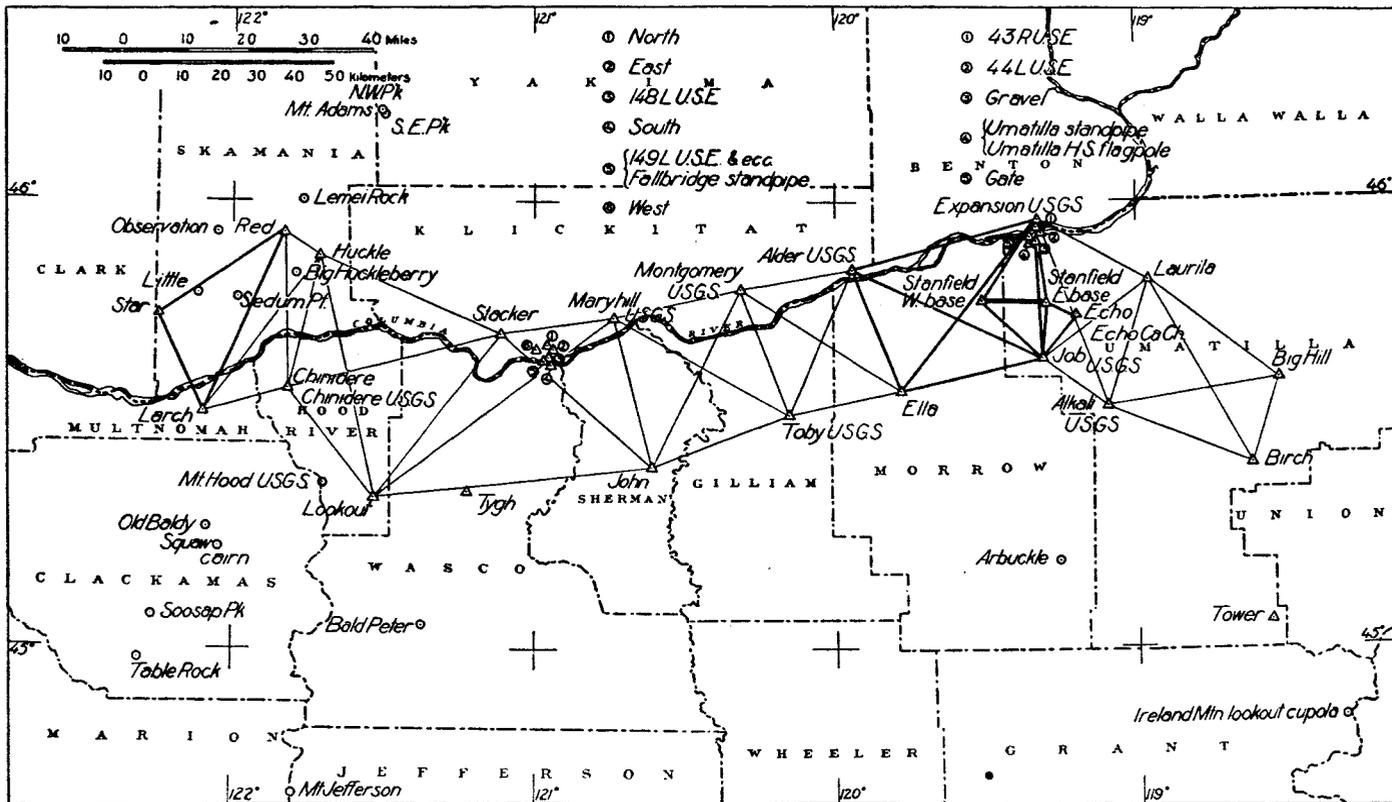


FIGURE 7.—First-order triangulation, along the Columbia River

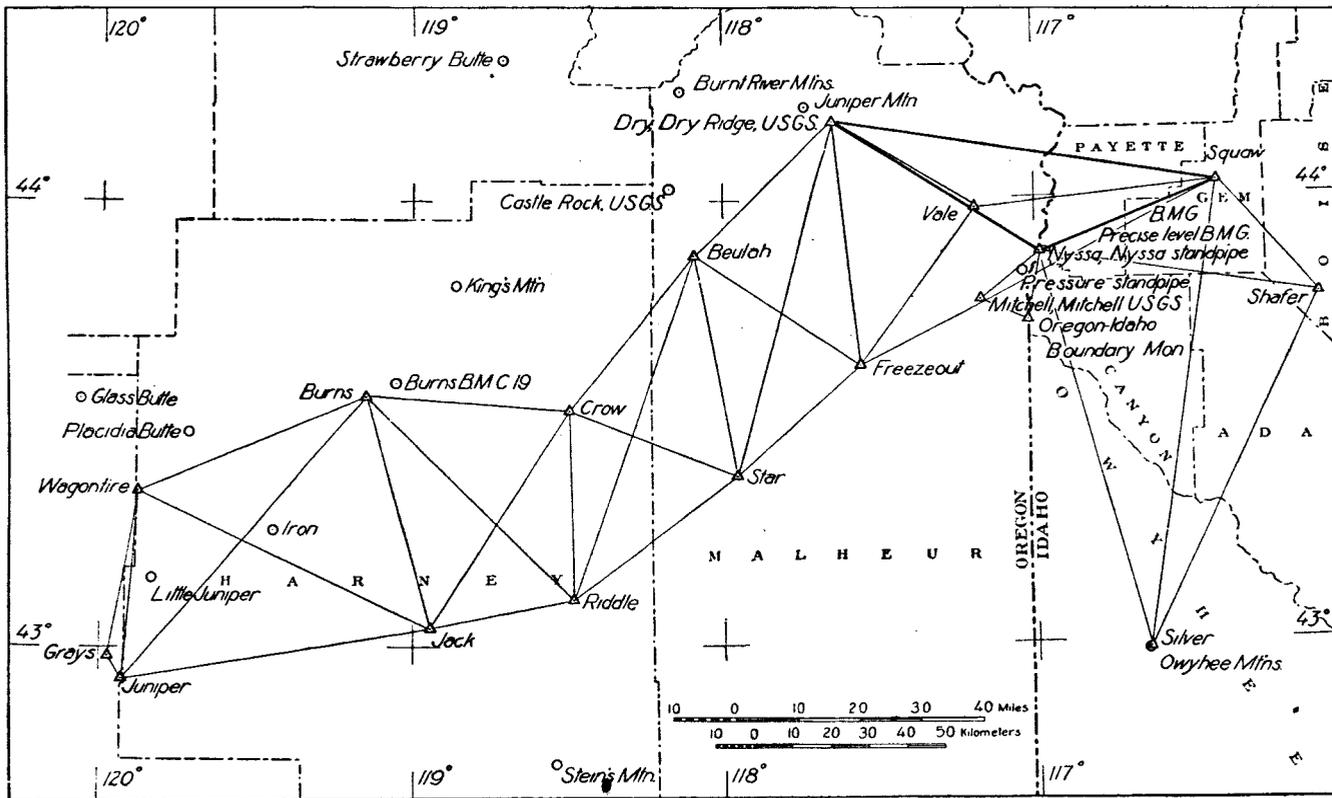


FIGURE 8.—First-order triangulation, southwest from Idaho boundary

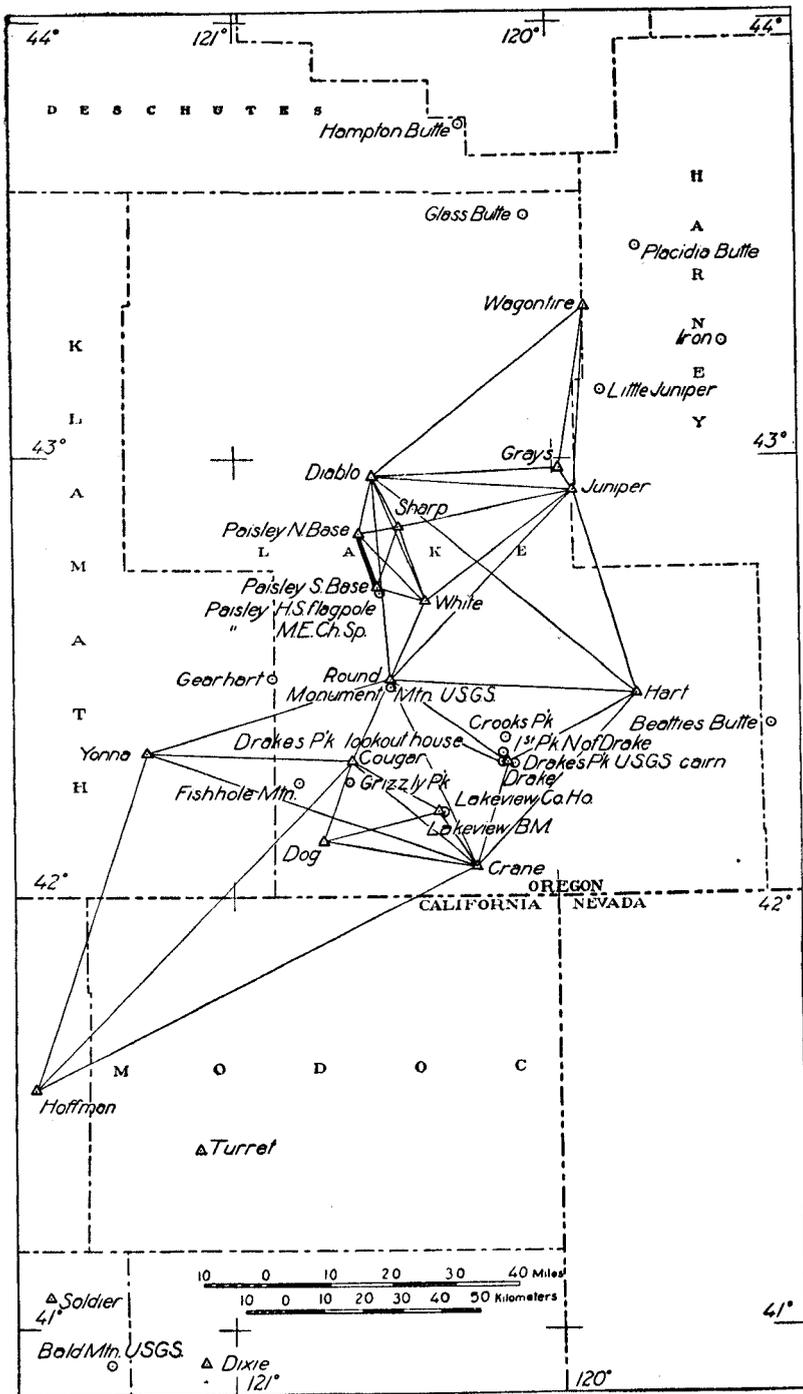


FIGURE 9.—First-order triangulation, southern Oregon

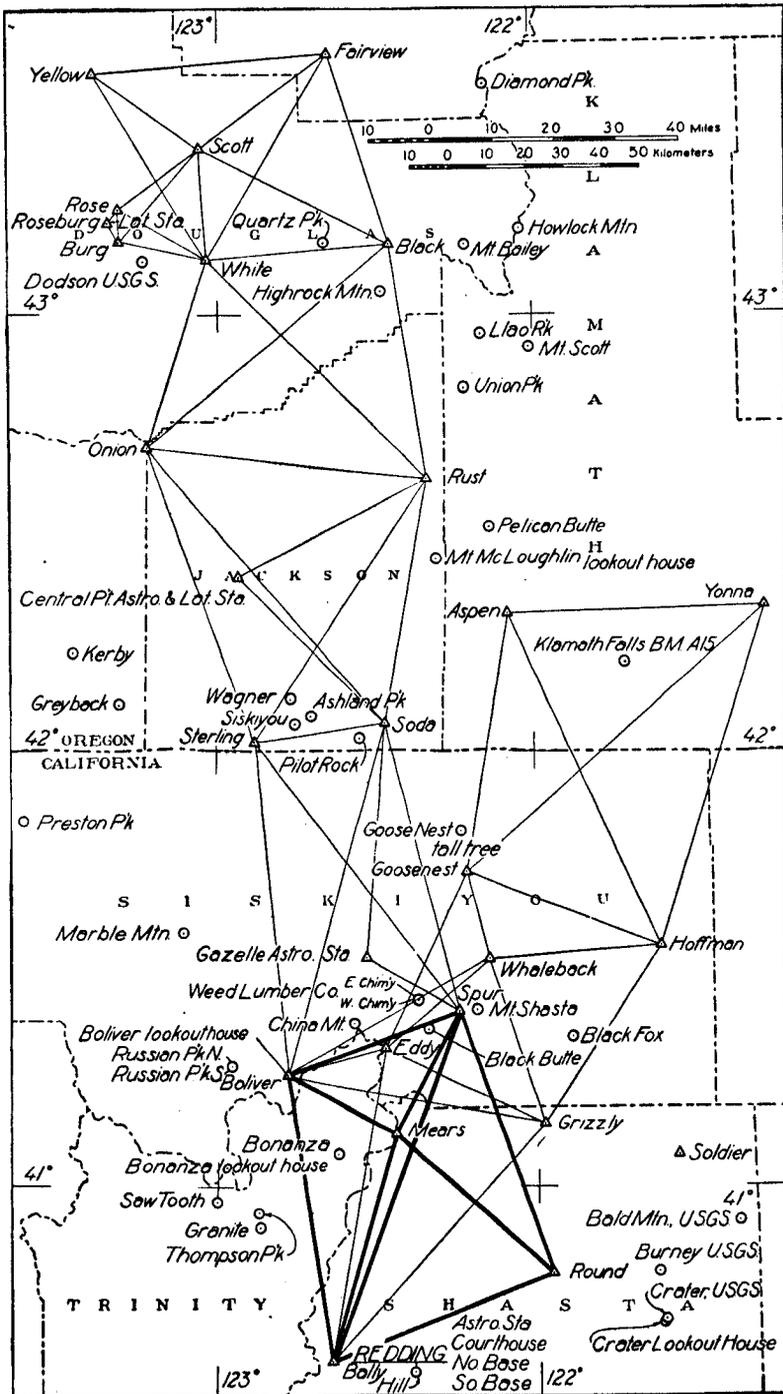


FIGURE 10.—First-order triangulation, junction of Idaho-Oregon arc with Washington-California arc

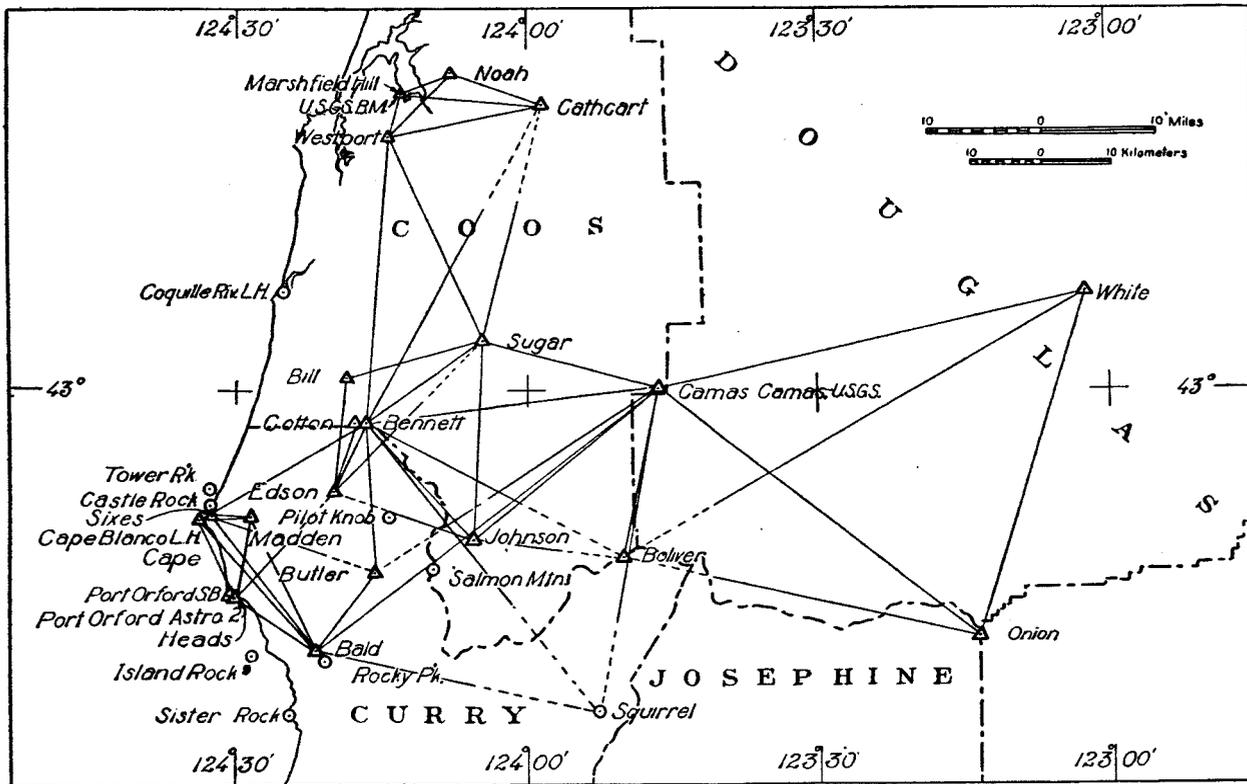


FIGURE 12.—Second-order triangulation, southwest Oregon

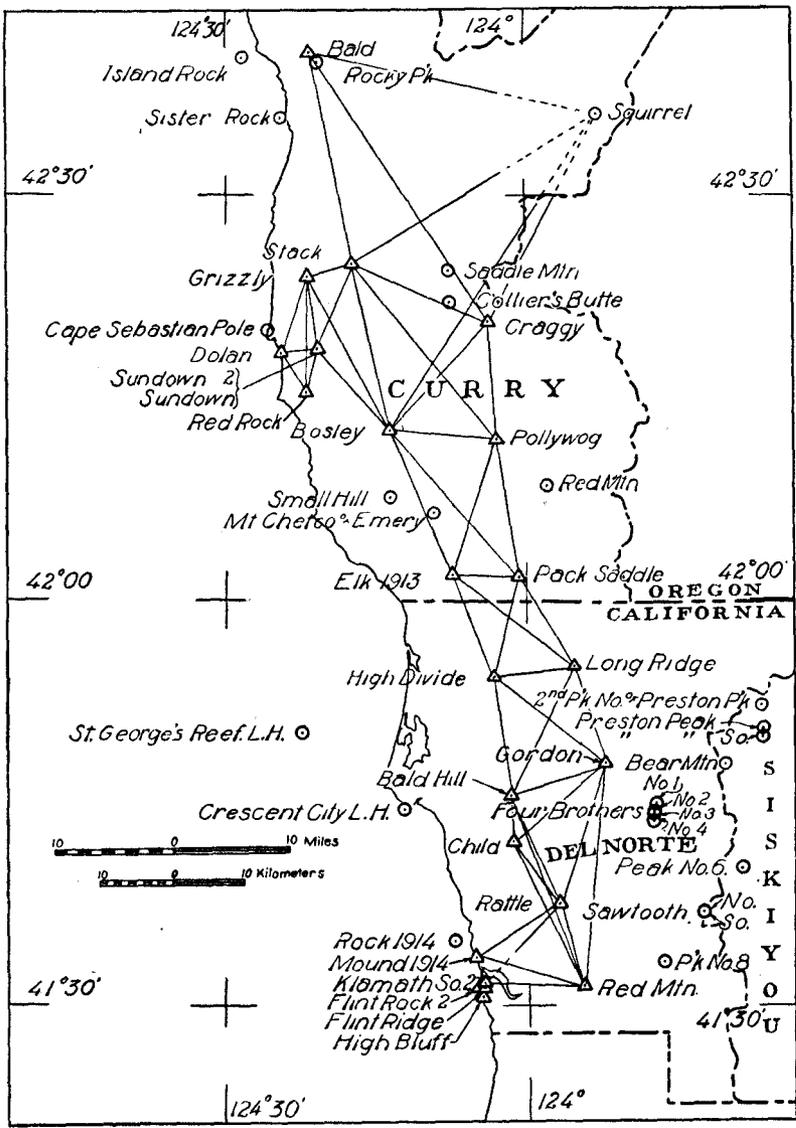


FIGURE 13.—Second-order triangulation, southwest Oregon

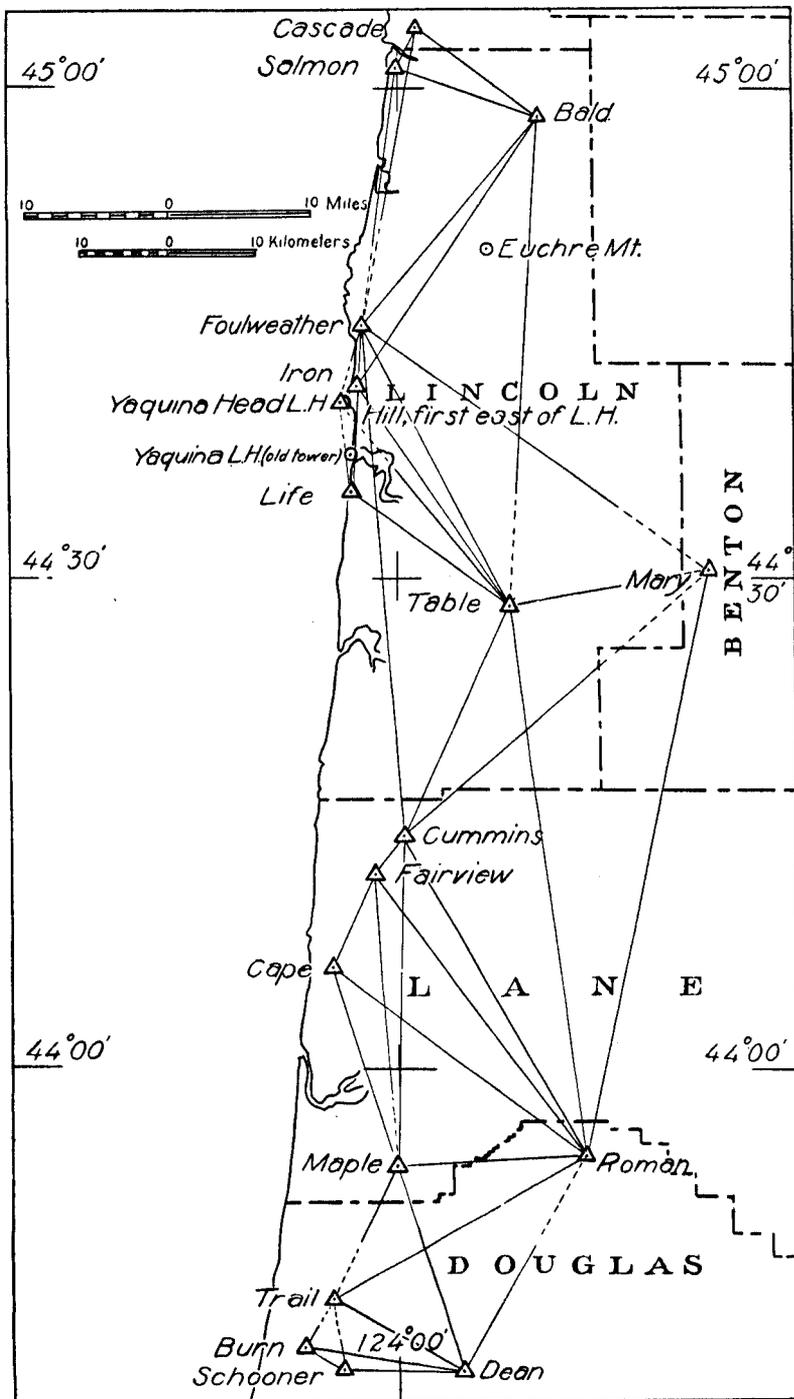


FIGURE 14.—Second-order triangulation, northwest Oregon

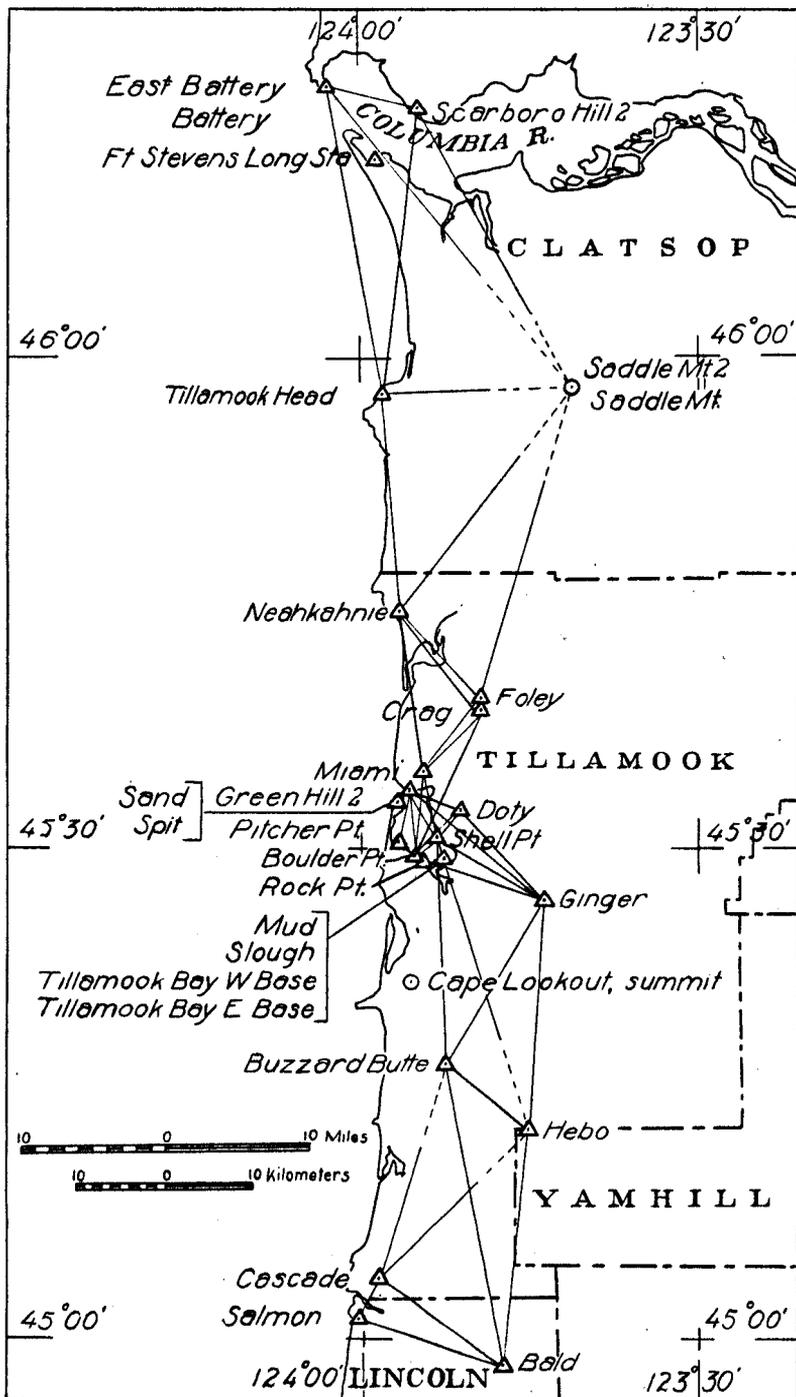


FIGURE 15.—Second-order triangulation, northwest Oregon

Index to positions, descriptions, elevations, and sketches

Station	Position	Description	Elevation	Sketch	Station	Position	Description	Elevation	Sketch
	Page	Page	Page	Figure		Page	Page	Page	Figure
Albany courthouse cupola	27	---	39	11	Cannibal Peak, highest wooded peak	28	---	39	11
Alder (U. S. G. S.)	16	46	37	7	Cape (Curry County)	29	64	40	12
Alkali (U. S. G. S.)	16	45	37	7	Cape (Lane County)	34	68	40	14
Alsea Peak (Grass Mountain), partly cleared, wooded summit	28	---	39	11	Cape Blanco Lighthouse	31	---	---	12
Arbuckle	18	49	---	7	Cape Lookout, summit	36	---	40	15
Arquett (Soosap Peak), cairn	28	---	39	7, 11	Cape Sebastian, pole	32	---	---	13
Ashland Peak, cairn	28	---	39	10	Cascade	34	70	40	14, 15
Aspen	21	52	38	10	Castle Rock	32	---	---	12
Astronomical station:					Castle Rock, cairn (U. S. G. S.)	21	---	38	6, 8
Central Point	27	61	39	10	Cathcart	29	63	40	12
Eugene	25	57	---	11	Catholic Church spire, Echo	18	---	37	7
Gazelle	25	59	39	10	Cem.	26	---	39	11
La Grande	18	---	---	6	Central Point astronomical station	27	61	39	10
Redding	27	62	39	10	Central point latitude station	27	61	---	10
Bachelor Butte (Ball Butte)	28	---	39	11	Chemawa tank	26	---	39	11
Balch	26	60	---	11	Child.	31	66	40	13
Bald (Curry County)	29	63	40	12, 13	China Mountain (not the cairn)	28	---	39	10
Bald (Lincoln County)	34	69	40	14, 15	Chinidere	17	47	37	7, 11
Bald Hill	31	66	40	13	Chinidere (U. S. G. S.), cairn	19	---	---	7, 11
Bald Mountain (Monmouth Peak)	28	---	39	11	Christian Church, Springfield	27	60	---	11
Bald Mountain (U. S. G. S.)	23	54	38	9, 10	Collier Butte	32	---	40	13
Bald Peter	19	49	---	7, 11	Coquille River Lighthouse	32	---	---	12
Ball Butte (Bachelor Butte)	28	---	39	11	Corvallis, closed cupola	27	---	39	11
Bally	25	59	38	10	Corvallis, open cupola	27	---	39	11
Baptist Church spire, Eugene	27	61	---	11	Cotton	31	67	40	12
Barnes	24	55	39	11	Cougar	21	52	38	9
Battery	35	71	40	15	Courthouse:				
Bear Mountain	33	---	40	13	Albany, cupola	27	---	39	11
Beatys Butte, summit	22	---	38	9	Eugene, flagpole	27	61	---	11
Beaver	15	44	37	6	Redding	27	62	39	10
Bench mark (U. S. G. S.), Portland	26	60	---	11	Crag	35	71	---	15
Bennet	17	48	37	6	Craggy	30	64	40	13
Bennett	29	63	40	12	Crane	21	52	38	9
Beulah	20	50	38	8	Crater (U. S. G. S.)	23	54	38	10
Big Hill	16	45	37	6, 7	Crater (Magee) lookout house	23	---	---	10
Big Huckleberry	19	49	37	7, 11	Crater Peak	28	---	---	13
Bill	32	67	40	12	Crescent City Lighthouse	33	---	---	9
Birch	15	45	37	6, 7	Crook Peak, highest point	22	---	38	8
Black	25	58	39	10	Crow	20	50	38	---
Black Butte, cairn	28	62	39	10	Crow (U. S. G. S.). (See Crow, description.)	34	68	40	14
Black Fox	23	54	38	10	Davis	24	55	39	11
B. M. 2782 A, precise level	17	48	---	6	Deady Hall, west tower, Eugene	27	60	---	11
B. M. G.	17	48	37	6, 8	Dean	34	68	40	14
B. M. G., precise level	17	48	---	6, 8	Diablo	20	51	38	9
B. M. (U. S. G. S.)	18	---	---	---	Diamond Peak	28	39	39	10, 11
Boliver (first-order)	25	59	38	10	Dixie	23	54	38	9
Boliver (second-order)	29	62	40	12	Dixie (U. S. G. S.). (See Dixie, description.)	28	---	39	10
Boliver lookout house	23	---	38	10	Dodson (U. S. G. S.)	23	53	38	9
Bonanza	23	54	---	10	Dolan	30	65	40	13
Bonanza lookout house	23	---	38	10	Doty	35	70	40	15
Bosley	30	65	40	13	Drake	21	52	38	9
Boulder Point	35	70	40	15	Drake Peak cairn (U. S. G. S.)	23	---	38	9
Boundary monument, Idaho-Oregon	17	48	37	6, 8	Drake Peak lookout house	22	---	38	9
Broken Top (St. Mary Butte)	28	---	39	11	Dry	15	43	37	6, 8
Burg	27	61	39	10	Dry Ridge (U. S. G. S.), cairn (see Dry, description)	17	---	---	6, 8
Burn	34	69	40	14	Eagle (Old Baldy) cairn	26	---	39	7, 11
Burney (U. S. G. S.)	23	54	38	10	East	18	---	37	7
Burns	20	50	38	8					
Burns bench mark, C 19	22	53	38	8					
Burnt River Mountains, summit	22	---	38	6, 8					
Butler	29	64	40	12					
Buzzard Butte	35	70	40	15					
Camas	29	62	40	12					
Camas (U. S. G. S.)	31	67	---	12					

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

Station	Position	Description	Elevation	Sketch	Station	Position	Description	Elevation	Sketch
Mary	24	55	39	11, 14	Pollywog	30	65	40	13
Maryhill (U. S. G. S.)	16	47	37	7	Port Orford Astronomical 2.	30	64	40	12
Maxwell	15	44	37	6	Port Orford south base	32	67	---	12
Mears	25	59	38	10	Portland:				
Medical	15	44	37	6	Bench mark (U. S. G. S.)	26	60	---	11
Methodist Church:					Latitude station	26	60	---	11
Eugene, spire	27	61	---	11	Longitude station	26	60	---	11
Springfield	27	60	---	11	Powder	15	44	37	6
Miami	35	71	---	15	Prairie Peak, west tree	28	---	39	11
Middle Sister	28	---	39	11	Precise level, B. M. G.	17	48	---	6, 8
Mitchell	17	48	37	6, 8	Precise level, B. M. 2782 A.	17	48	---	6
Mitchell (U. S. G. S.), cairn	17	---	39	11	Pressure standpipe	17	---	---	6, 8
Mitchell (Wash.)	26	---	39	11	Preston Peak	33	67	40	10, 13
Monmouth Peak (Bald Mountain)	28	39	11	---	Preston Peak, second peak north of	33	67	40	13
Montgomery (U. S. G. S.)	16	47	37	7	Preston Peak, south	33	---	40	13
Monument, General Land Office	26	60	39	11	Quartz Peak	28	---	39	10
Monument Mountain, cairn (U. S. G. S.)	22	---	38	9	Rattle	31	66	40	13
Mound	31	66	40	13	Rauch	24	56	39	11
Mount Adams, northwest peak	19	---	---	7, 11	Red	24	54	37	7, 11
Mount Adams, southeast peak	19	---	---	7, 11	Red Mountain	32	---	---	13
Mount Bailey (Old Bailey)	28	---	39	10	Red Mountain (Calif.)	31	66	40	13
Mount Hood (U. S. G. S.)	19	49	37	7, 11	Red Rock	30	65	40	13
Mount Jefferson	28	---	39	7, 11	Redding:				
Mount McLaughlin (Mount Pitt), lookout house	23	---	38	10	Astronomical station	27	62	39	10
Mount Pitt (Mount McLaughlin), lookout house	23	---	38	10	Courthouse	27	62	39	10
Mount Scott	28	39	10	---	North base	27	62	---	10
Mount Shasta, top	28	39	11	---	South base	27	62	---	10
Mount Washington	28	39	11	---	Riddle	20	50	38	8
Mount Zion	28	39	11	---	Ridge	24	56	39	11
Mud	36	72	15	---	River	26	60	39	11
Neahkahnie	35	71	15	---	Rock	33	---	---	13
Nebo	28	39	11	---	Rock Creek Mountain, cairn	17	---	37	6
Noah	29	63	40	12	Rock Point	36	72	---	15
North	18	37	7	---	Rocky Butte	25	60	39	11
North Sister	28	39	11	---	Rocky Peak	32	---	---	12, 13
Nyssa	15	44	37	6, 8	Roman	25	57	39	11, 14
Nyssa standpipe	17	37	6, 8	---	Rose	27	61	39	10
Observation	19	50	37	7, 11	Roseburg latitude station	27	61	39	10
Old Bailey (Mount Bailey)	28	39	10	---	Round	21	51	38	9
Old Baldy (Eagle), cairn	26	39	7, 11	---	Round (Calif.)	25	59	39	10
Onion	25	58	39	10, 12	Round Peak	28	---	39	11
Oregon-Idaho boundary monument	17	48	37	6, 8	Russian Church, cross	27	---	---	11
Oregonian	26	60	39	11	Russian Peak, north point	28	---	39	10
Owyhee Mountains, summit	22	38	8	---	Russian Peak, south point	28	---	---	10
Packsaddle	30	65	40	13	Rust	25	58	39	10
Paisley:					Saddle Mountain (Clatsop County)	35	71	---	15
High school, flagpole	22	---	38	9	Saddle Mountain (Curry County)	32	---	40	13
Methodist Church, spire	22	---	38	9	Saddle Mountain 2	35	---	40	15
North base	21	51	38	9	St. Georges Reef Lighthouse	33	---	---	13
South base	21	51	38	9	St. Mary Butte (Broken Top)	28	---	39	11
Patterson School spire, Eugene	27	61	---	11	Salem Capitol, dome	26	---	39	11
Peak, first north of station Drake	23	---	38	9	Salmon	34	70	40	14, 15
Peak No. 6	33	---	40	13	Salmon Mountain	31	---	40	12
Peak No. 8	33	---	40	13	Sawtooth	28	---	39	10
Pelican Butte (Lost Peak)	28	---	39	10	Sawtooth, North	33	---	40	13
Peterson	24	55	39	11	Sawtooth, South	33	---	40	13
Pilot Knob	31	---	39	10	Scarboro Hill 2	35	71	40	15
Pilot Rock	28	---	39	10	Schooner	34	69	---	14
Pigzag	25	57	---	15	Scott	25	58	39	10
Pitcher Point	35	71	---	15	Seavies (U. S. G. S.)	27	61	39	11
Placidia Butte, summit	22	---	38	8, 9	Seavies 2	25	57	---	11
					Second peak north of Preston Peak	33	67	40	13
					Sedum Point	19	49	---	7, 11
					Shafer	15	43	37	8
					Sharp	20	51	38	9
					Shell Point	35	70	40	15
					Sheridan Peak, highest green tree	28	---	39	11

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Station	Position		Elevation	Sketch	Station	Position		Elevation	Sketch
	Page	Page				Page	Page		
Silver	15	43	37	8	Twin	24	56	39	11
Siskiyou Peak	28		39	10	Tygh	19	49	37	7
Sister Rock	32			12, 13	Umatilla:				
Sixes	29	64	40	12	High school flagpole	18			7
Slough	36	72		15	Standpipe	18		37	7
Small hill southwest (south)					Union Peak	28		39	10
of Bosley	33		40	13	United Brethren Church				
Soda	25	58	39	10	spire, Eugene	27	61		11
Soldier	23	53	38	9, 10	U. S. E. monument:				
Soosap Peak (Arquetl),					43 R.	18	49		7
cairn	28		39	7, 11	44 L.	18	49		7
South	18		37	7	148 L.	18	49	37	7
South Sister	28		39	11	149 L.	18	49		7
Spencer	24	56	39	11	149 L, eccentric	18	49	37	7
Springfield:					U. S. G. S. B. M.	18			
Christian Church	27	60		11	U. S. G. S. bench mark,				
Methodist Church	27	60		11	Marshfield			40	12
Spur	25	58	39	10	Vale	20	50	38	6, 8
Squaw	15	44	37	6, 8	Vale (U. S. G. S.). (See				
Squaw, cairn	28		39	7, 11	Vale, description.)				
Squirrel	29	63	40	12, 13	Vancouver Barracks flag-				
Stack	30	64	40	13	staff, west	26			11
Stacker	17	47	37	7	Wagner Butte	28		39	10
Stanfield east base	16	46	37	7	Wagontire	20	51	38	8, 9
Stanfield west base	16	46	37	7	Walker Peak (Howlock				
Star	20	50	38	8	Mountain)	28			10
Star (Wash.)	24	55	39	7, 11	Warren	25	59	39	11
State Forest Service,					Warren Schoolhouse cupola	26			11
lookout tower, northwest					Weed Lumber Co., east				
corner (see Emily, de-					chimney	23		38	10
scription)	18			6	Weed Lumber Co., west				
Steens Mountain, highest					chimney	23		38	10
point	22		38	8	West	18		37	7
Starling	25	58	39	10	Westport	29	63	40	12
Strawberry Butte	22			6, 8	Whaleback	21	52	38	10
Sugar	29	63	40	12	White (Douglas County)	25	58	39	10, 12
Sundown	32	67		13	White (Lake County)	20	51	38	9
Sundown 2	30	65		13	White church spire, west of				
Table	34	69	40	14	Brooks	26		39	11
Table Rock, cairn	28		39	7, 11	Willamette north base	24	56	39	11
Thomas, cairn	28		39	11	Willamette south base	24	56	39	11
Thompson Peak	28		39	10	Wishram (Fallbridge)				
Three Fingered Jack (Hay-					standpipe	19			7
rick)	28		39	11	W. O. W. Hall spire, Eugene	27	61		11
Tillamook Bay east base	36	72		15	Yam	24	55	39	11
Tillamook Bay west base	36	72		15	Yaquina Head Lighthouse	36		40	14
Tillamook Head	35	71	40	15	Yaquina Lighthouse, old				
Toby (U. S. G. S.)	16	46	37	7	tower	36			14
Tower	17	48		6, 7	Yellow	25	57	39	10, 11
Tower Rock	32			12	Yonna	21	52	38	9, 10
Trail	34	68	40	14					
Turret	23	54	38	9					

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The DIRECTOR, U. S. COAST AND GEODETIC SURVEY,
Washington, D. C.

DEAR SIR: I desire that my name be placed on the mailing lists indicated by check below to receive notification of the issuance of airway maps, nautical charts, and miscellaneous publications of the Coast and Geodetic Survey:

- 109. Astronomic Work.
- 109-A. Base Lines.
- 109-B. Coast Pilots.
- 109-C. Currents.
- 109-D. Geodesy, or Measurement of the Earth.
- 109-E. Gravity.
- 109-F. Hydrography.
- 109-G. Leveling.
- 109-H. Nautical Charts.
- 109-I. Oceanography.
- 109-J. Traverse.
- 109-K. Seismology.
- 109-L. Terrestrial Magnetism.
- 109-M. Tides.
- 109-N. Topography.
- 109-O. Triangulation.
- 109-P. Cartography.
- 109-R. Airway Maps.

(Name)-----

(Address)-----

(89)



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